AMENDED RECORD OF DECISION

Northrop Grumman Bethpage Facility

Operable Unit Number 02: Off-Site Groundwater
Operable Unit Number 03: Former Grumman Settling Ponds and Adjacent Areas Off-Site Groundwater

and

Naval Weapons Industrial Reserve Plant

Operable Unit Number 02: Off-Site Groundwater
State Superfund Projects
Bethpage, Nassau County

Site Nos. 130003A & 130003B
December 2019

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT – AMENDED RECORD OF DECISION

Selected Remedy for Full Hydraulic Containment of the Navy Grumman Groundwater Plume

Northrop Grumman - Bethpage Facility and Naval Weapons Industrial Reserve Plant Site
Bethpage, Nassau County
Site Nos. 130003A and 130003B
December 2019

Statement of Purpose and Basis

This document presents the remedy to address groundwater contamination, herein referred to as the Navy Grumman groundwater plume, that originated from the Northrop Grumman Bethpage Facility and the Naval Weapons Industrial Reserve Plant and that now extends nearly four miles from these two New York State Inactive Hazardous Waste Disposal Sites. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Navy Grumman groundwater plume and the public's input to the proposed remedy presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the Amended Record of Decision (AROD).

Description of Selected Remedy

The selected remedy for the site is the construction, long-term operation, and maintenance of a full hydraulic containment and treatment system that can effectively halt the further migration of the Navy Grumman groundwater plume. This remedy also includes a network of mass flux extraction wells within the interior of the plume to expedite cleanup. The elements of the amended remedy (which are intended to supplement remedial element(s) previously selected in existing RODs) are as follows:

1) A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which will otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2) Groundwater extraction and treatment will be implemented to treat site contaminants in the off-site groundwater plume. Based on the current groundwater flow modeling, it is expected that a network of approximately 16 extraction wells will be installed along the margins of the SCG plume (typically 5 ppb TCVOC) to hydraulically contain the Navy Grumman groundwater plume. This well network has been specifically designed to prevent the continued uncontrolled migration of the plume.

   The hydraulic containment extraction wells will be supplemented with approximately eight groundwater extraction wells that will be installed and pumped within the interior of the groundwater plume to achieve capture of site contaminants that exceed 50 ppb. These eight wells are positioned as mass flux wells and specifically designed to capture the bulk of the groundwater contamination mass. In total, these 24 extraction wells will withdraw contaminated groundwater at an approximate combined rate of 12,100 gallons per minute (17.5 MGD). The exact number and locations of the extraction wells will be determined after pre-design sampling, completion of a full engineering design and continued groundwater modeling. This will also assist in finalizing the well depths and pumping rates.

   The extracted groundwater will be treated at one of five groundwater treatment plants using air stripping technology. This air stripping will be implemented ex-situ to remove volatile contaminants from extracted groundwater. Using this technology, the groundwater will be contacted with an air stream to volatilize contaminants from groundwater to air. Following air stripping, the water will be secondarily treated with liquid-phase granulated active carbon (GAC). The GAC will be used to remove dissolved contaminants from extracted groundwater by adsorption. The GAC system will consist of one or more vessels filled with carbon connected in series and/or parallel. Advanced oxidation process (AOP) technology will be used for 1,4-dioxane removal, if necessary, based on data acquired during the remedial design. The extracted air stream containing the volatile contaminants will be treated prior to discharge to the atmosphere using vapor-phase GAC. The above description of the groundwater treatment processes is based on evaluations in the FS. The details of this treatment process will be fully determined during a remedial design program.

   Following withdrawal, contaminated groundwater from 17 of the 24 extraction wells will be pumped to a centralized groundwater treatment plant in the area of the former Northrop Grumman property. This centralized treatment plant will be capable of treating approximately

8,100 gpm (11.7 MGD). Following treatment, this water will be returned to the aquifer via a newly constructed recharge basin located on the public property within Bethpage State Park. It is expected that a recharge basin approximately 10-acres in size will be necessary to manage the treated water. Seasonally, a portion of the treated water will be beneficially re-used for irrigation purposes by the Bethpage State Park.

Contaminated groundwater withdrawn from four of the 24 extraction wells will be pumped to a second centralized treatment plant near the headwaters of Massapequa Creek. This centralized treatment plant will be capable of treating approximately 2,000 gpm (2.8 MGD). Following treatment, this water will be used to augment flow in Massapequa Creek. This streamflow augmentation will provide environmental benefits (e.g., increased steam flows) to the local aquatic habitat within Massapequa Creek.

Contaminated water from the three remaining groundwater extraction wells will be treated at three smaller, individual, treatment plants located south of the Southern State Parkway. Two of these treatment plants will be capable of treating 1,000 gpm (1.4 MGD) each and the third treatment plant will be capable of treating 500 gpm (0.72 MGD). Treated water from these individual treatment plants will be discharged to three existing recharge basins at a total flow rate of approximately 2,000 gpm (2.9 MGD) to mitigate potential environmental impacts to surface water flow, wetland water levels, and subsea discharge (saltwater intrusion) caused by the extraction of approximately 12,100 gallons per minute (17.5 MGD) of groundwater under this alternative.

Groundwater modeling will be performed during the remedial design program to assist in finalizing the number, size, and locations of recharge basins to be used (and the associated discharge rates), and the amount of treated water that will be discharged to Massapequa Creek (to augment flow) and to Bethpage State Park (for irrigation purposes). To convey water from the extraction wells to the five treatment plants and from the treatment plants to the discharge locations, it is estimated that a total of approximately 124,000 feet (23.5 miles) of underground conveyance piping will be installed as part of this remedy.

The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

3) The remedy assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I [in design and construction] and RE108 Phase II [in design]) are operating and that the existing and planned on-site remedial actions will be implemented. The existing and planned on-site remedial actions include:
    1. Continued operation of the Bethpage Park Soil Vapor Extraction and Treatment System;
    2. Continued Operation of the Site 1, Former Drum Marshaling Yard, Soil Vapor Extraction Containment System;
    3. Continued implementation of the In-situ Thermal Treatment remedy to address VOC soil contamination in the Former Grumman Settling Ponds/Bethpage Park area;

4. Implementation of the soil excavation and off-site disposal remedy to address PCB and metals contaminated soil in the Former Grumman Settling Ponds/Bethpage Park area;
5. Continued implementation of the soil excavation and off-site disposal remedy to address PCB contaminated soil in the Site 1, Former Drum Marshaling Yard; and
6. Continued operation of the steam injection system with free product recovery and biosparging at Site 4, Former Underground Storage Tanks area, to address fuel oil contamination.

4) The remedy assumes that the existing water district public water supply wells will continue to pump water at rates equivalent to the average rate for those wells (over a representative six-year period (2010-2015)) during operation of the remedy.

5) The Bethpage Water District Plants 4, 5, and 6 pumping wells will be transitioned over time from public water supply wells to remedial wells. To allow Bethpage Water District to continue to meet municipal demands without these wells, the remedy includes a provision for development of an alternate water supply.

6) Imposition of an institutional control in the form of an environmental easement, deed restriction or an environmental notice on properties where engineering controls (e.g., extraction wells, water treatment plants) are constructed.

7) A Site Management Plan is required, which includes the following:
   - An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the Northrop Grumman Bethpage Facility and NWIRP sites and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:
     - Institutional Controls: The Institutional Control/s discussed in Paragraph 5 above.
     - Engineering Controls: The extraction wells, underground conveyance piping, treatment plants, and recharge basins discussed in Paragraphs 2 and 3 above.
   - A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
     - monitoring of groundwater to assess the performance and effectiveness of the remedy; and
     - a schedule of monitoring and frequency of submittals to the Department.
   - An Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:
     - procedures for operating and maintaining the remedy;
     - compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
     - maintaining site access controls and Department notification; and
     - providing the Department access to the site and O&M records.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

DEC 20 2019

Date

Michael J. Ryan, P.E., Director
Division of Environmental Remediation

AMENDED RECORD OF DECISION

Northrop Grumman - Bethpage Facility and Naval Weapons Industrial Reserve Plant Site
Bethpage, Nassau County
Site Nos. 130003A and 130003B
December 2019

SECTION 1: SUMMARY AND PURPOSE OF THE AMENDED RECORD OF DECISION

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is amending certain Records of Decision (RODs) for the Northrop Grumman Bethpage Facility and Naval Weapons Industrial Reserve Plant (NWIRP) sites (Figure 1). The disposal of hazardous wastes at these sites, as more fully described in the original RODs and Section 7 of this document, has contaminated various environmental media. The amendment is intended to attain the remedial action objectives identified for these sites for the protection of public health and the environment. This amendment identifies the new information which has led to this selection and discusses the reasons for the preferred remedy.

The purpose of this Amended ROD (AROD) is to present a final remedy to address groundwater contamination, herein referred to as the Navy Grumman groundwater plume, that originated from the Northrop Grumman Bethpage Facility and the Naval Weapons Industrial Reserve Plant and that now extends nearly four miles from these two New York State Inactive Hazardous Waste Disposal Sites. This remedy was not developed to fully replace remedies detailed in existing Records of Decision (RODs). Instead, with data showing that the existing remedies are not fully effective at achieving remedial action objectives, this remedy has been developed to supplement the existing remedies and to address off-site groundwater contamination not adequately addressed under the existing RODs. Specifically, under the existing remedies, not only does groundwater contamination continue to migrate south toward currently unimpacted public water supplies and unimpacted portions of the Long Island Sole Source Aquifer, but this southward migration is causing contaminant concentrations to increase in off-site groundwater. This remedy specifically addresses these threats to public health and the environment associated with this off-site groundwater contamination.

This AROD is based on a Feasibility Study (FS) completed to evaluate remedial alternatives based on new information that are capable of addressing groundwater contaminated with chlorinated solvents (including trichloroethene (TCE)) and 1,4-dioxane originating from the former Northrop Grumman Bethpage Facility and the NWIRP sites. The FS was finalized in April 2019 and expanded on an earlier (July 2016) Remedial Options Report completed to initially evaluate containment options for the off-site groundwater plume. The Remedial Options Report was completed and provided to the New York State Legislature in accordance with A09492 (Saladino) /S07832 (Hannon) that were signed into law in December 2014. In February 2017, following issuance of the Remedial Options Report, the Department initiated an expedited engineering analysis/FS. To complete this engineering analysis/FS, the Department partnered with the United

States Geological Survey (USGS) and issued a work assignment to the engineering firm Henningson, Durham, & Richardson Architecture & Engineering, P.C. (HDR).

The New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375, and Guidance Document DER-2 – "Making Changes to Selected Remedies". This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comments on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repository:

Bethpage Public Library
47 Powell Avenue
Bethpage, NY 11714
Phone: (516) 931-3907

A public meeting and an availability session were also conducted on June 10, 2019. At the public meeting and the availability session, the findings of previous remedial investigations (RIs), the current investigation, the USGS groundwater flow modeling, and the feasibility study (FS) were presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period was held, during which verbal and written comments were accepted on the proposed remedy.

Comments on the remedy received during the comment period are summarized and addressed in the Responsiveness Summary included as Appendix A of the AROD. Complete transcripts of the public meeting can be found in Appendix C of the AROD.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act

Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: DETAILS OF NAVY GRUMMAN GROUNDWATER PLUME

This AROD includes a detailed analysis of the remedial alternatives assessed to address the Navy Grumman groundwater plume emanating from the Northrop Grumman Bethpage Facility (NYS Inactive Hazardous Waste Disposal Site No. 130003A) and the NWIRP site (NYS Inactive Hazardous Waste Disposal Site No. 130003B). The details of the Navy Grumman groundwater plume are summarized below.

Navy Grumman Groundwater Plume Discovery:
The presence of chlorinated solvents in groundwater collected from industrial water supply wells in the Bethpage area was first identified in October 1975 during a New York State Department of Health sampling program. A subsequent groundwater evaluation completed by the Nassau County Department of Health and the USGS in 1986 identified a groundwater plume that was approximately one-mile wide, two-miles in length, and more than 500-feet thick originating from the industrial area at the Northrop Grumman Bethpage Facility and NWIRP properties.

Navy Grumman Groundwater Plume Location and Characteristics:
Since the discovery of the Navy Grumman groundwater plume in the 1970s, remedial investigation activities completed by Northrup Grumman and the U.S. Navy, along with the recent investigation activities completed by the Department, demonstrate that past disposal practices have contaminated both on-site and off-site groundwater with chlorinated solvents and that the extent of the groundwater plume has expanded. The investigation results indicate that the primary contaminant of concern in the groundwater is TCE. As shown on Figure 2, there is a western groundwater plume and an eastern groundwater plume that originate from the Northrop Grumman and NWIRP sites. Downgradient of the sites, the two plumes comingle to form one overall groundwater plume that now extends approximately 4.3 miles south toward the Southern State Parkway. At its widest point, the plume is approximately 2.1 miles wide. In most areas, the top of the groundwater plume is over 200 feet beneath the ground surface and extends to depths of approximately 900 feet beneath the ground surface. A three-dimensional illustration of the surface of the Navy Grumman groundwater plume is included as Figure 3.

The Navy Grumman groundwater plume described above has impacted the groundwater resources in the shallow Upper Glacial Aquifer and the deeper Magothy Aquifer that are part of the Environmental Protection Agency-designated Long Island Sole Source Aquifer that underlies the majority of Long Island. The Long Island Sole Source Aquifer is the largest and most productive aquifer in New York State and represents the source of high-quality drinking water for approximately 2.6 million people. In Nassau County, a total of 46 public water suppliers rely on the Long Island Sole Source Aquifer as a source of drinking water. These water suppliers use 360 public water supply wells to withdraw the groundwater from the aquifer system.

There are 11 public water supply wells that have been impacted by the groundwater contamination that has originated from the Northrop Grumman and NWIRP sites, and 16 public water supply wells that are threatened by the Navy Grumman groundwater plume. The 11 impacted public

water supply wells have treatment that allows for continued use of these wells for drinking water purposes. Of the 11 public water supply wells that are already impacted, five public supply wells (Bethpage Water District Plants 4, 5, and 6) are immediately downgradient of the NWIRP and Northrop Grumman Bethpage Facility sites and within the central portion of the groundwater plume. These were the first to require wellhead treatment, and groundwater withdrawn from some of these wells has continuously contained increasing concentrations of site-related contaminants over time.

SECTION 4: SITE DESCRIPTIONS AND HISTORY

The Northrop Grumman Bethpage Facility and NWIRP sites are located in the Hamlet of Bethpage, Town of Oyster Bay, New York (Figure 1) and have been associated with the aerospace industry since approximately the 1930s. The facility included a combination of Grumman owned and operated plants and U.S. Navy owned and contractor (Grumman) operated plants. Activities performed at these facilities occurred on an approximately 600-acre area and included administration, engineering, research and development, and manufacturing and testing for the U.S. Navy and the National Aeronautics and Space Administration. All manufacturing ceased at the Northrop Grumman and NWIRP facilities in 1996.

Based on the on-site and off-site presence of chlorinated solvents in groundwater, the Grumman Aerospace-Bethpage Facility was added to the New York State Inactive Hazardous Waste Disposal Site Registry in 1983 and listed as Site No. 130003. Following this site listing, a combination of investigation and remediation activities have been completed and are ongoing to address this contamination. In 1993, the Grumman Aerospace-Bethpage Facility Site (130003) was divided into the Northrop Grumman Bethpage Facility Site (130003A) and the U.S. Navy NWIRP Site (130003B). The Northrop Grumman Bethpage Facility Site (130003A) was further divided in March of 2000 with 26 acres becoming the Northrop Grumman-Steel Los Plant 2 Site (130003C).

Since operations ended, many portions of the Northrop Grumman Bethpage Facility were delisted from the Registry as investigations were completed in different areas of the site and the U.S. Navy transferred most of the property to Nassau County for economic redevelopment. Currently the Northrop Grumman Bethpage Facility site occupies 9-acres and the NWIRP site comprises an 8.7-acre parcel. The current boundaries for the Northrop Grumman Bethpage Facility and the NWIRP site, along with historic property boundaries, are shown on Figure 1. The sites are surrounded by properties that are utilized for a combination of industrial, commercial, and residential purposes.

There were several locations at both the Northrop Grumman Bethpage Facility and the NWIRP site where the storage, treatment, and disposal of various wastes occurred. These areas are described in detail in earlier RI reports and RODs for the two sites. Remedial actions have either been taken to address this site contamination or are underway. This includes the current operation of two on-site groundwater extraction and treatment systems and one off-site groundwater extraction and treatment system. Additionally, two off-site groundwater extraction and treatment systems are under various stages of construction and design to address groundwater hotspots (areas where high concentrations of site contaminants occur in groundwater).

Site Geology and Hydrogeology:
The site is located on the Long Island glacial sand deposits that are part of the Environmental Protection Agency designated Sole Source Aquifer. Depth to groundwater (in the Upper Glacial aquifer) is approximately 50 to 55 feet beneath the ground surface and groundwater flow is generally southward. The upper glacial aquifer is underlain by the Magothy aquifer which is the primary source of drinking water for most parts of Nassau County. Beneath the site, the Magothy aquifer extends to depths of approximately 700 to 900 feet beneath the ground surface. The Magothy aquifer is a complex sequence of gravel, sand, silt, and clay. Within the Magothy aquifer, lenses of low permeability clay, silt, and sand are abundant. These lenses are not necessarily continuous and have a significant influence on the movement of both groundwater and the site contaminants. The Magothy aquifer is underlain by the Raritan clay and the Lloyd Sand of the Raritan Formation. The Raritan clay is approximately 100-feet thick and generally represents an underlying confining unit for the Magothy aquifer. The Lloyd Sand is comprised of fine to coarse sand and gravel and is the lowest of the Long Island aquifers.

Operable Units:
An operable unit (OU) represents a portion of a remedial program that for technical or administrative reasons can be addressed separately to investigate, eliminate, or mitigate a release, threat of release or exposure pathway resulting from contamination. The Northrop Grumman Bethpage Facility and NWIRP sites are divided into four OUs. Soil remediation at the former Northrop Grumman Bethpage Facility and NWIRP manufacturing plants are designated as OU1. Groundwater contamination at and downgradient of the Northrop Grumman Bethpage Facility and NWIRP sites is designated as OU2. An off-site area located immediately east of the Northrop Grumman-Bethpage Facility Site referred to as the former Grumman Settling Ponds (Figure 2) is identified as OU3. OU3 includes soil and groundwater at and downgradient of the Former Grumman Settling Ponds, adjacent areas of the Bethpage Community Park, and the Northrop Grumman Access Road. OU4 was established by the U.S. Navy to specifically address contaminated soil, soil vapor, and groundwater at a former drum marshaling location in an area referred to as Site 1.

OU2 and OU3 for the Northrop Grumman Bethpage Facility Site (130003A) and OU2 for the NWIRP Site (130003B) are the subject of this AROD. Currently, the off-site groundwater contamination is managed under two separate operable units. The OU2 plume generally corresponds to groundwater contamination that originated from the NWIRP and Northrop Grumman Bethpage Facility while the OU3 groundwater plume originated from the off-site area identified as the Former Grumman Settling Ponds. This AROD evaluates alternatives and identifies the preferred option for addressing the Navy Grumman groundwater plume.

The following Records of Decision (RODs) have been issued for the Northrop Grumman Bethpage Facility site and the NWIRP site:

1. 130003A, Operable Unit 1 On-Site Soil Source Area, March 1995;
2. 130003A and 130003B, Operable Unit 2 Groundwater, March 2001;
3. 130003A, Operable Unit 3, Former Grumman Settling Ponds and Associated Groundwater, March 2013;
4. 130003B, Operable Unit 1 On-Site Soils Source Areas, May 1995;

5. 130003B, Operable Unit 2, Groundwater, Department of the Navy, January 2003; and
6. 130003B, Operable Unit 4, Site 1 – Former Drum Marshaling Area Contaminated Soil, Soil Vapor, and Groundwater, Department of the Navy, September 2018.

SECTION 5: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. This AROD evaluates remedial options for addressing the off-site portions of the groundwater plume and does not address on-site soil remediation. On-site soil contamination is addressed under the existing RODs for the NWIRP site and the Northrop Grumman Bethpage Facility site. Land use is one of the eight criteria used in evaluating the alternatives in this AROD for addressing the off-site portions of the groundwater plume. Specifically, this criterion evaluates the current, intended, and reasonably anticipated future use of the site and its surroundings, as it relates to an alternative when unrestricted levels are not achieved.

With the size of the off-site groundwater plume and the plume's location within heavily developed areas in the Towns of Oyster Bay and Hempstead, implementation of each alternative would produce disruptions to nearby land uses. Therefore, this AROD details how the elements of each alternative would impact the nearby communities and the approaches to minimize these disruptions.

SECTION 6: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the off-site groundwater contamination, documented to date, include:

- Northrop Grumman Corporation
- Department of the Navy
- New South Road Realty, LLC (current owner of the RUCO Polymer Corp. (Hooker Chem) site (NYS Inactive Hazardous Waste Disposal Site No. 130004)

Northrop Grumman signed an RI/FS Order on Consent for OU1 (On-Site Soil Source Area) and OU2 (Groundwater) in 1989. Northrop Grumman also signed an RI/FS Order on Consent in July 2005 for the Former Grumman Settling Ponds and Associated Groundwater. In 2014 and 2015, Northrop Grumman entered into Orders on Consent for the OU3 (Former Grumman Settling Ponds and Associated Groundwater) Remedial Design and Remedial Action and the OU2 (Groundwater) remedial program, respectively.

The Navy signed a Federal Facilities Site Remediation Agreement in 2005 for implementation of the OU2 (Groundwater) remedy.

As this AROD supplements and incorporates the elements of the prior OU2 and OU3 RODs, and, pursuant to the Orders and Agreements referenced above, the PRPs will continue to implement the

elements of those RODs that are contained in this final amended remedy.

SECTION 7: SITE CONTAMINATION

7.1: Expanded Investigation and Engineering Evaluation of the Navy Grumman Groundwater Plume

In February 2017, the Department commenced an expanded investigation to develop an up-to-date understanding of the Navy Grumman groundwater plume and an engineering analysis to evaluate alternatives to hydraulically contain the Navy Grumman groundwater plume. This investigation and engineering evaluation has been completed by the Department in partnership with the USGS. A description of the tasks included in the investigation and engineering evaluation is included below and in more detail in the Feasibility Study Report (April 2019).

Vertical Profile Boring Drilling, Monitoring Well Installation, and Groundwater Sampling Program

To assist the Department in understanding the southern extent of the Navy Grumman groundwater plume, two vertical profile borings (VPBs) were advanced along the distal end of the plume (DEC-VPB-1 and DEC-VPB-2 on Figure 4). To assess water quality with depth in each of the VPBs, discrete interval groundwater samples were collected at approximately 20-foot intervals to depths of approximately 1,000 feet beneath the ground surface. Following collection, the groundwater samples were submitted for laboratory analysis and the data were used to design three permanent groundwater monitoring wells at these two locations. Two monitoring wells (DEC1D1 and DEC1D2 on Figure 4) were installed adjacent to DEC-VPB-1 while the third well (DEC2D1) was installed near DEC-VPB-2 (Figure 4). The groundwater sampling results from the VPBs and permanent groundwater monitoring wells were used to supplement data collected from previous investigations and long-term groundwater monitoring programs being completed by the U.S. Navy and Northrop Grumman in developing a comprehensive groundwater database.

Comprehensive Groundwater Sampling Results Database Development

Groundwater quality data derived from previous investigations, routine long-term monitoring, Nassau County Department of Health public water supply well sampling, and the Department's drilling program were compiled and incorporated into a single comprehensive groundwater database. The database included over 5,600 groundwater samples collected from over 540 locations for a total of over 200,000 individual records. The database was then used to analyze and evaluate the nature and extent of the Navy Grumman groundwater plume and to prepare three-dimensional (3D) visualizations of the groundwater contamination. The 3D plume representations were then used to compare and evaluate alternatives to extract and manage treated water with the USGS groundwater flow model that was developed for this project, as discussed below.

The contaminants of concern (COCs) included in the groundwater database were identified based on a review of the following four documents:

1. 2001 New York State Department of Environmental Conservation OU2 ROD;
2. 2003 Navy OU2 ROD;
3. 2013 New York State Department of Environmental Conservation OU3 ROD; and

4. 2003 Public Water Supply Contingency Plan

A "contaminant of concern" is a contaminant that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the previously prepared RI reports contain a full discussion of the data. The contaminant(s) of concern identified at the Northrop Grumman Bethpage Facility and NWIRP sites are:

1,1,2,2-Tetrachloroethane	Tetrachloroethene
1,1,1-Trichloroethane	Toluene
1,1,2-Trichloroethane	trans-1,2-Dichloroethene
1,1-Dichloroethane	Trichloroethene
1,1-Dichloroethene	1,1,2-Trichloro-1,2,2,-trifluoroethane
1,2-Dichloroethane	(Freon 113)
1,2-Dichloroethene	Vinyl chloride
1,2-Dichloropropane	Carbon disulfide
1,4-Dioxane	Carbon tetrachloride
Chloroform	Chlorobenzene
cis-1,2-Dichloroethene	Chromium
Chlorodiflouromethane (Freon 22)	Iron
Dichlorodifluoromethane (Freon 12)	Nickel

Development of Three-Dimensional Navy Grumman Groundwater Plume Representations
The comprehensive groundwater database was used as the source of data for the preparation of a series of 3D visualizations of the Navy Grumman groundwater plume. Specifically, plume visualizations were created for TCE, Toluene, 1,1-DCA, Freon, and Total Chlorinated Volatile Organic Compounds (TCVOCs). Once this was completed, the individual plumes were superimposed to form a 3D visualization of COCs that exceed the respective Standards, Criteria and Guidance (SCGs). This 3D visualization of the contaminant plume is shown on Figure 3. The SCG plume included 1,4-dioxane to a concentration of 0.35 parts per billion (ppb) which is the United States Environmental Protection Agency (USEPA) calculated screening level identified as 0.35 µg/l based on a 10^{-6} lifetime excess cancer risk screening level in tap water (EPA, 2013C). Three-dimensional visualizations were also created for a 50 ppb (Figure 5) and 100 ppb (Figure 6) TCVOC plume.

Groundwater Flow Modeling Program
In partnership with the USGS, a groundwater flow model capable of simulating groundwater flow beneath Long Island was developed. The USGS model was used to evaluate how various groundwater extraction and discharge scenarios influence plume migration and groundwater containment and was a critical component of the Feasibility Study and ultimately in the development of a remedy for addressing the Navy Grumman groundwater plume. Specifically, the modeling was important in quantitatively evaluating the following:

1. Migration and capture of the Navy Grumman groundwater plume;
2. Influence of increased groundwater withdrawal on yield of nearby public water supply wells;
3. Potential for landward movement of the freshwater-saltwater interface; and

4. Possible impacts to nearby surface water streams (e.g., Massapequa Creek) and wetland environments.

The USGS used MODFLOW and MODPATH to complete the groundwater flow modeling. Both of these models are considered industry standard for use in simulating complex groundwater flow systems. MODFLOW is a modular hydrologic model that simulates 3D groundwater flow in aquifers while MODPATH is a particle tracking post processing model that calculates the path lines along which a groundwater particle would travel based on the MODFLOW results. The model contained 25 layers, 250 columns, and 346 rows of 100–foot square cells.

The 3D plume representations were provided to the USGS for use in the groundwater flow modeling. As part of this process, MODPATH was used to assign particles at the centroid of each model cell within the entire plume representation. MODPATH then calculated the forward path along which each particle within the plume travels from its origin to its ultimate discharge location.

The USGS groundwater flow model was then used to develop remedial alternatives and to better understand zones of contribution to extraction wells, possible movement of existing hotspots, potential influence on or by the public water supply wells and existing groundwater recovery systems, the return of treated water to the aquifer system (i.e., recharge basins and injection wells), and the influence on the environmental parameters (surface water stream flow, wetland water levels, and freshwater-saltwater interface).

Engineering Evaluation Included in a Feasibility Study

The engineering analysis and FS relied on the results of the groundwater flow modeling to compare groundwater extraction alternatives and quantify the volume of groundwater requiring extraction, treatment, and discharge to achieve the remedial action objectives. The primary objective of the engineering evaluation included in the FS is to present technically feasible options to hydraulically contain the Navy Grumman groundwater plume, reduce its volume and contaminant concentrations, and prevent its further expansion and migration. The FS represents the technical basis for the selected remedy detailed in this AROD.

There is also other significant new information (in addition to that which resulted from the investigation and engineering evaluation) that is now available, that did not exist at the time that the earlier RODs were issued. A summary of this new information is provided below.

Groundwater flow modeling performed in the 2000 Feasibility Study that was prepared by Arcadis/Geraghty Miller on behalf of Northrop Grumman and formed the basis of the NYSDEC OU2 ROD, indicated that the selected remedy would not result in exposures to site related VOCs in downgradient public water supply wells. At that time, all water supply wells that were affected had treatment for VOCs, and the modeling indicated that no other public supply wells would be affected, based on 30-year predictive simulations. Contrary to the modeling results, due to plume migration that has occurred since then, the addition of wellhead treatment has been necessary to address site related VOCs at several previously un-impacted public water supply wells at three separate well fields.

The 2000 FS stated that the off-site portion of the plume that would not be captured by the active pump and treatment systems would undergo natural attenuation. However, based on a review of the available information, it is clear that natural attenuation alone in these areas would not significantly contribute to attaining groundwater quality standards in the off-site portion of the plume, as defined in the 2000 FS.

In the 2000 FS, the modeling for the alternative that was selected in the ROD predicted that SCGs would be attained at Bethpage Water District Well 4-2 in 11 years. In 2012 (11 years after the issuance of the ROD), the average TCE concentration in Bethpage Water District Well 4-2 raw water was 83 ppb and has since increased to an average of 221 ppb (2017 annual average). Similarly, the groundwater flow modeling performed as part of the 2000 FS predicted that SCGs would not be exceeded in Bethpage Water District Well 4-1 under the selected alternative. However, groundwater quality monitoring has shown that TCE, cis-1,2-DCE, and 1,1-DCA have exceeded their respective SCGs in raw water samples collected from Bethpage Water District Well 4-1. Specifically, in 2017, TCE, cis-1,2-DCE, and 1,1-DCA were detected at maximum concentrations 183 ppb, 53 ppb, and 6 ppb respectively. Furthermore, the groundwater flow modeling performed as part of the 2000 FS simulated a peak influent total VOC concentration of 11 ppb at Bethpage Water District Well 6-2 under the selected remedy. Monthly sampling of raw, untreated water from Bethpage Water District Well 6-2 shows a continuous increase of TCE concentrations over time since the 2001 ROD with a maximum concentration of 1,940 ppb in March 2017.

The 2000 FS included a figure which indicated that the downgradient edge (5 ppb total volatile organic compounds) of the plume was located north of Hempstead Turnpike. Based on groundwater quality data that was collected subsequent to the OU2 ROD, it is now known that the 5 ppb plume extends to the vicinity of Southern State Parkway, in excess of 8,000 feet further downgradient.

Based on the results of the NYSDEC investigation and engineering evaluation, the Navy Grumman groundwater plume continues to migrate south toward currently unimpacted public water supplies and unimpacted portions of the Long Island Sole Source Aquifer, and this southward migration is causing contaminant concentrations to increase in off-site groundwater. This is also evident based on the information provided above, which demonstrates that some of the conclusions regarding plume migration in the 2000 Feasibility Study are not supported by groundwater monitoring data that have since been collected. Based on the above, the NYSDEC has determined that the existing remedies are not fully effective in achieving the remedial action objectives for the site and in addressing the threats to public health and the environment.

As a result, the NYSDEC conducted an engineering evaluation and related groundwater modeling to develop additional remedial alternatives to address the Navy Grumman groundwater contaminant plume.

7.2: Summary of Actions Under Public Water Supply Protection Program

The 2001 New York State Department of Environmental Conservation ROD for OU2 (Groundwater) and the U.S. Navy 2003 ROD for OU2 (Groundwater) recognized the importance

of the continued provision of potable water to those communities/populations served by water supply wells that are, or that may become, impacted by site-related contamination. Based on this, the 2001 and 2003 RODs required that a Public Water Supply Protection Program be implemented. The components of this program continue to be implemented and include the following:

1. Continued public water supply wellhead treatment to meet appropriate drinking water quality performance objectives at wellfields already affected by the groundwater contaminant plume for as long as these affected wellfields are used as community water supply sources;
2. Public water supply wellhead treatment or comparable alternative measures, as necessary, for wellfields that become affected in the future; and
3. Long-term monitoring of the groundwater contaminant plume including outpost monitoring wells upgradient of potentially affected water supply wells.

Based on the Public Water Supply Protection Program, the U.S. Navy and Northrop Grumman provided wellhead treatment at six separate water plants (Figure 2) operated by three nearby water districts. The U.S. Navy and Northrop Grumman also continue to implement a long-term groundwater monitoring program to assess the need for future wellhead treatment at 16 additional public water supply wells that are threatened by continued migration of the Navy Grumman groundwater plume. The wellhead treatment actions are summarized below.

1) <u>Bethpage Water District</u>

Under the Public Water Supply Protection Program, three separate air stripping treatment systems were constructed for five public supply wells at Bethpage Water District Plants 4, 5, and 6. These three public water supply well fields are immediately downgradient of the NWIRP and Northrop Grumman Bethpage Facility sites and within the central portion of the groundwater plume. These were the first to require wellhead treatment, and groundwater withdrawn from some of these wells has experienced continuous increases in concentrations of the site contaminants over time. The Bethpage Water District continues to provide treatment at Plants 4, 5, and 6 prior to distribution of water to customers.

Bethpage Water District Plant 6

Bethpage Water District Plant 6 relies on two public water supply wells (Well 6-1 and Well 6-2). Sampling of raw, untreated water between November and December of 1976 detected TCE in Well 6-1 at concentrations of 28, 26 and 60 ppb during three separate sampling events. Based on these TCE detections, Bethpage Water District removed Well 6-1 from service in December 1976.

In February 1985, TCE was first detected in raw, untreated water from Well Number 6-2 at a concentration of 1 ppb. In February 1987, TCE was detected at a maximum concentration of 5 ppb in the raw, untreated water and Bethpage Water District removed Well 6-2 from service in November 1988.

A treatment system was installed at the Bethpage Water District Plant 6 in 1990 to address the TCE contamination. The District returned Well 6-1 into service in June of 1990 and returned Well 6-2 into service in December 1990. Since this time, water from both wells has been treated and routine monitoring is conducted to verify that the water meets NYS drinking water standards prior

to distribution. The cost for constructing the treatment system at Bethpage Water District Plant 6 was reimbursed by Northrop Grumman.

Bethpage Water District Plant 4
Bethpage Water District Plant 4 relies on two public water supply wells (Well 4-1 and Well 4-2). TCE was detected in raw, untreated water from Well 4-1 between September 7, 1988 and July 30, 1990 at concentrations (0.5 to 2.6 ppb) below the drinking water maximum contaminant level of 5 ppb. TCE and other site-related contaminants originating from the NWIRP and Northrop Grumman Bethpage Facility sites were not detected in routine monitoring samples again until October of 1992 when TCE was detected in raw, untreated water from Well 4-1 at a concentration of 1.2 ppb. After October 1992, TCE was detected in Well 4-1 at or above the reporting limit during four sampling events between 1993 and 1995.

TCE was detected occasionally at low levels in raw, untreated water from Well 4-2 between January 7, 1993 and October 3, 1994. Treatment equipment (air stripper) was installed on wells at the Bethpage Water District Plant 4 (Wells 4-1 and 4-2) in 1995 to treat the raw water prior to its distribution to customers. Routine monitoring is performed to verify that the water meets NYS drinking water standards prior to distribution. The cost for constructing the treatment system at Bethpage Water District Plant 4 was reimbursed by Northrop Grumman. Unrelated to the presence of TCE, Bethpage Water District removed Well 4-1 from service in February 2013 because of the periodic detection of radium.

Bethpage Water District Plant 5
Bethpage Water District Plant 5 relies on a single public water supply well (Well 5-1). A treatment system was installed at the Bethpage Water District Plant 5 (Well 5-1) in October of 1995 prior to the detection of site contaminants in raw, untreated water as a precautionary measure. The cost for constructing the treatment system at Bethpage Water District Plant 5 was reimbursed by the U.S. Navy. This treatment system was constructed in anticipation of site contaminants originating from the NWIRP and Northrop Grumman Bethpage Facility sites ultimately impacting the quality of water at Well 5-1. The first detection of site contaminants in the raw, untreated water at Well 5-1 did not occur until 2007, when TCE was detected at 0.6 ppb.

No other Bethpage Water District public water supply wells have been threatened or impacted by contamination from the Northrop Grumman Bethpage Facility and NWIRP sites.

2) <u>South Farmingdale Water District</u>
Under the Public Water Supply Protection Program, two separate air stripping treatment systems were constructed for the public supply wells at South Farmingdale Water District Plants 1 and 3. These treatment systems were installed prior to the detection of site contaminants in raw, untreated water as a precautionary measure. The treatment system was installed at Plant 1 in 2011 and at Plant 3 in 2013. The cost for constructing the treatment systems at South Farmingdale Water District Plants 1 and 3 was reimbursed by the U.S. Navy. No other South Farmingdale Water District public water supply wells are impacted by contamination from the NWIRP and Northrop Grumman sites.

3) New York American Water Company – Seamans Neck Road Water Plant

The New York American Water Company – Seamans Neck Road Water Plant relies on two supply wells (Well Number 3 and Well Number 4). Both wells have been impacted by contaminants originating from the NWIRP and Northrop Grumman Bethpage Facility sites. However, no detections in the raw, untreated water exceeded the drinking water maximum contaminant level of 5 ppb. Specifically, in 2006, TCE was detected in raw, untreated water at a concentration of 0.6 ppb in Well Number 3. Subsequently, TCE concentrations gradually increased to a maximum concentration of 3.3 ppb on October 18, 2011. TCE was detected at low concentrations (approximately 0.5 ppb) in Well Number 4 in early 2008. The highest TCE concentration of 0.9 ppb was detected in Well Number 4 in February of 2011.

In response to the presence of TCE in the raw, untreated water, the U.S. Navy installed an interim treatment system at the Seaman's Neck Road Water Plant in July 2012. A permanent, full scale wellhead treatment system for the Seaman's Neck Road wells went on line in February of 2015 to address the TCE groundwater contamination. No other New York American Water Company public water supply wells have been impacted by contamination from the NWIRP and Northrop Grumman Bethpage Facility sites.

7.3: Summary of Previous Remedial Investigations at NWIRP and Northrop Grumman Sites

Since its listing on the New York State Registry of Inactive Hazardous Waste Disposal Sites in 1983, data relative to the Northrop Grumman Bethpage Facility and NWIRP contamination has been collected on an on-going basis that continues today. The previous Remedial Investigations (RIs) associated with the groundwater plume have generally established the nature and extent of contamination resulting from former activities at the sites. The field activities and findings of the investigations are described in the earlier RI Reports. The previously completed RIs, and the ongoing groundwater monitoring programs performed by the U.S. Navy and Northrop Grumman, were supplemented by data collected by the Department as part of this expanded investigation.

7.3.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from this investigation were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

As contaminants of concern exceeding SCGs in OU2 and OU3 on-site soil, groundwater, and on and off-site soil vapor, are being addressed in accordance with separate RODs, this AROD focuses on contaminants of concern that exceed SCGs in off-site groundwater.

7.3.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

The following IRM(s) have been completed at the Northrop Grumman Bethpage Facility and NWIRP sites and were performed as source control measures to address the off-site migration of contaminated groundwater and soil vapor based on conditions observed during earlier remedial investigations.

1) *Plant 2 Soil Vapor Extraction System* - A soil vapor extraction system was installed and continues to operate adjacent to a former storage tank that was used to store TCE at Plant 2 (Figure 2).

2) *Plant 15 Soil Vapor Extraction System* - A soil vapor extraction system was used to remediate an area of tetrachloroethene (PCE) contamination that was present adjacent to Plant 15 (Figure 2).

3) *On-Site Containment System (ONCT)* – In 1997, Northrop Grumman began operation of five extraction wells that are part of the ONCT (Figure 2). The combined pumping rate from the five wells is approximately 3,800 gallons per minute (5.5 million gallons per day (MGD)). Following withdrawal, the contaminated groundwater is treated with two separate air stripping treatment systems to remove the contaminants. Once treated, the water is returned to the aquifer through a series of on-site recharge basins. Since operation of the ONCT IRM began in late 1997, nearly 200,000 pounds of contamination has been removed and an area of clean groundwater has developed downgradient of the remediation system. The ONCT system continues to operate.

4) *Site 1, Former Drum Marshaling Yard Soil Vapor Extraction Containment System* - To address high concentrations of site-related chlorinated solvent contamination in soil vapor present in the Former Drum Marshaling Area located in Site 1 (Figure 2), the U.S. Navy installed and began operation of an on-site soil vapor extraction and treatment system in 2010. The system continues to operate and relies on 17 soil vapor extraction wells designed to prevent off-site migration of soil vapor contamination and eliminate potential impacts to off-site structures.

5) *Bethpage Community Park On-Site Groundwater Extraction and Treatment System* – In 2009, Northrop Grumman began operation of a groundwater extraction and treatment system along the former Grumman access road to address groundwater contamination originating from the Former Grumman Settling Ponds area (Figure 2). The system includes four groundwater extraction wells that remove contaminated water at a combined rate of approximately 250 gpm (0.36 MGD). Once treated, the water is returned to the aquifer system through discharge to a nearby recharge basin. Since operation of the IRM began in 2009, approximately 2,200 pounds of contamination has been removed and an area of clean groundwater has developed downgradient of the remediation system. The groundwater extraction and treatment system continues to operate.

6) *Bethpage Community Park On-Site Soil Vapor Extraction and Treatment System* - To address high concentrations of site-related chlorinated solvent contamination in soil vapor present in the Former Grumman Settling Ponds area, Northrop Grumman installed and began operation of a soil vapor extraction and treatment system along the southern and western boundary of the Bethpage Community Park. The system continues to operate and relies on 18 soil vapor extraction wells to prevent off-site migration of soil vapor contamination and eliminate potential impacts to off-site structures. Prior to the start of the soil vapor extraction system, a vapor intrusion sampling program was completed in 2007 at eight off-site properties. This vapor intrusion sampling program confirmed that site contaminants are not migrating off-site in soil vapor and entering into overlying structures.

7) *Bethpage Community Park Soil Excavation* - The Town of Oyster Bay completed a remedial investigation and subsequent remediation as part of an IRM for 7 of the 12 acres comprising Bethpage Community Park. The IRM included the excavation and off-site disposal of approximately 175,000 cubic yards of soil contaminated with chlorinated solvents, PCBs, metals and Freon compounds (dichlorodifloromethane (R-12) and chlorodifloromethane (R-21)) from this seven-acre area. Following removal, the excavation was backfilled with certified clean backfill material.

7.4: Summary of Remedial Actions in Accordance with Earlier RODs

In addition to the IRMs, and in accordance with earlier RODs, the U.S. Navy and Northrop Grumman are currently implementing remedial actions to address on-site soil contamination and off-site groundwater contamination. These remedial actions are described below and shown on Figure 2.

1) *GM-38 Area Groundwater Extraction and Treatment* System - To address off-site groundwater contamination in a portion of the plume identified as the GM-38 Area, the U.S. Navy installed and began operation of a groundwater extraction and treatment system in 2008 (GM-38 Groundwater Extraction and Treatment System on Figure 2). The system continues to operate and withdraws contaminated groundwater at a rate of approximately 1,000 gpm (1.4 MGD) from two extraction wells. Following withdrawal, the contaminated water is treated using air stripping technology combined with granulated activated carbon prior to being returned to the aquifer through discharge to a nearby recharge basin.

2) *RW-21 Area Groundwater Extraction and Treatment System* - To address off-site groundwater contamination in a portion of the plume identified as the RW-21 Area, Northrop Grumman has installed three groundwater extraction wells (Figure 2). Northrop Grumman is currently designing a treatment plant, the underground conveyance piping system, and the approach for managing the treated water. The RW-21 Groundwater Extraction and Treatment System is being designed to withdraw approximately 1,500 gpm (2.2 MGD) of contaminated water from the aquifer. Once treated, the water will be returned to the aquifer using recharge basins and/or injection wells. It is expected that the RW-21 Groundwater Extraction and Treatment System will be operational in 2020.

3) *RE-108 Area Groundwater Extraction and Treatment System* - To address off-site groundwater contamination in a portion of the plume identified as the RE-108 Area, the U.S. Navy is currently designing a groundwater extraction and treatment system. The system is being designed in two phases to include three to five extraction wells (Figure 2) and two separate treatment plants. The first phase will include one extraction well that will withdraw contaminated water from the aquifer at a rate of approximately 400 gpm (0.58 MGD). Once withdrawn, the contaminated water will be conveyed to the existing GM-38 treatment plant for treatment prior to being discharged to a nearby recharge basin. It is expected that the Phase I RE-108 groundwater extraction and treatment system will be operational in 2020. The second phase will include two to four groundwater extraction wells, construction of a treatment plant, and the use of nearby recharge basins to manage the treated water. The U.S. Navy is expecting that the Phase II RE-108 groundwater extraction and treatment system will be operational in 2022.

4) *Site 1 – Former Drum Marshaling Area* - To address PCB soil and groundwater contamination, the U.S. Navy is currently implementing an excavation and off-site disposal remedy to address approximately 45,000 cubic yards of PCB contaminated soil. Following excavation, the area will be backfilled and land-use controls will be in-place to prevent possible future disturbance of the remaining contaminated subsurface soil. The U.S. Navy is expecting that the excavation and off-site disposal remedy will be completed in 2020. The U.S. Navy will continue to operate the existing soil vapor extraction and treatment system and will be supplementing it with additional soil vapor extraction wells.

5) *Former Grumman Settling Ponds* – In the area of the Former Grumman Settling Ponds, Northrop Grumman is currently implementing an in-situ thermal remedy to address residual chlorinated solvent contamination present in soil approximately 40 to 60 feet beneath the ground surface and an excavation and off-site disposal remedy to address soil contaminated with PCBs and metals. Northrop Grumman is expecting that the in-situ thermal and the excavation and off-site disposal remedies will be completed in 2020.

7.5: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the Navy Grumman groundwater plume originating from the NWIRP and Northrop Grumman Bethpage Facility sites. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OU2 and OU3.

In 2017, the Department conducted an expanded investigation to develop an up-to-date understanding of the Navy Grumman groundwater plume and an engineering analysis to evaluate alternatives to address the Navy Grumman groundwater plume. This analysis has confirmed that past disposal practices have contaminated both on-site and off-site groundwater with chlorinated

solvents. The investigation results indicate that the primary contaminant of concern in the groundwater is TCE. The TCE contamination has impacted the groundwater resources in the shallow Upper Glacial Aquifer and the deeper Magothy Aquifer. Both aquifers are part of the Environmental Protection Agency designated Sole Source Aquifer that underlies the majority of Long Island.

Groundwater data compiled into a comprehensive database and subsequently used to develop three-dimensional plume representations confirms that there is a western groundwater plume (OU2) and an eastern groundwater plume (OU3) that originated from the NWIRP and Northrop Grumman sites. Downgradient of the on-site areas, the two plumes comingle to form one overall groundwater plume (Navy Grumman groundwater plume). The Navy Grumman groundwater plume is approximately 4.3 miles in length, 2.1 miles wide, and extends to depths of approximately 900 feet beneath the ground surface.

Within the overall plume, TCE concentrations in groundwater exceed the SCG of 5 ppb and range from 0.23 ppb to 11,200 ppb. TCE is present in groundwater at concentrations exceeding SCGs to a maximum depth of 820 feet below ground surface. The highest TCE concentrations occur in groundwater downgradient of the former Northrop Grumman Bethpage Facility and NWIRP sites and in groundwater downgradient of an off-site area referred to as the Former Grumman Settling Ponds (Figure 2). In addition to TCE, TCE degradation products (e.g., cis-DCE), tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), and Freon compounds are also present in on-site and off-site groundwater at concentrations that exceed SCGs. The emerging contaminant 1,4-Dioxane is also present in on-site and off-site groundwater at concentrations exceeding SCGs and may be associated with use as a stabilizer for solvents that were historically used on-site. The SCG for 1,4-dioxane is a USEPA calculated screening level identified as 0.35 ppb based on a 10^{-6} lifetime excess cancer risk screening level in tap water (EPA, 2013C). The SCG for 1,4-dioxane will be revised once the currently recommended standard is promulgated.

While there are two on-site groundwater containment systems and one off-site groundwater extraction and treatment system operating and removing significant amounts of groundwater contamination, the Navy Grumman groundwater plume continues to migrate to the south-southeast. This southward migration of the plume is causing contaminant concentrations to increase in off-site groundwater. Based on the presence of site contaminants in off-site groundwater, the U.S. Navy and Northrop Grumman have provided wellhead treatment at six separate water plants operated by three nearby water districts. Additionally, with uncontrolled continued expansion of the off-site groundwater plume, there are an additional 16 downgradient public water supply wells that are considered threatened by the groundwater contamination.

Investigation activities have also identified on-site soils contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals and PCBs. These areas have either already been addressed or are currently being addressed under existing RODs to address on-site soil contamination.

7.6: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

The area is served by multiple public water suppliers, some of which are impacted by site-related contaminants. The currently impacted public water supplies treat the water prior to distribution to consumers. This treated water is in compliance with all current Maximum Contaminant Levels as per NYSDOH Part 5, Subpart 5-1 regulations that apply to Public Water Systems. In addition, a Public Water Supply Protection Plan, as required in previous Records of Decision, will continue to address any future impacts to public water supplies from site related contaminants should they be affected by the expanding groundwater plume.

7.7: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal of the recently completed expanded investigation and engineering analysis is to identify remedial alternatives to address the Navy Grumman groundwater plume, based on new environmental data and modeling. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

Groundwater RAOs for Public Health Protection:

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards; and
- Prevent contact with contaminated groundwater.

Groundwater RAOs for Environmental Protection:

- Hydraulically contain the Navy Grumman groundwater plume, reduce its volume and contaminant concentrations, and prevent its further expansion and migration;
- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable;
- Prevent the discharge of contaminants to surface water; and
- Prevent adverse impacts to the quantity or quality of the groundwater resources associated with the Nassau-Suffolk Sole Source Aquifer.

SECTION 8: SUMMARY OF THE AMENDED REMEDY

To be selected, the remedy must be protective of public health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 7.7. Potential remedial alternatives for the Northrop Grumman Bethpage Facility and NWIRP sites were identified, screened and evaluated in the April 2019 FS report.

A summary of the remedial alternatives that were considered for the Northrop Grumman Bethpage Facility and NWIRP sites is presented in Exhibit B. Cost information is presented in the form of present value, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit C.

The basis for the Department's amended remedy is set forth at Exhibit D. For the Navy Grumman groundwater plume, the amended remedy is referred to as the **Hydraulic Containment of Site Contaminants above SCGs Combined with Mass Flux Remediation - Centralized Treatment Plant with a Centralized Recharge Basin remedy**. The remedy corresponds to groundwater contamination addressed under Operable Units 2 and 3 in previous Records of Decision.

The estimated present worth cost to implement the remedy is $585,000,000. The cost to construct the remedy is estimated to be $241,000,000 and the estimated average annual cost for operation and maintenance of the system is $16,300,000.

The elements of the amended remedy (which are intended to supplement remedial element(s) previously selected in existing RODs, as described in Section 1) are as follows:

1) A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse gases and other emissions;
    - Increasing energy efficiency and minimizing use of non-renewable energy;
    - Conserving and efficiently managing resources and materials;
    - Reducing waste, increasing recycling and increasing reuse of materials which will otherwise be considered a waste;
    - Maximizing habitat value and creating habitat when possible;
    - Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
    - Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2) Groundwater extraction and treatment will be implemented to treat site contaminants in the off-site groundwater plume. Based on the current groundwater flow modeling, it is expected that a network of approximately 16 extraction wells will be installed along the margins of the SCG plume (typically 5 ppb TCVOC) to hydraulically contain the Navy Grumman

groundwater plume. This well network has been specifically designed to prevent the continued uncontrolled migration of the plume.

The hydraulic containment extraction wells will be supplemented with approximately eight groundwater extraction wells that will be installed and pumped within the interior of the groundwater plume to achieve capture of site contaminants that exceed 50 ppb. These eight wells are positioned as mass flux wells and specifically designed to capture the bulk of the groundwater contamination mass. In total, these 24 extraction wells will withdraw contaminated groundwater at an approximate combined rate of 12,100 gallons per minute (17.5 MGD). The exact number and locations of the extraction wells will be determined after pre-design sampling, completion of a full engineering design and continued groundwater modeling. This will also assist in finalizing the well depths and pumping rates.

The extracted groundwater will be treated at one of five groundwater treatment plants using air stripping technology. This air stripping will be implemented ex-situ to remove volatile contaminants from extracted groundwater. Using this technology, the groundwater will be contacted with an air stream to volatilize contaminants from groundwater to air. Following air stripping, the water will be secondarily treated with liquid-phase granulated active carbon (GAC). The GAC will be used to remove dissolved contaminants from extracted groundwater by adsorption. The GAC system will consist of one or more vessels filled with carbon connected in series and/or parallel. Advanced oxidation process (AOP) technology will be used for 1,4-dioxane removal, if necessary, based on data acquired during the remedial design. The extracted air stream containing the volatile contaminants will be treated prior to discharge to the atmosphere using vapor-phase GAC. The above description of the groundwater treatment processes is based on evaluations in the FS. The details of this treatment process will be fully determined during a remedial design program.

Following withdrawal, contaminated groundwater from 17 of the 24 extraction wells will be pumped to a centralized groundwater treatment plant in the area of the former Northrop Grumman property. This centralized treatment plant will be capable of treating approximately 8,100 gpm (11.7 MGD). Following treatment, this water will be returned to the aquifer via a newly constructed recharge basin located on the public property within Bethpage State Park. It is expected that a recharge basin approximately 10-acres in size will be necessary to manage the treated water. Seasonally, a portion of the treated water will be beneficially re-used for irrigation purposes by the Bethpage State Park.

Contaminated groundwater withdrawn from four of the 24 extraction wells will be pumped to a second centralized treatment plant near the headwaters of Massapequa Creek. This centralized treatment plant will be capable of treating approximately 2,000 gpm (2.8 MGD). Following treatment, this water will be used to augment flow in Massapequa Creek. This streamflow augmentation will provide environmental benefits (e.g., increased steam flows) to the local aquatic habitat within Massapequa Creek.

Contaminated water from the three remaining groundwater extraction wells will be treated at three smaller, individual, treatment plants located south of the Southern State Parkway. Two of these treatment plants will be capable of treating 1,000 gpm (1.4 MGD) each and the third treatment plant will be capable of treating 500 gpm (0.72 MGD). Treated water from these

individual treatment plants will be discharged to three existing recharge basins at a total flow rate of approximately 2,000 gpm (2.9 MGD) to mitigate potential environmental impacts to surface water flow, wetland water levels, and subsea discharge (saltwater intrusion) caused by the extraction of approximately 12,100 gallons per minute (17.5 MGD) of groundwater under this alternative.

Groundwater modeling will be performed during the remedial design program to assist in finalizing the number, size, and locations of recharge basins to be used (and the associated discharge rates), and the amount of treated water that will be discharged to Massapequa Creek (to augment flow) and to Bethpage State Park (for irrigation purposes). To convey water from the extraction wells to the five treatment plants and from the treatment plants to the discharge locations, it is estimated that a total of approximately 124,000 feet (23.5 miles) of underground conveyance piping will be installed as part of this remedy.

The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

3) The remedy assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I [in design and construction] and RE108 Phase II [in design]) are operating and that the existing and planned on-site remedial actions will be implemented. The existing and planned on-site remedial actions include:
    1. Continued operation of the Bethpage Park Soil Vapor Extraction and Treatment System;
    2. Continued Operation of the Site 1, Former Drum Marshaling Yard, Soil Vapor Extraction Containment System;
    3. Continued implementation of the In-situ Thermal Treatment remedy to address VOC soil contamination in the Former Grumman Settling Ponds/Bethpage Park area;
    4. Implementation of the soil excavation and off-site disposal remedy to address PCB and metals contaminated soil in the Former Grumman Settling Ponds/Bethpage Park area;
    5. Continued implementation of the soil excavation and off-site disposal remedy to address PCB contaminated soil in the Site 1, Former Drum Marshaling Yard; and
    6. Continued operation of the steam injection system with free product recovery and biosparging at Site 4, Former Underground Storage Tanks area, to address fuel oil contamination.

4) The remedy assumes that the existing water district public water supply wells will continue to pump water at rates equivalent to the average rate for those wells (over a representative six-year period (2010-2015)) during operation of the remedy.

5) The Bethpage Water District Plants 4, 5, and 6 pumping wells will be transitioned over time from public water supply wells to remedial wells. To allow Bethpage Water District to continue to meet municipal demands without these wells, the remedy includes a provision for development of an alternate water supply.

6) Imposition of an institutional control in the form of an environmental easement, deed restriction or an environmental notice on properties where engineering controls (e.g., extraction wells, water treatment plants) are constructed.

7) A Site Management Plan is required, which includes the following:
   - An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the Northrop Grumman Bethpage Facility and NWIRP sites and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:
     - Institutional Controls: The Institutional Control/s discussed in Paragraph 5 above.
     - Engineering Controls: The extraction wells, underground conveyance piping, treatment plants, and recharge basins discussed in Paragraphs 2 and 3 above.
   - A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
     - monitoring of groundwater to assess the performance and effectiveness of the remedy; and
     - a schedule of monitoring and frequency of submittals to the Department.
   - An Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:
     - procedures for operating and maintaining the remedy;
     - compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
     - maintaining site access controls and Department notification; and
     - providing the Department access to the site and O&M records.

Amended Record of Decision Exhibits

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation for all environmental media that were evaluated. As described in Section 7, samples were collected from various environmental media to characterize the nature and extent of contamination.

This document evaluates remedial options for addressing the off-site portions of the groundwater plume originating from the NWIRP site and the Northrop Grumman Bethpage Facility site. On-site waste/source areas, soil contamination, and on and off-site soil vapor is addressed under the existing RODs for the NWIRP site and the Northrop Grumman Bethpage Facility site. Each of the existing RODs includes tables summarizing findings of the investigations for each medium for which contamination was identified. This document includes tables to present the range of contamination found in on-site and off-site groundwater and compares the data with the applicable SCGs for the site.

Waste/Source Areas

As described in the RI reports, waste/source materials were identified at the site and are impacting groundwater, soil, and soil vapor.

Wastes are defined in 6 NYCRR Part 375-1.2 and include solid, industrial and/or hazardous wastes. Source areas are defined in 6 NYCRR Part 375. Source areas are areas of concern at a site where substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium. Wastes and source areas were identified at the site and include a former drum marshaling area, areas where above-ground and underground storage tanks were located, recharge basins that received process water, sludge drying beds, and a salvage storage area.

The waste/source areas identified at the sites were addressed/will be addressed by the IRM(s), by remedial actions completed in accordance with earlier RODs; and by remedial actions that will be completed in accordance with IRMs and RODs described in Sections 7.3.2 and 7.4 respectively.

Groundwater

Remedial investigations completed by Northrup Grumman (Geraghty & Miller and Arcadis) and the U.S. Navy (TetraTech) over the last few decades, demonstrate that past disposal practices contaminated the groundwater in both the upper glacial and Magothy aquifers. The western (OU2) and eastern plumes (OU3) originated from the sites, and the two plumes comingle downgradient of the on-site areas to form one overall groundwater plume (Figure 2).

The groundwater plume is a three-dimensional volume of contaminated groundwater in the subsurface that varies by location and depth within its overall limits (Figure 3). The length of the groundwater plume that contains site contaminants exceeding the respective Standards, Criteria and Guidance (SCGs) is approximately 4.3 miles. As

shown on Figure 3, the SCG groundwater plume extends from the NWIRP and Northrop Grumman properties to the distal edge near the Southern State Parkway. The overall width of the plume is approximately 2.1 miles wide at its widest point.

The assessment of the existing groundwater quality data conducted in support of this AROD confirmed that TCE is the primary contaminant in the overall groundwater plume. TCE has the highest number of detections and the highest number of measured sample concentrations that exceed applicable standards (Table 1). Specifically, TCE was detected in 3,172 of the 5,545 groundwater samples analyzed for TCE (57% of samples). As summarized in Table 1, the TCE concentrations in groundwater ranged from 0.23 parts per billion (ppb) to 11,200 ppb and exceeded the SCG of 5 ppb in 2,257 of the 5,545 samples. TCE was found to exceed the SCG to a maximum depth of 820 feet below ground surface. TCE was detected at the highest concentration in a monitoring well located in the RW-21 Area south of the Former Grumman Settling Ponds area (Figure 2).

As summarized in Table 1, cis-DCE and PCE were the next most frequently detected site contaminants in groundwater. Specifically, cis-DCE was detected in 494 of 4,243 groundwater samples at concentrations that exceeded the 5 ppb SCG. The highest cis-DCE concentration was 210,000 ppb and this sample was collected from a vertical profile boring (VP-27) completed in 2005 during the investigation of the Former Grumman Settling Ponds area (Figure 2). The deepest groundwater sample that exceeded the standard for cis-DCE was collected from a monitoring well screened from 716 to 726 feet (MW-13 in the RW-21 area). PCE was detected in 890 of 5,447 groundwater samples at concentrations exceeding the SCG of 5 ppb. The highest PCE concentration (940 ppb) occurred in a groundwater sample collected at a depth of 640 feet beneath the ground surface in a monitoring well (MW-87D2) located south of the former RUCO Polymer Corp (Hooker Chemical site on Figure 2) site (Site No. 130004) and immediately west of the NWIRP and Northrop Grumman Bethpage Facility sites.

Additional chlorinated volatile organic compounds (CVOCs), Freon compounds, toluene and 1,4-dioxane were also detected at concentrations exceeding their respective standards and are generally found comingled with the TCE, PCE, and cis-DCE groundwater plume. The deepest groundwater sample that was found to be above standards was 980 feet below ground surface where toluene was measured at 5.8 ppb in a vertical profile boring (VPB-167) immediately south of the Southern State Parkway. The emerging contaminant 1,4-dioxane was detected in approximately 50% of the 634 groundwater samples in the database at concentrations exceeding the EPA health-based guidance value 0.35 ppb. The detected concentrations for 1,4-dioxane ranged from 0.046 ppb to 190 ppb, and 1,4-dioxane was detected in samples as deep as 750 feet below ground surface.

Site contaminants have been detected in raw, untreated groundwater used as drinking water in six different well fields operated by the Bethpage Water District, South Farmingdale Water District, and New York American Water Company (Figure 2). The Bethpage Water District operates three of the six well fields. These three well fields are immediately downgradient of the NWIRP and Northrop Grumman Bethpage Facility sites and within the central portion of the groundwater plume. Due to their proximity to the sites, these Bethpage Water District well fields were the first to require wellhead treatment to address site related VOC contamination present in off-site groundwater. Based on sampling completed in in 2017, the average TCE concentrations in raw, untreated groundwater exceeded the SCG of 5 ppb for TCE in the three Bethpage Water District well fields and ranged from 30.87 ppb to 1,940 ppb. With the exception of Bethpage Water District Well 6-1, the TCE concentrations in raw, untreated groundwater have increased over time in each of the Bethpage Water District wells. Raw, untreated water from Bethpage Water District Well 6-2 has consistently contained the highest TCE concentrations. In 2017, TCE concentrations in raw, untreated water from Well 6-2 ranged from 844 ppb to 1,940

ppb with an average of 1,362 ppb. The average annual TCE concentration in raw, untreated groundwater from Well 6-2 increased over 700 percent from 2008 (161 ppb) to 2017 (1,362 ppb). In 2017, TCE concentrations in raw, untreated water from Bethpage Water District Well 4-1 ranged from 85 ppb to 183 ppb with an average of 143 ppb. The average annual TCE concentration in raw, untreated groundwater from Well 4-1 increased nearly 300 percent from 2008 (36 ppb) to 2017 (143 ppb). The Bethpage Water District provides treatment at each of its wells prior to distribution of water to customers.

Table 1 - Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
1,1,1-Trichloroethane	0.1 - 110	5	31 of 4,618
1,1,2,2-Tetrachloroethane	0.2 - 0.25	5	0 of 4,596
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	0.22 - 250	5	335 of 4,107
1,1,2-Trichloroethane	0.21 - 5	1	83 of 4,604
1,1-Dichloroethane	0.16 - 110	5	205 of 4,615
1,1-Dichloroethene	0.19 - 110	5	195 of 4,618
1,2-Dichloroethane	0.14 - 39.9	0.6	133 of 4,616
1,2-Dichloroethene	0.21 – 1,100	5	43 of 1,843
1,2-Dichloropropane	0.28 - 32.7	1	38 of 4,433
1,4-Dioxane	0.046 - 190	0.35	306 of 634
Carbon Disulfide	0.089 - 18	60	0 of 4,231
Carbon Tetrachloride	0.09 - 8	5	3 of 4,605
Chlorobenzene	0.3 - 7	5	2 of 4,605
Chlorodifluoromethane (Freon 22)	0.21 - 400	5	22 of 1,276
Chloroform	0.11 - 110	7	100 of 4,550
Chromium, Total	0.4 - 804	5	56 of 113
Cis-1,2-Dichloroethylene	0.19 – 210,000	5	494 of 4,243
Dichlorodifluoromethane (Freon 12)	0.2 - 32	5	5 of 3,767
Tetrachloroethylene (PCE)	0.2 - 940	5	890 of 5,447
Toluene	0.06 – 84,000	5	59 of 4,441
Trans-1,2-Dichloroethene	0.23 - 95	5	23 of 4,238
Trichloroethylene (TCE)	0.23 – 11,200	5	2,257 of 5,545
Vinyl Chloride	0 – 6,300	2	568 of 5,403
Inorganics			
Iron	120 – 1,700	300	11 of 15
Nickel	30.6 - 30.6	100	0 of 15

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b - SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).

Based on the findings of the expanded investigation combined with earlier RIs, the past disposal of hazardous waste has resulted in the contamination of on-site and off-site groundwater. While on-site groundwater contamination identified during the previous RIs was addressed during the IRMs described in Section 7.3.2 and will be further addressed in accordance with existing RODs, contaminant concentrations in off-site groundwater continue to increase and the plume continues to migrate to the south-southeast. The site contaminants that are

considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: TCE, and TCE breakdown products, PCE, and 1,4-dioxane.

Soil

Based on the findings of the earlier Remedial Investigations, the past disposal of hazardous waste has resulted in the contamination of soil. The site contaminants identified in soil which are considered to be the primary contaminants of concern are TCE and TCE breakdown products, PCE, PCBs, and metals. These contaminants have been addressed by IRMs and the existing RODs, or will be addressed by the existing RODs.

Soil Vapor

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the sampling of soil vapor, sub-slab soil vapor under structures, and indoor air inside structures. At this site due to the presence of buildings in the impacted area a full suite of samples were collected to evaluate whether soil vapor intrusion was occurring.

To assess the potential for soil vapor intrusion, sub-slab and indoor air samples were collected from a total of 26 homes located immediately south of the former NWIRP and Northrop Grumman Bethpage Facility sites. This sampling identified elevated concentrations of site-related VOCs in soil vapor and in the indoor air of six residential structures. Granular activated carbon (GAC)-based air purification units (APUs) were initially installed to remove site-related VOC vapors from indoor air of the affected structures and then slab-slab depressurization systems (SSDs) were installed to mitigate the potential for soil vapor intrusion to occur.

Based on the concentrations detected, and in comparison with the NYSDOH Soil Vapor Intrusion Guidance, soil vapor contamination identified during the RI was addressed during the IRM described in Section 7.3.2. Specifically, the Bethpage Community Park On-Site Soil Vapor Extraction and Treatment System operated by Northrop Grumman and the Site 1, Former Drum Marshaling Yard Soil Vapor Extraction Containment System operated by the U.S. Navy, prevent off-site migration of VOC contaminated soil vapor.

Exhibit B

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Section 7.7) to address the off-site groundwater plume originating from the Northrop Grumman Bethpage Facility and NWIRP sites as described in Exhibit A.

With the exception of the No Further Action Alternative, the following common elements are included in each of the remedial alternatives evaluated:

- **Groundwater Extraction**: Contaminated groundwater would be withdrawn from the subsurface using high capacity extraction wells. The total number of extraction wells, along with the approximate locations, pumping rates, and depths for each alternative was determined based on groundwater flow modeling completed in cooperation with the USGS. The final locations, depths, and flow rates for each of the extraction wells would be further refined during a remedial design program.
- **Treatment of Contaminated Water**: The typical treatment process would include filtration, removal of VOCs using air stripping technology, vapor-phase granulated active carbon (GAC), liquid-phase GAC, and advanced oxidation process (AOP) for 1,4-dioxane. Depending on the alternative, the contaminated groundwater from each extraction well would either be treated utilizing one or two large centralized treatment plants or multiple decentralized groundwater treatment plants near the extraction wells. The details for the centralized treatment plant and decentralized treatment plant options are summarized below.

    1) Decentralized Treatment Plants: Under this treatment option, multiple decentralized treatment plants would be located near the extraction wells (either individually or in a group) based on the locations and flow rates of the respective extraction wells. Alternatives including decentralized treatment plants are identified with the "A" suffix. The property acquisition costs for sufficient acreage for constructing the decentralized treatment plants is included within the cost estimates for each of the decentralized treatment plant alternatives. For the purpose of this analysis, it is assumed that an approximately 2,000 to 4,000-square foot groundwater treatment plant building is required adjacent to each extraction well. To the maximum extent practicable, public ROWs, existing state/county/town-owned recharge basins, and publicly-available real estate would be utilized when evaluating possible locations for the decentralized treatment plants.

    2) Centralized Treatment Plants: Under this treatment option, one large centralized treatment plant would be located within the area of the former Northrop Grumman Bethpage Facility and NWIRP site property boundaries (herein referred to as north treatment plant); and a second treatment plant would be located along the Southern State Parkway near Massapequa Creek (herein referred to as south treatment plant). To the maximum extent practicable, public ROWs, existing state/county/town-owned recharge basins, and publicly-available real estate would be utilized when evaluating possible locations for the extraction well houses and pump stations.
- **Management of Treated Water**: Each alternative includes options for managing treated water by either beneficially re-using the water and/or returning the treated water to the surface water and/or groundwater systems. Specifically, treated water would be managed using a combination of existing recharge basins, constructed recharge basins, surface water streams (e.g., Massapequa Creek), injection wells or irrigation at the Bethpage State Park.
- **Conveyance of Water**: For the conveyance of contaminated groundwater from mass flux extraction wells, double-walled high-density polyethylene (HDPE) piping would be used. For the conveyance of treated water

to the location for management, single-walled HDPE piping would be used.

- **Development of Alternate Water Supply:** Each of the remedial alternatives assume that the currently operating water district pumping wells (e.g., Bethpage Water District Plants 4, 5, and 6; South Farmingdale Water District Plants 1 and 3; and American Water New York – Seamans Neck Road Plant, etc.) would continue to withdraw water during remedy operation. Of these water districts, the three Bethpage water plants have been most impacted by the plume originating from the NWIRP and Northrop Grumman Bethpage Facility sites. Specifically, they are immediately downgradient of the NWIRP and Northrop Grumman Bethpage Facility sites, are within the central portion of the groundwater plume, were the first to require wellhead treatment, and groundwater withdrawn from some of these wells has exhibited continuous increases in contaminant concentrations over time. While these three Bethpage Water District plants are operated to meet municipal demands, they indirectly remove significant amounts of site-related contaminants from the aquifer system through water extraction and treatment. Although this removal provides an added remedial benefit, this dual use of public water supply wells is not a preferred option over the long term. Therefore, it is the intent of the Department and NYSDOH to transition the Bethpage Water District Plants 4, 5, and 6 pumping wells over time from public water supply wells to remedial wells. To allow Bethpage Water District to continue to meet municipal demands without these wells, a provision for development of an alternate water supply in the future is required and included as a common component of each remedial alternative.
- **Long-Term Groundwater Monitoring**: Periodic monitoring of on-site and off-site groundwater quality to assess the performance of the remedial program; and
- **Periodic Reviews**: Periodic reviews would be used to evaluate the remedy and certify that the remedial measures remain in-place.

Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed by the IRM(s) along with on-going and planned remedial actions under existing RODs. The on-going and planned remedial actions are listed below and also described in 7.2 (Summary of Actions Under Public Water Supply Protection Program), Section 7.3.2 (Interim Remedial Measures), and Section 7.4 (Summary of Remedial Actions in Accordance with Earlier RODs). This alternative leaves the site in its present condition and does not provide any additional protection of the environment.

- Operation of the ONCT (five groundwater extraction wells);
- Operation of the Bethpage Community Park Groundwater Containment System (four groundwater extraction wells);
- Operation of the GM-38 Groundwater Extraction and Treatment System (currently two groundwater extraction wells);
- Future operation of the RW-21 Area Groundwater Extraction and Treatment System (three groundwater extraction wells);
- Future operation of the RE-108 Groundwater Extraction and Treatment System (three to five groundwater extraction wells);
- Continued wellhead treatment at six public water supplies; and
- Continued implementation of the Public Water Supply Contingency Plan.

Alternative 2A: Hydraulic Containment of Site Contaminants above Standards, Criteria, and Guidance (SCGs) - Decentralized Treatment Plants with Various Discharge Methods

Under Alternative 2A, a series of groundwater extraction wells would be installed and pumped along the margins of the groundwater plume in order to achieve hydraulic containment of site contaminants that are present at

concentrations exceeding SCGs (typically 5 ppb). Once withdrawn, the contaminated water would be treated using multiple, decentralized treatment plants. Alternative 2A assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I [in design] and RE108 Phase II [in design]) are operating. This alternative also assumes that the existing water district wells would continue to pump water at rates equivalent to the average rate for those wells over a representative six-year period (2010-2015) during operation of the remedy. Alternative 2A is shown conceptually on Figure 7.

Specifically, under Alternative 2A, 16 extraction wells would be installed and pumped at a total rate of 10,400 gallons per minute (gpm) or 15 million gallons per day (MGD) from the aquifer to provide capture of the SCG plume. Extraction wells would be installed to depths ranging from approximately 300-feet below ground surface (bgs) to 950-feet bgs with an estimated screen length of 100 to 200 feet per extraction well. Following withdrawal, the contaminated groundwater from each extraction well would be pumped to a nearby groundwater treatment plant. In total, Alternative 2A includes the construction of six 500-gpm (0.7 MGD) treatment plants, six 1,000-gpm (1.4 MGD) treatment plants, and one 2,250-gpm (3.2 MGD) treatment plant (along the Southern State Parkway near Massapequa Creek).

Once treated, water from 12 of the treatment plants would be returned to the aquifer via 13 existing recharge basins. Three of the 13 recharge basins located beyond the southern edge of the groundwater plume are included under Alternative 2A to manage treated water at a total flow rate of approximately 2,000 gpm (2.9 MGD) to mitigate potential environmental impacts to surface water flow, wetland water levels, and subsea discharge (saltwater intrusion) caused by groundwater extraction under this alternative. Treated water from a single treatment plant near Massapequa Creek would be used to augment flow in Massapequa Creek.

To convey water from point of extraction to treatment and then from the treatment plants to the recharge basins or Massapequa Creek, a total of approximately 82,000 feet (15.5 miles) of underground piping would be installed as part of this remedial alternative. Figure 7 shows the approximate locations of the extraction wells, treatment plants, conveyance piping, and discharge locations.

It is expected that it would take approximately five years to design and implement the remedy. Since Alternative 2A focuses on the area of lowest groundwater VOC concentrations and because of the persistent nature of the contaminants and the length of the groundwater plume, it is not expected that Alternative 2A would achieve the groundwater SCGs within the near future.

Costs are based on completion of remedial design testing, installation of 16 extraction wells, construction and operation of 13 groundwater treatment systems for a 30-year period, installation of 82,000 feet (15.5 miles) of underground piping, development of an alternate water supply, property acquisitions to support the remedy, and long-term groundwater quality monitoring.

Present Worth: *$553,000,000*
Capital Cost: *$210,000,000*
Annual Costs: *$16,700,000*

Alternative 2B: Hydraulic Containment of Site Contaminants above SCGs - Centralized Treatment Plants with a Centralized Recharge Basin

Under Alternative 2B, a series of groundwater extraction wells would be installed and pumped along the margins of the groundwater plume in order to achieve capture of site contaminants that are present at concentrations

exceeding SCGs (typically 5 ppb). Once withdrawn, the contaminated water would be treated at one of two centralized treatment plants or one of three decentralized treatment plants. Alternative 2B assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I [in design] and RE108 Phase II [in design]) are operating. This alternative also assumes that the existing water district wells would continue to pump water at rates equivalent to the average rate for those wells over a representative six-year period (2010-2015) during operation of the remedy. Alternative 2B is shown conceptually on Figure 8.

Specifically, Alternative 2B includes 16 extraction wells that would be installed and pumped at a total rate of 9,200 gpm (13.2 MGD) from the aquifer to provide capture of the SCG plume. Extraction wells would be installed to depths ranging from approximately 300-feet bgs to 950-feet bgs with an estimated screen length of 100 to 200 feet per extraction well. Following withdrawal, the contaminated groundwater from the 16 extraction wells would be pumped to either a north centralized treatment plant capable of treating approximately 5,200 gpm (7.5 MGD), a south centralized treatment plant capable of treating 2,000 gpm (2.9 MGD), two decentralized treatment plants located south of the Southern State Parkway capable of treating 1,000 gpm (1.4 MGD) or a decentralized treatment plant located south of the Southern State Parkway capable of treating 500 gpm (0.72 MGD).

Discharge water from the north centralized treatment plant would be returned to the aquifer via a newly constructed recharge basin located in the public property in the vicinity of the Bethpage State Park. It is expected that a 10-acre recharge basin would be necessary to manage the treated water from the north centralized treatment plant. Approximately 900 gpm (1 MGD) of the treated water would also be beneficially re-used for irrigation purposes by the Bethpage State Park for eight months of the year from the north centralized treatment plant. The discharge water from the south centralized treatment plant would be used to augment flow in Massapequa Creek. Treated water from the three smaller, decentralized treatment plants located near the southern edge of the groundwater plume and near the Southern State Parkway would be discharged to three existing recharge basins to mitigate potential negative environmental impacts to surface water flow, wetland water levels, and subsea discharge (saltwater intrusion) caused by the withdrawal of water from the aquifer under this alternative.

To convey water from the extraction wells to the treatment plants and from the treatment plants to the recharge basins, Massapequa Creek, or Bethpage State Park for irrigation purposes, a total of approximately 108,000 feet (20.4 miles) of underground piping would be installed as part of this remedial alternative. Figure 8 shows the approximate locations of the extraction wells, treatment plants, conveyance piping, and discharge locations.

It is expected that it would take approximately five years to design and implement the remedy. Since Alternative 2B focuses on the area of lowest groundwater VOC concentrations and because of the persistent nature of the contaminants and the length of the groundwater plume, it is not expected that Alternative 2B would achieve the groundwater SCGs within the near future.

Costs are based on completion of remedial design testing, installation of 16 extraction wells, construction and operation of two centralized and three decentralized groundwater treatment systems for a 30-year period, construction of a 10-acre recharge basin, installation of 108,000 feet (20.4 miles) of underground piping, development of an alternate water supply, property acquisitions to support the remedy, and long-term groundwater quality monitoring.

Present Worth: *$485,000,000*
Capital Cost: *$195,000,000*
Annual Costs: *$13,900,000*

Alternative 3A: Plume Mass Flux Remediation - Decentralized Treatment Plants with Various Discharge Methods

Under Alternative 3A, a series of mass flux groundwater extraction wells would be installed and pumped within the interior of the groundwater plume in order to achieve capture of site contaminants that are present at concentrations exceeding 50 ppb. Once withdrawn, the contaminated water would be treated using multiple, decentralized treatment plants. Alternative 3A assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I [in design] and RE108 Phase II [in design]) are operating. This alternative also assumes that the existing water district wells would continue to pump water at rates equivalent to the average rate for those wells over a representative six-year period (2010-2015) during operation of the remedy. Alternative 3A is shown conceptually on Figure 9.

Specifically, under Alternative 3A, 17 extraction wells would be installed and pumped at a total rate of 9,100 gpm (13.1 MGD) from the aquifer to provide capture of site contaminants at concentrations exceeding 50 ppb. Under Alternative 3A, extraction wells would be installed to depths ranging from 300-feet bgs to 800-feet bgs with an estimated screen length of 100 to 200 feet per extraction well. Following withdrawal, the contaminated groundwater from each extraction well would be pumped to a nearby decentralized groundwater treatment plant. In total, Alternative 3A includes the construction of 12 decentralized treatment plants designed to treat water at flow rates ranging from 500 to 2,250 gpm. Once treated, water would be returned to the aquifer using 12 existing recharge basins. Approximately 900 gpm (1 MGD) of the treated effluent would also be discharged to Bethpage State Park and used for irrigation purposes at the park for eight months of the year.

To convey water from point of extraction to treatment and then from the treatment plants to the recharge basins and Bethpage State Park for irrigation purposes, a total of approximately 118,000 feet (22.4 miles) of underground piping would be installed as part of this remedial alternative. Figure 9 shows the approximate locations of the extraction wells, treatment plants, conveyance piping, and discharge locations.

It is expected that it would take approximately five years to design and implement the remedy. Since Alternative 3A is a mass flux approach that focuses on the area of highest groundwater VOC concentrations and because of the persistent nature of the contaminants and the length of the groundwater plume, it is not expected that Alternative 3A would achieve the groundwater SCGs within the near future.

Costs are based on completion of remedial design testing, installation of 17 extraction wells, construction and operation of 12 groundwater treatment systems for a 30-year period, installation of 118,000 feet (22.4 miles) of underground piping, development of an alternate water supply, property acquisitions to support the remedy, and long-term groundwater quality monitoring.

Present Worth: *$522,000,000*
Capital Cost: *$234,000,000*
Annual Costs: *$17,200,000*

Alternative 3B: Plume Mass Flux Remediation - Centralized Treatment Plant with a Centralized Recharge Basin

Under Alternative 3B, a series of mass flux groundwater extraction wells would be installed and pumped within the interior of the groundwater plume in order to achieve capture of site contaminants that are present at concentrations exceeding 50 ppb. Once withdrawn, the contaminated water would be treated using a single centralized treatment plant. Alternative 3B assumes that the existing and planned groundwater extraction and

treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I (in design] and RE108 Phase II [in design]) are operating. This alternative also assumes that the existing water district wells would continue to pump water at rates equivalent to the average rate for those wells over a representative six-year period (2010-2015) during operation of the remedy. Alternative 3B is shown conceptually on Figure 10.

Alternative 3B includes 16 extraction wells that would be installed and pumped at a total rate of 7,100 gpm (10.2 MGD) from the aquifer to provide capture of site contaminants at concentrations exceeding 50 ppb. Under Alternative 3B, extraction wells would be installed to depths ranging from 300-feet bgs to 800-feet bgs with an estimated screen length of 100 to 200 feet per extraction well. Following withdrawal, the contaminated groundwater from the 16 extraction wells would be pumped to a centralized groundwater treatment plant located in the vicinity of the former NWIRP and Northrop Grumman property.

Once treated, water would be returned to the aquifer via a newly constructed recharge basin to be located on the public property in the vicinity of the Bethpage State Park. It is expected that an approximate 10-acre recharge basin would be necessary to manage the treated water. Approximately 900 gpm of the treated water would also be beneficially re-used for irrigation purposes by the Bethpage State Park for eight months of the year.

To convey water from the extraction wells to the treatment plant and from the treatment plant to the central recharge basin and Bethpage State Park for irrigation purposes, a total of approximately 82,500 feet (15.6 miles) of underground piping would be installed as part of this remedial alternative. Figure 10 shows the approximate locations of the extraction wells, treatment plants, conveyance piping, and discharge locations.

It is expected that it would take approximately five years to design and implement the remedy. Since Alternative 3B is a mass flux approach that focuses on the area of highest groundwater VOC concentrations and because of the persistent nature of the contaminants and the length of the groundwater plume, it is not expected that Alternative 3B would achieve the groundwater SCGs within the near future.

Costs are based on completion of remedial design testing, installation of 16 extraction wells, construction and operation of a centralized groundwater treatment system for a 30-year period, construction of a 10-acre recharge basin, installation of 82,500 feet (15.6 miles) of underground piping, development of an alternate water supply, property acquisitions to support the remedy, and long-term groundwater quality monitoring.

Present Worth: *$332,000,000*
Capital Cost: *$169,000,000*
Annual Costs: *$8,660,000*

Alternative 4: Aquifer Flushing

Alternative 4 is an aquifer flushing approach that involves the extraction of contaminated groundwater from the aquifer where site contaminant concentrations exceed 100 ppb, ex-situ treatment using multiple decentralized treatment plants, and the re-introduction of the treated water back into the subsurface using injection wells. Under this alternative, the treated water is strategically re-introduced to promote movement of impacted groundwater toward the extraction wells, enhance hydraulic control of the contaminated groundwater, and prevent further migration of the 100 ppb plume. Alternative 4 assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I (in design] and RE108 Phase II [in design]) are operating. This alternative also assumes that the existing water district wells would continue to pump water at rates equivalent to the average rate for those wells over a representative six-year period (2010-2015) during operation of the remedy. Alternative 4 is shown conceptually on Figure 11.

Under Alternative 4, a total of 23 extraction wells would be installed and pumped at a total rate of 8,700 gpm (12.5 MGD) from the aquifer to provide capture of site contaminants at concentrations exceeding 100 ppb. The extraction wells would be installed to depths ranging from 300-feet bgs to 1,000-feet bgs with an estimated screen length of 100 to 300 feet per extraction well. Following withdrawal, the contaminated groundwater from each extraction well would be pumped to a nearby decentralized groundwater treatment plant. In total, Alternative 4 includes the construction of 23 decentralized treatment plants with capacities ranging from 100 gpm to 1,000 gpm. Once treated, water from the 23 extraction wells would be returned to the aquifer using a network of 43 injection wells. It is expected that each injection well would re-introduce water to the Magothy aquifer at rates ranging from approximately 25 gpm to 700 gpm. The injection wells would be installed to depths ranging from approximately 160 feet bgs to 900 feet bgs.

To convey water from the point of extraction to the point of treatment and then from the treatment plants to the nearby injection wells, a total of approximately 93,000 feet (17.6 miles) of underground piping would be installed as part of this remedial alternative. Figure 11 shows the approximate locations of the extraction wells, treatment plants, conveyance piping, and injection wells.

It is expected that it would take approximately five years to design and implement the remedy. Since Alternative 4 is an approach developed to expedite plume cleanup in the area where the highest groundwater VOC concentrations exist, this alternative may require as little as 20-years to reach completion. This alternative does not however, directly address areas of the plume where site contaminants are less than 100 ppb and above the SCGs. The timeframe to address the remaining portions of the plume necessary to achieve RAOs would likely exceed 30 years.

Costs are based on completion of remedial design testing, installation of 23 extraction wells, 43 injection wells, construction and operation of 23 groundwater treatment systems for a 30-year period, installation of 93,000 feet (17.6 miles) of underground piping, development of an alternate water supply, property acquisitions to support the remedy, and long-term groundwater quality monitoring.

Present Worth: *$608,000,000*
Capital Cost: *$314,000,000*
Annual Costs: *$21,000,000*

Alternative 5A: Hydraulic Containment of Site Contaminants above SCGs Combined with Mass Flux Remediation - Decentralized Treatment Plants with Various Discharge Methods

Alternative 5A combines Alternatives 2A and 3A and provides an approach to not only capture site contaminants that exceed SCGs but also addresses areas of the plume with high contaminant concentrations using a plume mass flux approach. Under Alternative 5A, a series of groundwater extraction wells would be installed and pumped within the interior of the groundwater plume to achieve capture of site contaminants that are present at concentrations exceeding 50 ppb. These mass flux wells would be supplemented with a network of extraction wells located along the margins of the SCG plume (typically 5 ppb) to prevent continued migration of the plume. Once withdrawn, the contaminated water would be treated using multiple, decentralized treatment plants. Alternative 5A assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I [in design] and RE108 Phase II [in design]) are operating. This alternative also assumes that the existing water district wells would continue to pump water at rates equivalent to the average rate for those wells over a representative six-year period (2010-2015) during operation of the remedy. Alternative 5A is shown conceptually on Figure 12.

Specifically, under Alternative 5A, 24 extraction wells would be installed and pumped at a total rate of 13,300 gpm (19.2 MGD) from the aquifer to provide capture of both the 50 ppb plume and the SCG plume. Eight of the extraction wells (square well symbols on Figure 12) would be installed for the purpose of mass flux remediation within the 50 ppb plume and 16 extraction wells (circular well symbols on Figure 12) would be installed for hydraulic containment of the SCG plume. The extraction wells would be installed to depths ranging from approximately 300-feet bgs to 950-feet bgs with an estimated screen length of 100 to 300 feet per extraction well. Following withdrawal, the contaminated groundwater from each extraction well would be pumped to a nearby decentralized groundwater treatment plant. In total, Alternative 5A would include the construction of 17 decentralized treatment plants. Specifically, one treatment plant would be designed for an influent flow rate of approximately 1,250 gpm (1.8 MGD), four treatment plants would be designed for an influent flow rate of approximately 500 gpm (0.72 MGD) gpm, 11 treatment plants would be designed for an influent flow rate of approximately 1,000 gpm (1.4 MGD), and one plant (along the Southern State Parkway near Massapequa Creek) would be designed for an influent rate of approximately 1,500 gpm (2.2 MGD).

Once treated, approximately 10,900 gpm (15.7 MGD) of water from 21 extraction wells would be returned to the aquifer via 16 existing recharge basins. Water from three of the 21 extraction wells would be discharged to an existing recharge basin located to the west of Bethpage State park, but the treated water would also be available for beneficial re-use for irrigation purposes at Bethpage State Park for eight months of the year. Approximately 1,500 gpm (2.2 MGD) of the treated water withdrawn from the three remaining extraction wells would be used to augment flow in Massapequa Creek. Three of the twelve recharge basins located beyond the southern edge of the groundwater plume (south of the Southern State Parkway) are included under Alternative 5A to manage treated water and to mitigate potential environmental impacts to surface water flow, wetland water levels, and subsea discharge (saltwater intrusion) caused by groundwater extraction under this alternative.

To convey water from point of extraction to treatment and then from the treatment plants to the area where the water would be managed (i.e., recharge basins, irrigation, or streamflow augmentation), a total of approximately 131,000 feet (24.8 miles) of underground piping would be installed as part of this remedial alternative. Figure 12 shows the approximate locations of the extraction wells, treatment plants, conveyance piping, and discharge locations.

It is expected that it would take approximately five years to design and implement the remedy. Since Alternative 5A focuses on areas of the plume with the highest concentrations, as well as areas of lower concentrations along the margins of the plume, it is expected that Alternative 5A would be effective at achieving the groundwater SCGs. Because of the persistent nature of the contaminants and the length of the groundwater plume however, it is not expected that Alternative 5A would achieve the groundwater SCGs within the near future.

Costs are based on completion of remedial design testing, installation of 24 extraction wells (8 mass flux and 16 hydraulic containment), construction and operation of 17 treatment plants for a 30-year period, installation of 131,000 feet (24.8 miles) of underground piping, development of an alternate water supply, property acquisitions to support the remedy, and long-term groundwater quality monitoring.

Present Worth: *$748,000,000*
Capital Cost: *$283,000,000*
Annual Costs: *$22,500,000*

Alternative 5B: Hydraulic Containment of Site Contaminants Above SCGs Combined with Mass Flux Remediation - Centralized Treatment Plants with a Centralized Recharge Basin

Similar to Alternative 5A, Alternative 5B combines the approach to capture site contaminants that exceed SCGs (Alternative 2B) with the plume mass flux approach (Alternative 3B). Under Alternative 5B, a series of groundwater extraction wells would be installed and pumped within the interior of the groundwater plume to achieve capture of site contaminants that exceed 50 ppb. These mass flux wells would be supplemented with a network of extraction wells located along the margins of the SCG plume (typically 5 ppb) to prevent continued migration of the plume. Once withdrawn, the contaminated water would be treated using two centralized treatment plants or one of three decentralized treatment plants. Alternative 5B assumes that the existing and planned groundwater extraction and treatment remedial systems (i.e., GM-38 [existing], RW-21 [under construction], RE108 Phase I [in design] and RE108 Phase II [in design]) are operating. This alternative also assumes that the existing water district wells would continue to pump water at rates equivalent to the average rate for those wells over a representative six-year period (2010-2015) during operation of the remedy. Alternative 5B is shown conceptually on Figure 13.

Specifically, under Alternative 5B, eight of the extraction wells would be installed for the purposes of mass flux remediation within the 50 ppb plume and 16 extraction wells would be installed for hydraulic containment of the SCG plume. In total, these 24 extraction wells would be installed and pumped at a total rate of approximately 12,140 gpm (17.5 MGD) from the aquifer to provide capture of both the 50 ppb plume and the SCG plume. Extraction wells would be installed to depths ranging from approximately 300-feet bgs to 950-feet bgs with an estimated screen length of 100 to 200 feet per extraction well. Following withdrawal, contaminated groundwater from 17 of the extraction wells would be pumped to a north centralized groundwater treatment plant capable of treating 8,140 gpm (11.7 MGD) in the area of the former Northrop Grumman and NWIRP property and contaminated water from four of the extraction wells would be pumped to a south centralized treatment plant capable of treating 2,000 gpm (2.8 MGD) near the headwaters of Massapequa Creek. In addition, under Alternative 5B, contaminated water from the three remaining extraction wells would be pumped to individual decentralized treatment plants capable of treating 500 to 1,000 gpm near the southern-most reaches of the groundwater plume.

Discharge water from the north centralized treatment plant would be returned to the aquifer via a newly constructed recharge basin located on the public property in the vicinity of the Bethpage State Park. It is expected that a 10-acre recharge basin would be necessary to manage the treated water from the north centralized treatment plant. Approximately 900 gpm (1 MGD) of the treated water from the north centralized treatment plant would also be beneficially re-used for irrigation purposes by the Bethpage State Park for eight months of the year. The discharge water from the south centralized treatment plant would be used to augment flow in Massapequa Creek. Treated water from the three smaller, decentralized treatment plants located near the southern edge of the groundwater plume would be discharged to three existing recharge basins to mitigate potential negative environmental impacts to surface water flow, wetland water levels, and subsea discharge (saltwater intrusion) caused by the withdrawal of water from the aquifer under this alternative.

To convey water from the extraction wells to the five treatment plants and from the treatment plants to the area where the water would be managed (i.e., recharge basins, irrigation, or streamflow augmentation), a total of approximately 124,000 feet (23.5 miles) of underground piping would be installed as part of this remedial alternative. Figure 13 shows the approximate locations of the extraction wells, treatment plants, conveyance piping, and discharge locations.

It is expected that it would take approximately five years to design and implement the remedy. Since

Alternative 5B focuses on areas of the plume with the highest concentrations, as well as areas of lower concentrations along the margins of the plume, it is expected that Alternative 5B would be effective at achieving the groundwater SCGs. Because of the persistent nature of the contaminants and the length of the groundwater plume however, it is not expected that Alternative 5B would achieve the groundwater SCGs within the near future.

Costs are based on completion of remedial design testing, installation of 24 extraction wells (8 mass flux and 16 hydraulic containment), construction and operation of five groundwater treatment systems for a 30-year period, construction of one recharge basin, installation of 124,000 feet (23.5 miles) of underground piping, development of an alternate water supply, property acquisitions to support the remedy, and long-term groundwater quality monitoring.

Present Worth: *$585,000,000*
Capital Cost: *$241,000,000*
Annual Costs: *$16,300,000*

Exhibit C
Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
No Further Action	0	0	0
Alternative 2A	210,000,000	16,700,000	553,000,000
Alternative 2B	195,000,000	13,900,000	485,000,000
Alternative 3A	234,000,000	17,200,000	522,000,000
Alternative 3B	169,000,000	8,660,000	332,000,000
Alternative 4	314,000,000	21,000,000	608,000,000
Alternative 5A	283,000,000	22,500,000	748,000,000
Alternative 5B	241,000,000	16,300,000	585,000,000

Exhibit D

SUMMARY OF THE SELECTED REMEDY

The Department has selected Alternative 5B, Hydraulic Containment of Site Contaminants Above SCGs Combined with Mass Flux Remediation - Centralized Treatment Plants with a Centralized Recharge Basin as the amendment to the previously selected remedies. Alternative 5B will achieve the remediation goals by using 24 extraction wells to capture groundwater with the highest concentrations of site contaminants, as well as lesser contaminated groundwater (which exceeds the SCGs) along the margins of the plume. These extraction wells will allow for an expedited cleanup of the plume while at the same time preventing continued migration to areas that are currently not impacted by site contaminants. Following withdrawal, contaminated groundwater will be transferred via underground conveyance piping to one of two central treatment plants or one of three decentralized treatment plants. Once treated, the water will either be returned to the aquifer system via recharge basins, beneficially re-used at Bethpage State Park, or beneficially used to augment flow in Massapequa Creek. The elements of this remedy are described in Section 8. The amended remedy is depicted in Figure 13.

Basis for Selection

The amended remedy is based on the results of previous RIs, data collected since the previous RODs were issued and data collected as part of this recent investigation, USGS groundwater flow modeling, and the evaluation of alternatives. Based on the results of the investigation and engineering evaluation, the Navy Grumman groundwater plume continues to migrate south toward currently unimpacted public water supplies and unimpacted portions of the Long Island Sole Source Aquifer, and this southward migration is causing contaminant concentrations to increase in off-site groundwater. The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The amended remedy (Alternative 5B) satisfies this criterion by aggressively removing significant contaminant mass from the groundwater while also establishing hydraulic control of the plume and preventing continued migration of the Navy Grumman groundwater plume to currently un-impacted areas. By using centralized recharge combined with beneficial re-use as irrigation water and Massapequa Creek streamflow augmentation, Alternative 5B provides protection to the Long Island Sole Source Aquifer and the region’s surface water resources.

Full containment of the Navy Grumman groundwater plume will not only provide significant future protections for public health and the environment; it will also prevent long term expenditures associated with treatment that would otherwise become necessary at currently unimpacted public supply wells.

Similar to Alternative 5B, Alternative 5A (Hydraulic Containment of Site Contaminants above SCGs Combined with Mass Flux Remediation - Decentralized Treatment Plants with Various Discharge Methods) would satisfy this criterion through the removal of significant amounts of contaminant mass from the aquifer while also establishing hydraulic control of the plume. Alternative 5A provides protection to groundwater and surface water

resources by discharging the majority of treated water to individual recharge basins and Massapequa Creek. Based on contaminant transport analyses, both Alternatives 5A and 5B may require up to 110 years to fully achieve the remedial action objectives for the SCG plume.

Alternatives 2A and 2B are considered the next most protective, as both alternatives establish hydraulic control of the aquifer. This hydraulic control would eliminate continued migration of the groundwater plume that has already moved off the former NWIRP and Northrop Grumman Bethpage Facility sites. However, these two alternatives do not remove significant contaminant mass from the most impacted portions of the groundwater plume and are anticipated to require a longer timeframe (more than 30 years longer than Alternatives 5A and 5B) to achieve the RAOs.

Alternatives 3A, 3B and 4 are mass flux approaches that remove significant contaminant mass from the groundwater; but do not provide hydraulic control of the entire SCG plume. These alternatives are considered less protective than the other alternatives because they allow for the continued, uncontrolled migration of the plume beyond its current extent approximately four miles from the NWIRP and Northrop Grumman Bethpage Facility sites. These three alternatives (Alternatives 3A, 3B and 4) are anticipated to achieve RAOs over a longer timeframe (greater than 150 years) through a combination of contaminant mass removal, wellhead treatment, and natural processes. Alternative 1 (No Further Action) relies on the existing remedial actions and allows for continued migration of areas of the plume with high concentrations of site contaminants. As such, Alternative 1 does not provide added protection to public health and the environment and will not be evaluated further.

With the withdrawal of water from the Long Island aquifer at rates ranging from approximately 7,100 gpm (10.2 MGD) to 13,300 gpm (19.2 MGD), under Alternatives 2A, 2B, 3A, 3B, 4, 5A, and 5B, the USGS groundwater flow modeling was used to design these alternatives to minimize possible environmental impacts. Specifically, each alternative included the strategic use of treated water management techniques to minimize possible impacts to stream flow, wetland water levels, public water supply well yield, and saltwater intrusion (i.e., subsea discharge). The use of existing recharge basins, a constructed recharge basin, injection wells, or discharge to Massapequa Creek were used as the approaches to manage treated water.

While the groundwater flow modeling suggests that implementation of Alternatives 2A, 2B, 3A, 3B, 4, 5A, and 5B would result in only very minor environmental impacts; but of these, slightly larger environmental impacts would occur with implementation of Alternatives 2A, 2B, 5A, and 5B. Each of these alternatives include hydraulic containment of the SCG plume and the withdrawal of the largest volumes of water from the aquifer system. In particular, with the withdrawal of groundwater at rates greater than approximately 9,200 gpm (13.2 MGD) under each of these alternatives, the water levels in some surrounding public water supply wells could decrease by approximately 7.3 feet, groundwater levels beneath wetlands could decrease by up to approximately 2.1 feet, and the flow in nearby streams could decrease by up to approximately 1.1 cubic feet per second (cfs). In comparison, under Alternatives 3A, 3B, and 4, water levels in some surrounding public water supply wells could decrease by up to 4.8 feet, groundwater levels beneath wetlands could decrease by up to approximately 1.5 feet, and the flow in nearby streams could decrease by up to approximately 0.8 cfs.

Relative to possible effects on the positioning of the saltwater-freshwater boundary, implementation of Alternatives 4 (Aquifer Flushing) and 3B (Plume Mass Flux Remediation - Decentralized Treatment Plants with Various Discharge Methods), could reduce flow to the freshwater-saltwater boundary the most and therefore are the alternatives that have the greatest potential impact on possible saltwater intrusion. Alternatively, the groundwater flow modeling suggests that Alternatives 3A (Plume Mass Flux Remediation - Decentralized Plants with Various Discharge Methods) and 2A (Hydraulic Containment of Site Contaminants above SCGs - Decentralized Treatment Plants with Various Discharge Methods) would have the lowest potential impact on

saltwater intrusion. The groundwater flow modeling suggests that Alternatives 2B, 5A, and 5B have more of an effect on subsea discharge and the freshwater-saltwater boundary than Alternatives 2A and 3A, but less than Alternatives 3B and 4. As stated previously however, the groundwater flow modeling indicates that implementation of each of the alternatives would produce only very minor environmental impacts.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

Alternatives 2A, 2B, 5A and 5B, each involve groundwater extraction and treatment of the entire area where site contaminants occur in groundwater at concentrations that exceed the SCGs and are considered to be the most effective alternatives in achieving overall compliance with SCGs. By preventing the continued migration of the SCG plume, these four alternatives also eliminate the need for additional public water supplies to require wellhead treatment for the site contaminants. Of these four alternatives, Alternatives 5A and 5B include a mass flux approach to address areas of the plume with high contaminant concentrations while also capturing remaining portions of the plume with contaminant concentrations above the SCGs. Alternatives 5A and 5B are therefore considered to be the most effective at achieving SCGs, followed by Alternatives 2A and 2B.

Alternatives 3A, 3B and 4 are anticipated to effectively achieve SCGs within the most heavily impacted areas of the plume through the extraction and treatment of groundwater where COCs are present at concentrations above 50 ppb, 50 ppb, and 100 ppb, respectively. These alternatives, however, are anticipated to require a much longer timeframe to achieve SCGs within the remainder of the plume where COC concentrations exceed SCGs but are less than 50 ppb and 100 ppb. Instead, Alternatives 3A, 3B and 4 would rely on natural processes and wellhead treatment of public water supplies to achieve SCGs for the areas of the plume where the COC concentrations exceed SCGs but are less than 50 ppb and 100 ppb. These alternatives are therefore less effective at achieving SCGs.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial alternatives.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Long-term effectiveness is best accomplished by alternatives involving significant removal of contaminant mass from the aquifer and by preventing further expansion of the groundwater plume to areas that are currently not impacted. Since most of the contaminant mass is present in groundwater located in the central portion of the plume, five of the seven alternatives (Alternatives 3A, 3B, 4, 5A, and 5B) include installation of mass flux wells in areas where site contaminants are present at high concentrations. Alternatives 5A and 5B additionally include groundwater extraction wells along the perimeter of the plume to provide long-term hydraulic control and minimize continued migration of the groundwater plume.

Groundwater extraction and ex-situ treatment under each of the alternatives are considered effective technologies for addressing groundwater contaminated with the COCs. Alternatives 5A and 5B are anticipated to achieve RAOs in the shortest remedial timeframe by removing significant contaminant mass from within the most impacted portions of the plume combined with hydraulic control of groundwater with contaminant concentrations

exceeding the SCGs along the margins of the plume. Alternatives 2A and 2B provide hydraulic control of groundwater containing site contaminants at concentrations exceeding the SCGs, but these alternatives do not address plume areas with high contaminant concentrations. While Alternatives 2A and 2B would be effective in the long-term in preventing further plume migration, these alternatives are expected to require a significantly greater timeframe to achieve RAOs. Furthermore, since Alternatives 2A and 2B rely on groundwater extraction wells located along the margins of the plume, these alternatives may enhance the southward movement of groundwater with high contaminant concentrations in the center of the plume.

Alternatives 3A, 3B, and 4 would provide significant mass removal of contaminants within the portions of the plume containing site contaminants at concentrations above 50 ppb, 50 ppb, and 100 ppb, respectively, and are expected to require less time to achieve SCGs within the area of active remediation than Alternatives 2A and 2B. These three alternatives would not however be effective over the long-term in reducing contaminant concentrations outside the area of active remediation since they all rely on natural processes in this part of the plume. Achieving SCGs outside the area of active remediation (in the lesser contaminated portions of the SCG plume) is anticipated to require greater time for Alternatives 3A, 3B and 4 than for Alternatives 2A and 2B. Alternatives 3A, 3B, and 4 would also rely on wellhead treatment to prevent exposure to contaminant concentrations above SCGs for public water supply wells that are currently unimpacted and located hydraulically downgradient of the groundwater plume.

4. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternatives 2A, 2B, 3A, 3B, 4, 5A, and 5B would reduce the toxicity, mobility, and volume of contaminants in the aquifer by using extraction wells to capture contaminated groundwater and providing surface treatment through air stripping, granulated active carbon, and AOP technologies. With extraction wells placed in areas of the plume with high contaminant concentrations along with extraction wells placed along the plume margins, Alternatives 5A and 5B are expected to be the most effective in reducing the toxicity, mobility, and volume of contaminants.

Alternatives 2A and 2B would be effective in reducing toxicity, mobility, and volume of site contaminants by operating extraction wells along the margins of the SCG plume. However, these two alternatives would take a longer timeframe for high COC concentrations in the central portion of the plume to reach the extraction wells located along the perimeter of the plume. By withdrawing contaminated groundwater from only the margins of the plume under Alternatives 2A and 2B, contaminant mass may be allowed to diffuse into fine-grained silts and clays. Therefore, Alternatives 2A and 2B would provide less reduction of toxicity and mobility of the COCs in groundwater than Alternative 5A and 5B.

Alternatives 3A, 3B, and 4 would be effective in reducing the toxicity, mobility, and volume of contaminants in areas of the plume above 50 ppb, 50 ppb and 100 ppb, respectively. However, these alternatives would not actively reduce the toxicity, mobility, and volume in portions of the plume less than 50 ppb and 100 ppb, respectively. Instead, these alternatives would rely on wellhead treatment and natural processes to reduce the toxicity, mobility, and volume of contaminants within these areas of the plume. Therefore, these alternatives would provide less reduction of toxicity, mobility, and volume of the COCs in groundwater than Alternatives 2A, 2B, 5A, or 5B.

Each of the alternatives relies on commonly used treatment technologies to permanently destroy the contaminants once withdrawn from the aquifer. Following air stripping, any remaining contaminants trapped on the GAC adsorption media are destroyed during regeneration or disposed of in accordance with applicable waste

regulations. The AOP technology provides complete destruction and mineralization of many chlorinated solvents, including 1,4-dioxane.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Each of the alternatives would be effective in the short-term at controlling the migration of groundwater containing COCs above the SCGs and removing contaminant mass from the aquifer. Groundwater extraction systems would induce a hydraulic gradient capturing COCs within days or weeks of system startup. Alternatives 3A, 3B, and 4 would only provide control of the plume containing site contaminants at concentrations greater than 50 ppb, 50, ppb, and 100 ppb, respectively, while Alternatives 2A, 2B, 5A, and 5B would provide control of groundwater with contaminant concentrations exceeding the SCGs

With the drilling of extraction wells, installation of underground conveyance piping, construction of treatment plants, and development of discharge locations (e.g., construction of a central recharge basin, rehabilitation of existing recharge basins, construction of surface water outfall, and/or construction of a storage tank for irrigation purposes), each of the alternatives would have short-term impacts on the community. While each of the alternatives would have short-term impacts on the Town of Oyster Bay and Town of Hempstead communities, these disruptions would be minimized through noise and traffic control plans as well, as community air monitoring programs during construction, to minimize and address potential impacts to the community, remediation workers, and the environment.

Alternatives 2A, 3A, and 5A would have significant short-term impacts to workers, the public, and the environment during construction of the 12-17 decentralized treatment plants and 82,000-131,000 feet (15.5-24.8 miles) of underground piping and the rehabilitation of 12-16 existing recharge basins. Alternatives involving the use of centralized treatment plants and a centralized recharge basin (Alternatives 2B, 3B, and 5B), are expected to have significantly less short-term impacts on the community. Alternative 5A, with the construction of 24 extraction wells and 17 treatment plants, the reworking of 16 existing recharge basins, and the installation of approximately 131,000 feet (24.8 miles) of underground piping, would be expected to have the most significant short-term impacts to the Town of Oyster Bay and Town of Hempstead communities relative to Alternatives 2A, 2B, 3A, 3B, 5A, and 5B.

Alternative 4 (Aquifer Flushing) includes the largest amount of subsurface drilling (26 extraction wells and 43 injection wells) relative to the other remedial alternatives. While the use of injection wells under Alternative 4 eliminates the need for recharge basins to manage treated water, the drilling of injection wells and the associated underground piping (more than 93,000 linear feet (17.6 miles)) to convey contaminated water from point of extraction to treatment and then to the injection wells would result in significant short-term impacts to the community.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

While each alternative involves technologies that have been applied by the Department and are implementable, the size of the groundwater plume and location within heavily developed areas in the Town of Oyster Bay and Town of Hempstead makes each alternative difficult to implement. The construction of decentralized treatment plants combined with decentralized recharge makes Alternatives 2A, 3A, and 5A more difficult to implement than Alternatives 2B, 3B, and 5B that involve centralized treatment and recharge. Similarly, Alternative 4 (Aquifer Flushing) would be more difficult to implement than the centralized treatment and recharge alternatives (Alternatives 2B, 3B, and 5B) due to the need for installing 26 extraction wells and 43 injection wells, construction of 23 decentralized treatment plants, and 93,000 linear feet (17.6 miles) of underground piping needed to convey water.

Alternatives 2A, 3A, and 5A would require acquisition of land and permits to build decentralized treatment plants in heavily developed areas. These three alternatives would also result in greater disruptions (than Alternatives, 2B, 3B, and 5B) to traffic within numerous areas to build each of the decentralized treatment plants and to install conveyance piping between the extraction wells and the decentralized treatment plants, and from the treatment plants to the individual recharge basins or surface water discharge locations.

Alternatives 2B, 3B, and 5B require the potential acquisition of land in the vicinity of the former Northrop Grumman and U.S. Navy property and near the headwaters of Massapequa Creek for the construction of centralized, large capacity treatment plants. The construction of a single treatment plant in an area that is already zoned for commercial and industrial uses makes these alternatives (Alternatives 2B, 3B, and 5B) more implementable than the alternatives (Alternatives 2A, 3A, and 5A) involving treatment plant construction in mixed commercial and residential areas. These alternatives also require potential land acquisition for the installation of extraction wells, and significant disruption to traffic along a number of major roadways to install conveyance piping. The construction of a centralized recharge basin within the vicinity of Bethpage State Park is anticipated to be less disruptive to developed areas than the alternatives that rehabilitate existing recharge basins. The acquisition of land and permits is not expected to be necessary for construction of the centralized recharge basin under Alternatives 2B, 3B, and 5B.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

The costs of the alternatives vary significantly. Alternative 3B has the lowest present worth cost ($332 million (M)), but the contaminated groundwater within the SCG plume but outside of the 50 ppb plume would not be addressed under this alternative. Similarly, Alternative 2B has a lower cost, but this alternative does not address groundwater in the central portion of the plume where contaminant concentrations are the highest. Due to the large number of individual treatment plants and treated water discharge locations, Alternatives 4 and 5A have the highest overall costs ($608 M and $748 M respectively). While Alternatives 2A, 3A, and 5B each have comparable costs (ranging from $522 M to $585 M), Alternative 5B is the most cost-effective because it includes extraction of groundwater from the central portion of the plume combined with hydraulic containment of the entire Navy Grumman groundwater plume.

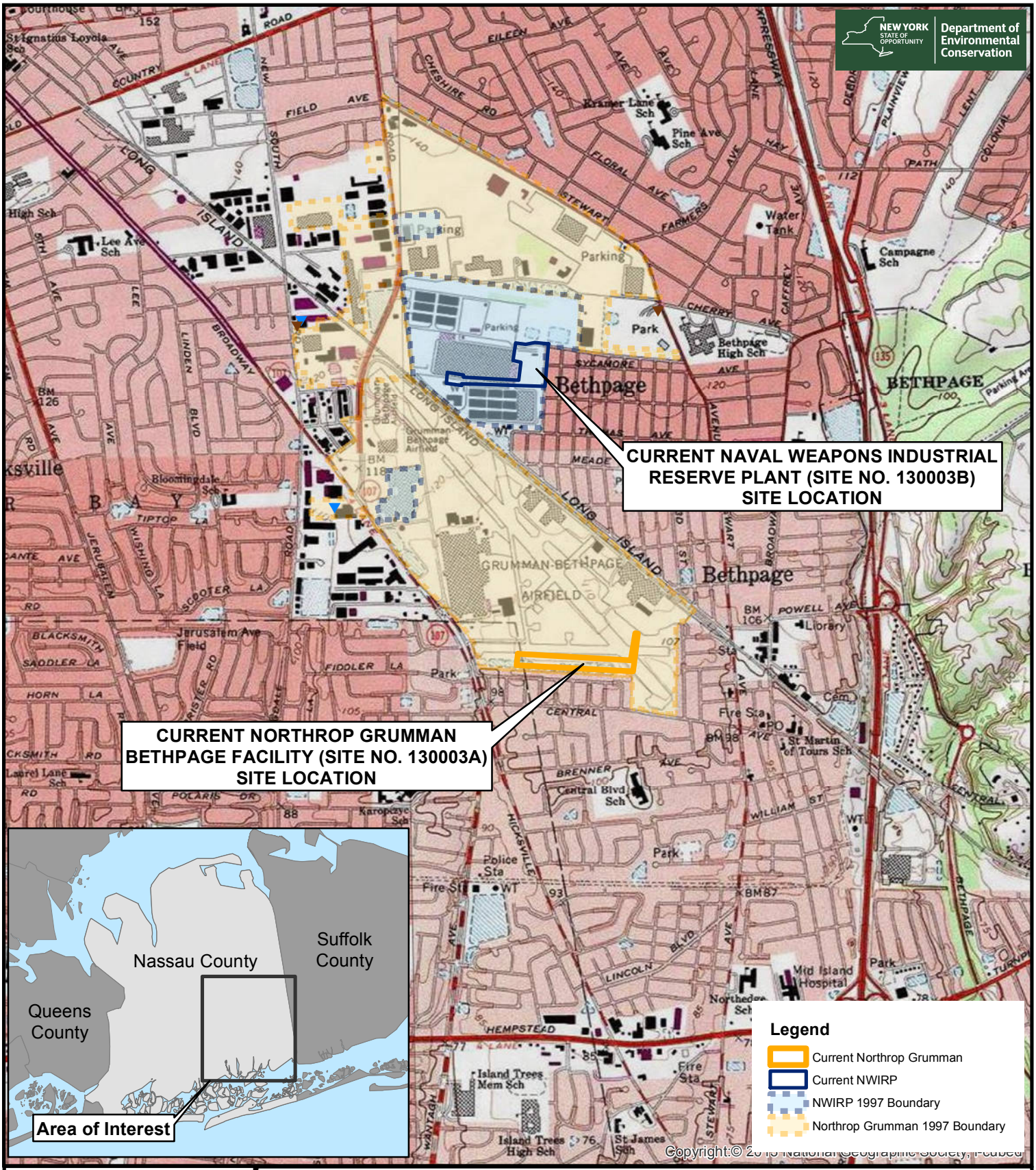
8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

Each of the alternatives address off-site portions of the groundwater plume. The selected remedies outlined in the existing RODs address on-site soil, soil vapor, and groundwater contamination. These existing on-site remedies, along with institutional and engineering controls, for the site would remain in place as part of each alternative to address the off-site groundwater plume.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the proposed AROD have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the proposed AROD are evaluated. A responsiveness summary has been prepared that describes public comments received and the manner in which the Department addressed the concerns raised.

Alternative 5B (**Hydraulic Containment of Site Contaminants Above SCGs Combined with Mass Flux Remediation - Centralized Treatment Plants with a Centralized Recharge Basin**) has been selected because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.



N
W E
S

0 950 1,900
Feet

Figure 1
Site Location Map

Northrop Grumman and NWIRP Sites
Town of Oyster Bay, Nassau County
Site Nos. 130003A and 130003B

RUCO Polymer Corp. (Hooker Chemical) Site No. 130004

PLANT 15

Former Grumman Settling Ponds

Site 3

Site 2

Bethpage Community Park

Plant 3

Site 1

Current Naval Weapons Industrial Reserve Plant (NWIRP) Site Site No. 130003B

Plant 2

Plant 1

Bethpage State Park

Approximate Groundwater Flow Direction

Current Northrop Grumman Bethpage Facility Site Site No. 130003B

Levittown

Plainedge

North Massapequa

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Legend

- Current Northrop Grumman Bethpage Facility Site Boundary
- Current NWIRP Site Boundary
- NWIRP 1997 Boundary
- Northrop Grumman 1997 Boundary
- Former Grumman Settling Ponds
- Northrop Grumman-Steel Los Plant 2 Site
- Bethpage Community Park
- RUCO Polymer Corp (Hooker Chemical) Site
- Navy Environmental Restoration Sites
- Select Former Site Buildings
- ONCT Extraction Wells
- Bethpage Community Park Extraction Wells
- GM-38 Groundwater Extraction and Treatment System
- RW-21 Groundwater Extraction Wells
- Approximate Location of Proposed RE-108 Extraction Wells
- Public Water Supplies with Wellhead Treatment
- 100 ppb TVOC Plume
- 50 ppb TVOC Plume
- Groundwater Plume Exceeding SCGs

N W E S

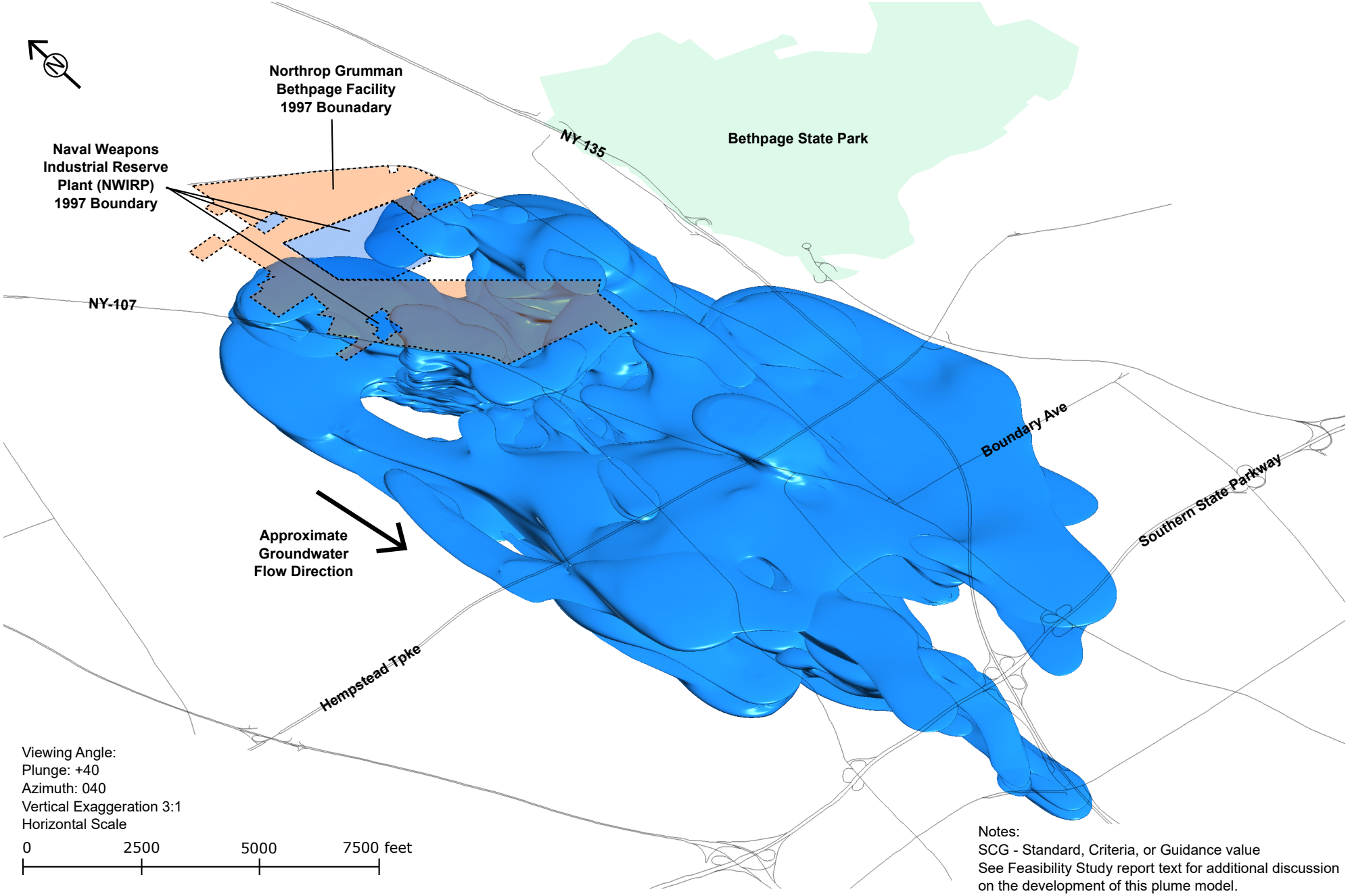
0 800 1,600

Feet

Figure 2

Site Detail Map

Northrop Grumman and NWIRP Sites
Town of Oyster Bay, Nassau County
Site Nos. 130003A and 130003B



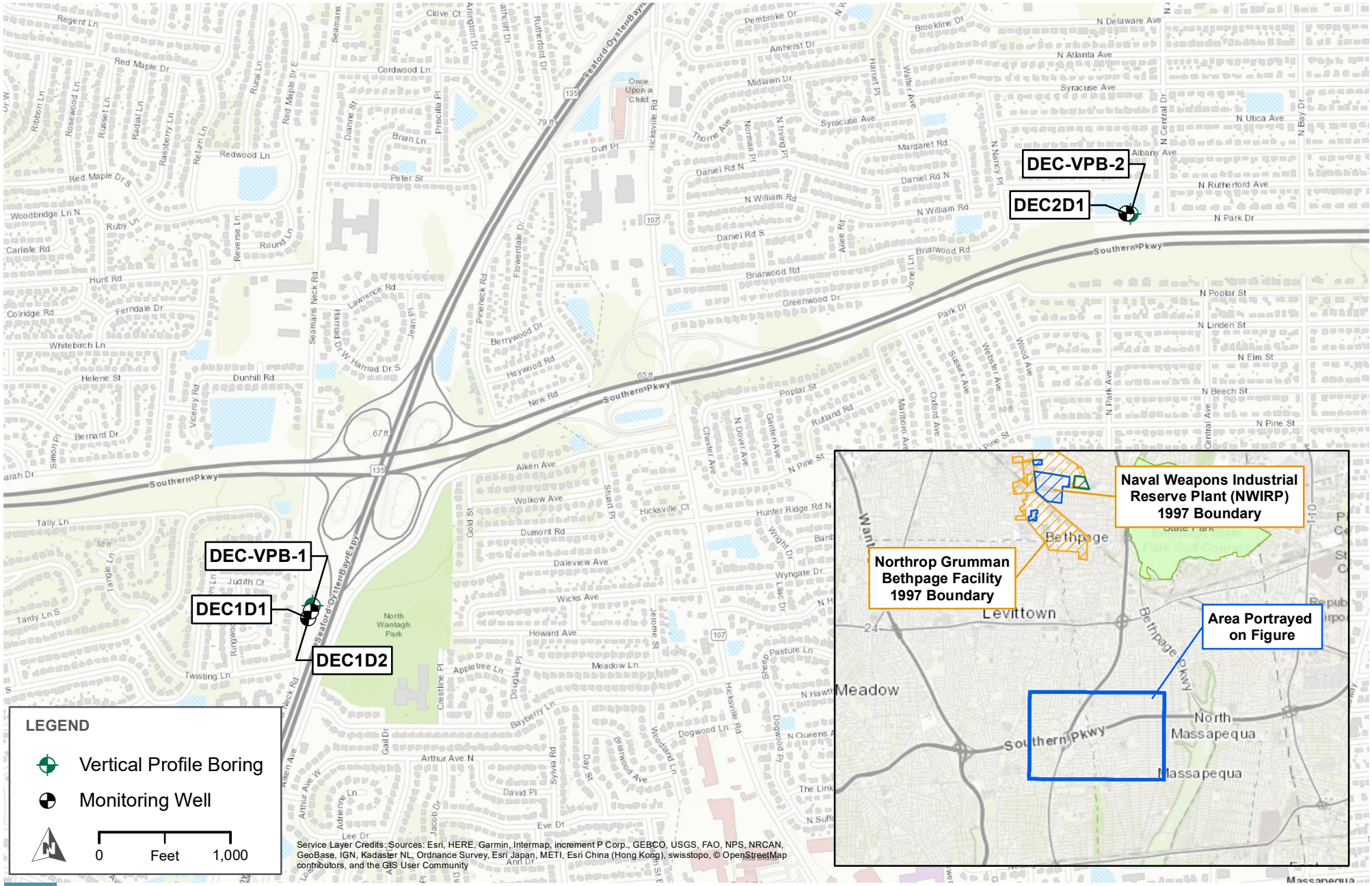
Notes:
SCG - Standard, Criteria, or Guidance value
See Feasibility Study report text for additional discussion on the development of this plume model.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

GROUNDWATER EXCEEDING SCGs - OBLIQUE 3D VIEW

NYSDEC SITE # 130003

FIGURE 3

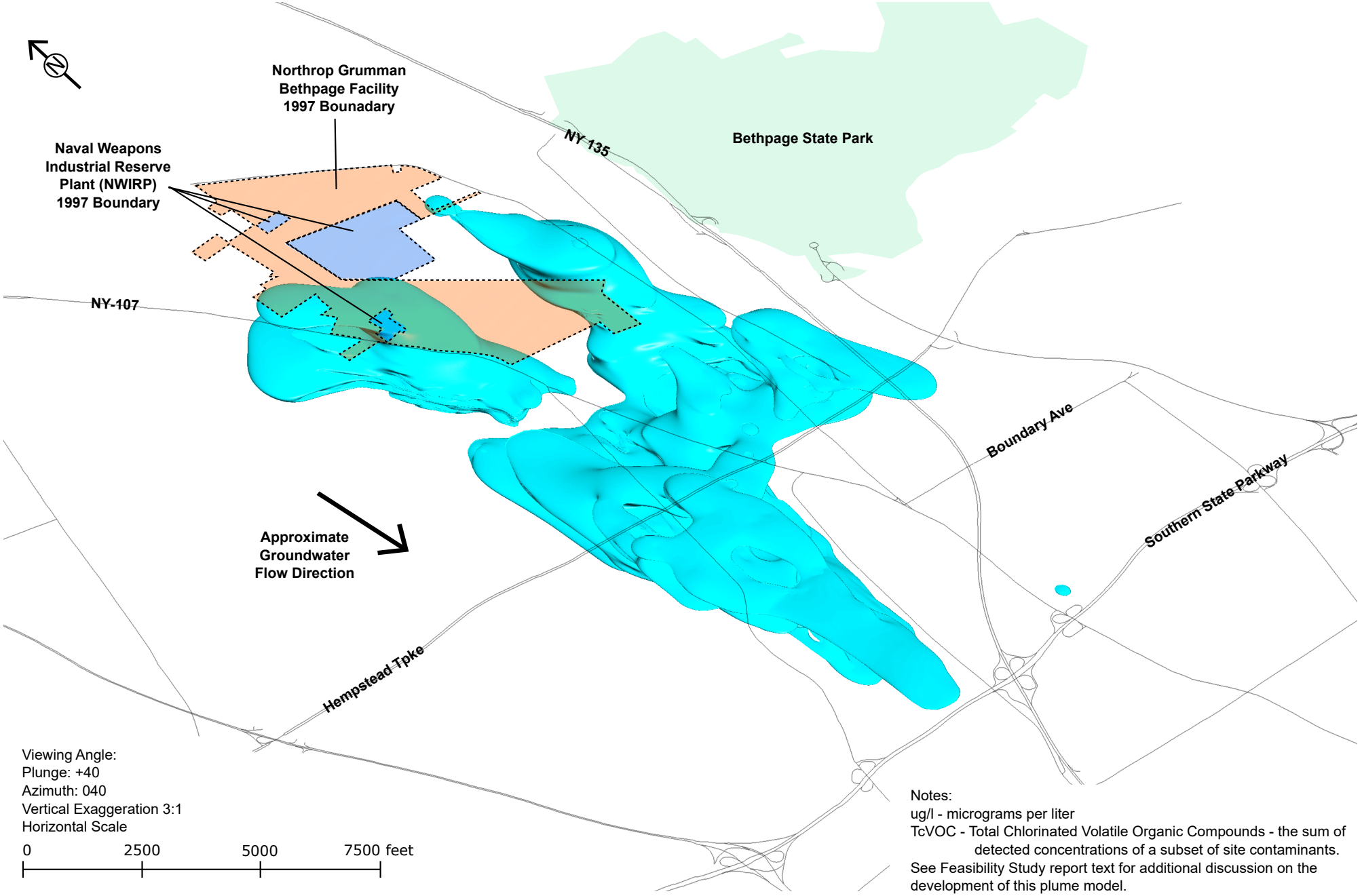


NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

NYSDEC VPB AND MONITORING WELL LOCATIONS

NYSDEC SITE # 130003

FIGURE 4



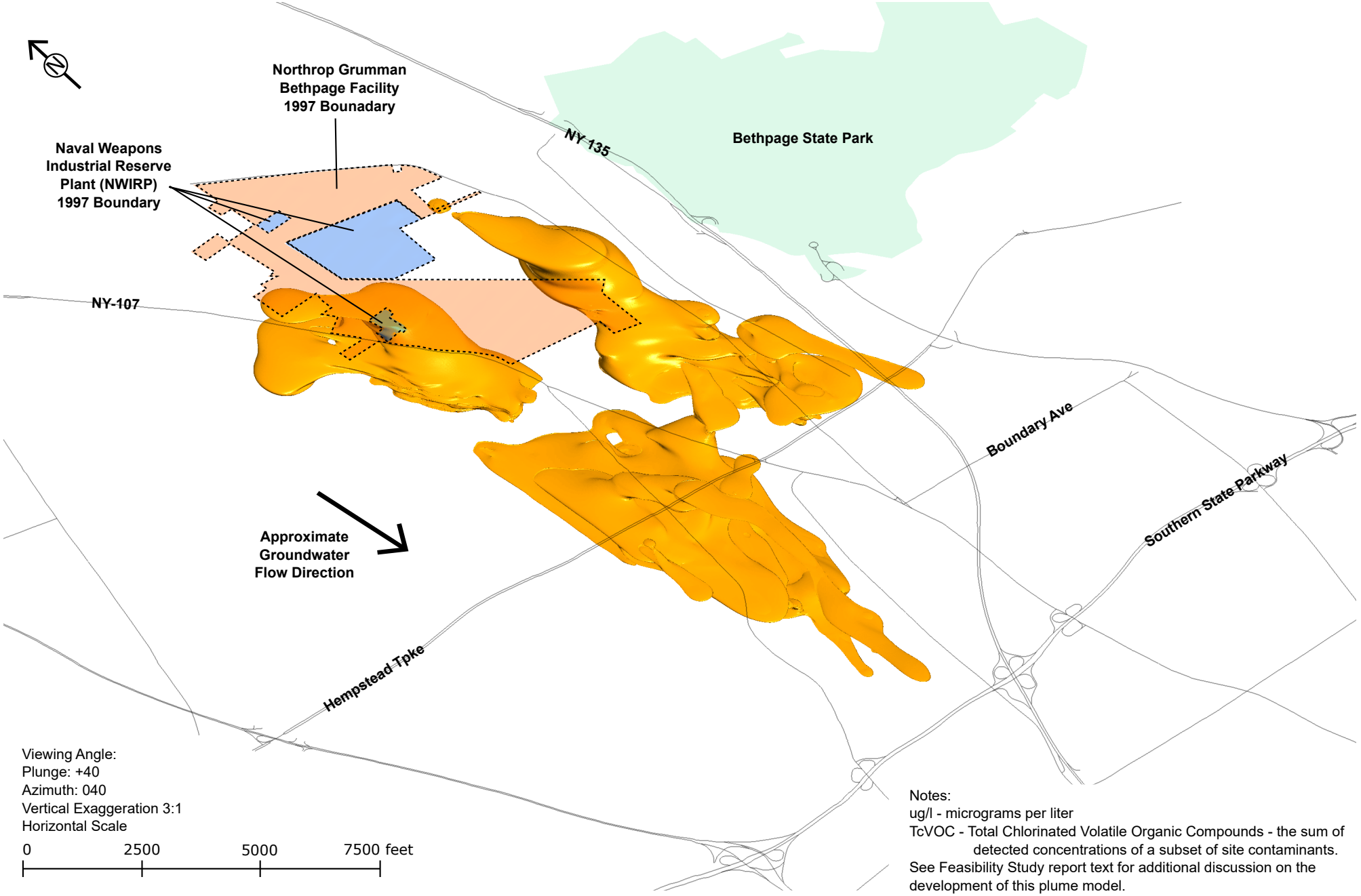
Notes:
ug/l - micrograms per liter
TcVOC - Total Chlorinated Volatile Organic Compounds - the sum of detected concentrations of a subset of site contaminants.
See Feasibility Study report text for additional discussion on the development of this plume model.

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation

50 ug/l TcVOC PLUME - OBLIQUE 3D VIEW

NYSDEC SITE # 130003

FIGURE 5



Viewing Angle:
Plunge: +40
Azimuth: 040
Vertical Exaggeration 3:1
Horizontal Scale

0 2500 5000 7500 feet

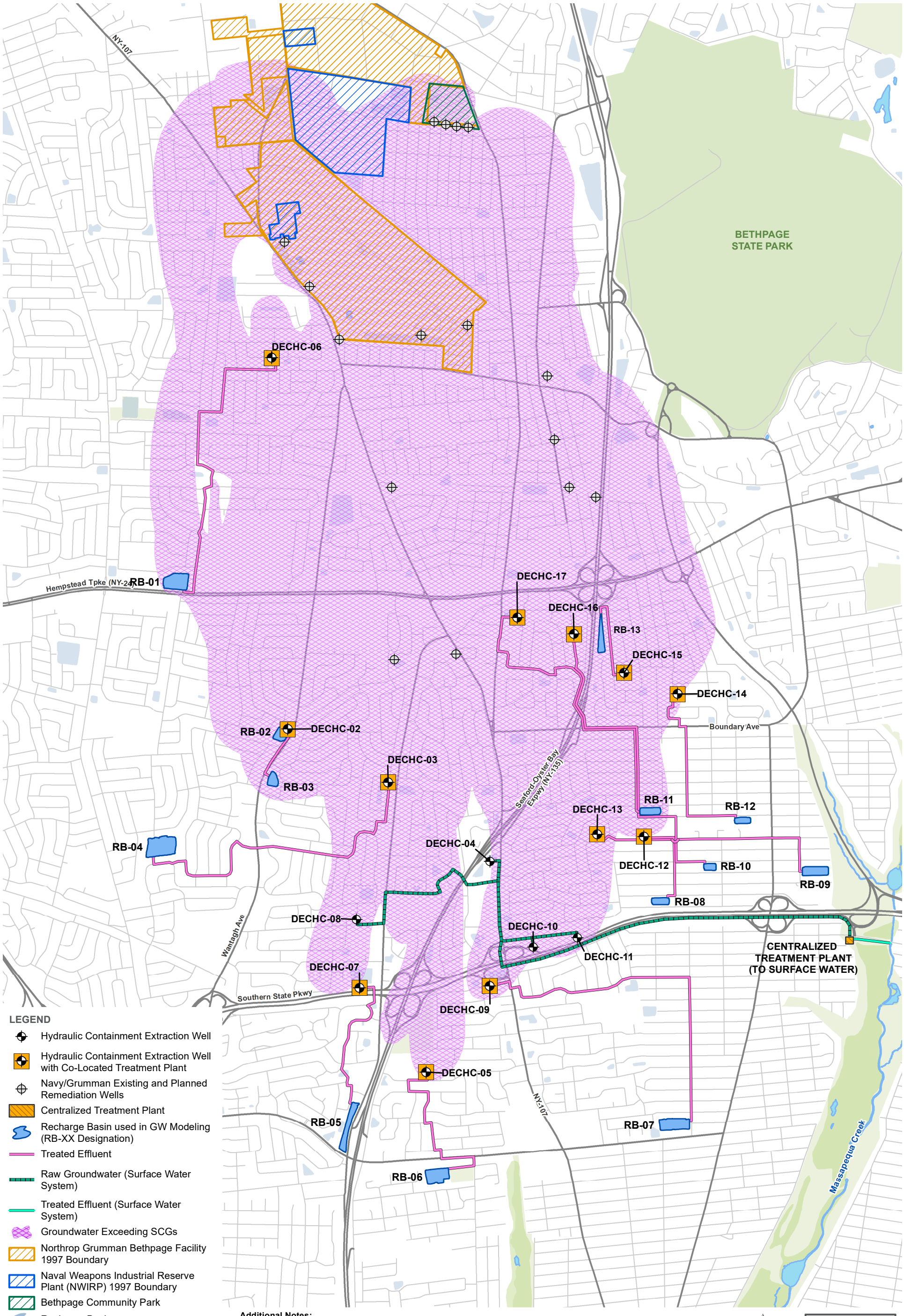
Notes:
ug/l - micrograms per liter
TcVOC - Total Chlorinated Volatile Organic Compounds - the sum of detected concentrations of a subset of site contaminants.
See Feasibility Study report text for additional discussion on the development of this plume model.

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

100 ug/l TcVOC PLUME - OBLIQUE 3D VIEW

NYSDEC SITE # 130003

FIGURE 6

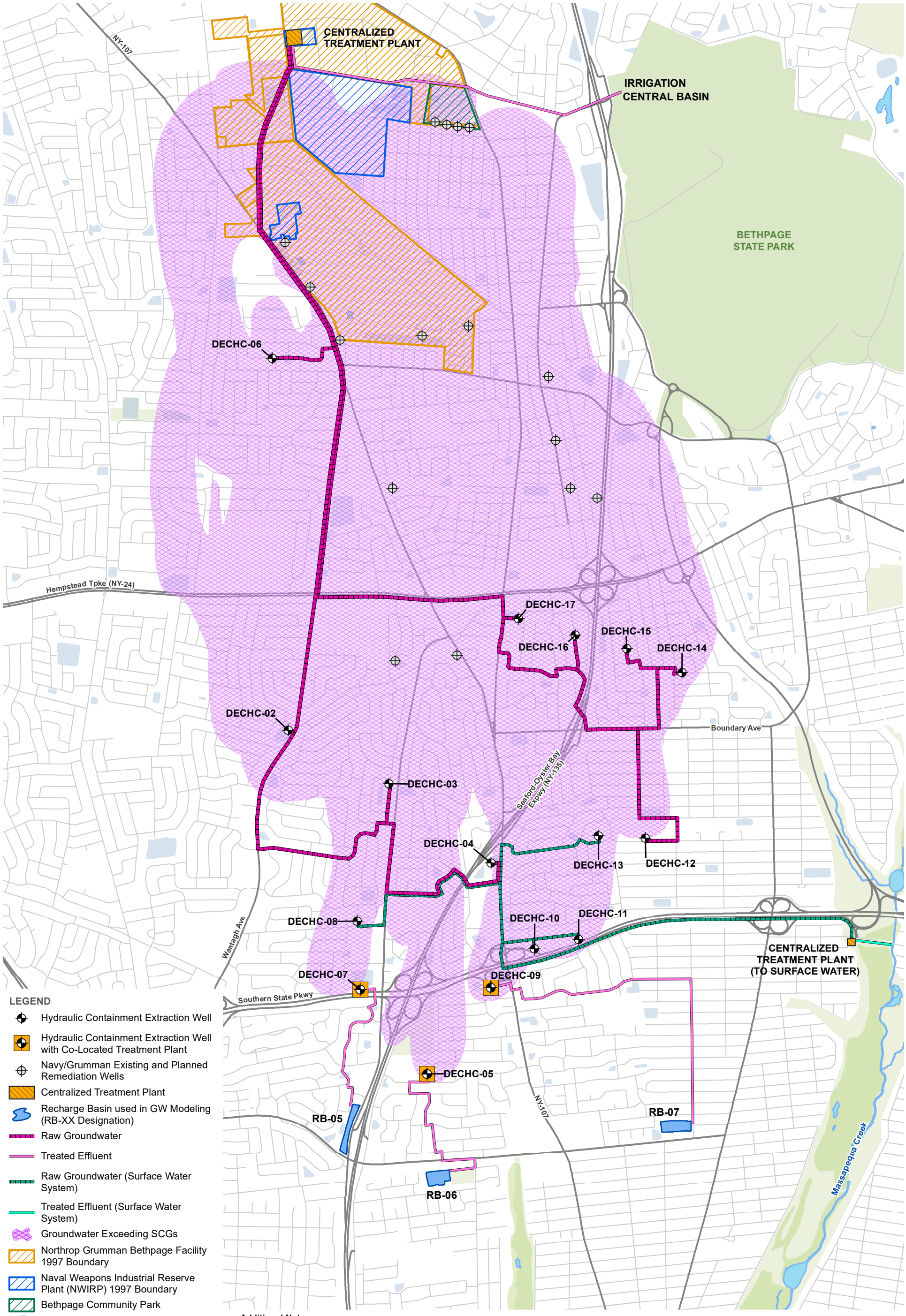


ALTERNATIVE 2A

HYDRAULIC CONTAINMENT OF SITE CONTAMINANTS ABOVE SCGs – DECENTRALIZED TREATMENT PLANTS WITH VARIOUS DISCHARGE METHODS

NYSDEC SITE # 130003

FIGURE 7

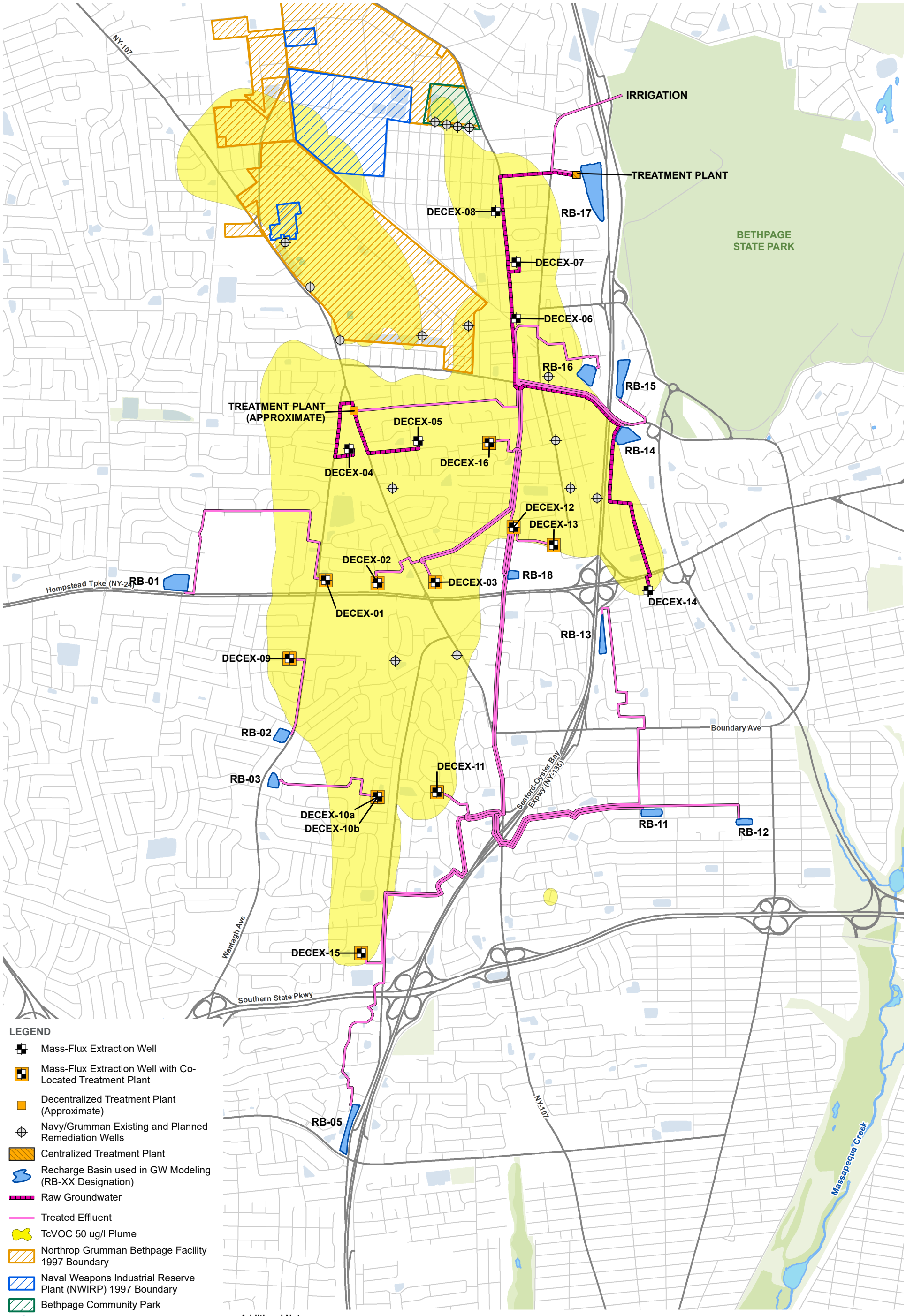


ALTERNATIVE 2B

HYDRAULIC CONTAINMENT OF SITE CONTAMINANTS ABOVE SCGs – CENTRALIZED TREATMENT PLANTS WITH A CENTRALIZED RECHARGE BASIN

NYSDEC SITE # 130003

FIGURE 8



ALTERNATIVE 3A

PLUME MASS FLUX REMEDIATION – DECENTRALIZED TREATMENT PLANTS WITH VARIOUS DISCHARGE METHODS

NYSDEC SITE # 130003

FIGURE 9

CENTRALIZED TREATMENT PLANT

IRRIGATION CENTRAL BASIN

BETHPAGE STATE PARK

NY-107

DECEX-08

DECEX-07

DECEX-06

DECEX-04

DECEX-05

DECEX-12

DECEX-13

DECEX-14

DECEX-02

DECEX-01

DECEX-03

Hempstead Tpke (NY-24)

DECEX-09

Boundary Ave

DECEX-11

Seaford-Oyster Bay Expwy (NY-135)

DECEX-10a

DECEX-10b

Wantagh Ave

DECEX-15

Southern State Pkwy

NY-107

Massapequa Creek

LEGEND

- Mass-Flux Extraction Well
- Navy/Grumman Existing and Planned Remediation Wells
- Centralized Treatment Plant
- Raw Groundwater
- Treated Effluent
- TcVOC 50 ug/l Plume
- Northrop Grumman Bethpage Facility 1997 Boundary
- Naval Weapons Industrial Reserve Plant (NWIRP) 1997 Boundary
- Bethpage Community Park
- Recharge Basin

See Feasibility Study report text for additional information.
Base Layer (roads, parks, basins, surface water) Sources: Nassau County GIS

Additional Notes:
ug/l - micrograms per liter
TCVOC - Total Chlorinated Volatile Organic Compounds (subset list of site contaminants of concern)
Basemap information provided by Nassau County GIS.

0 Feet 2,000

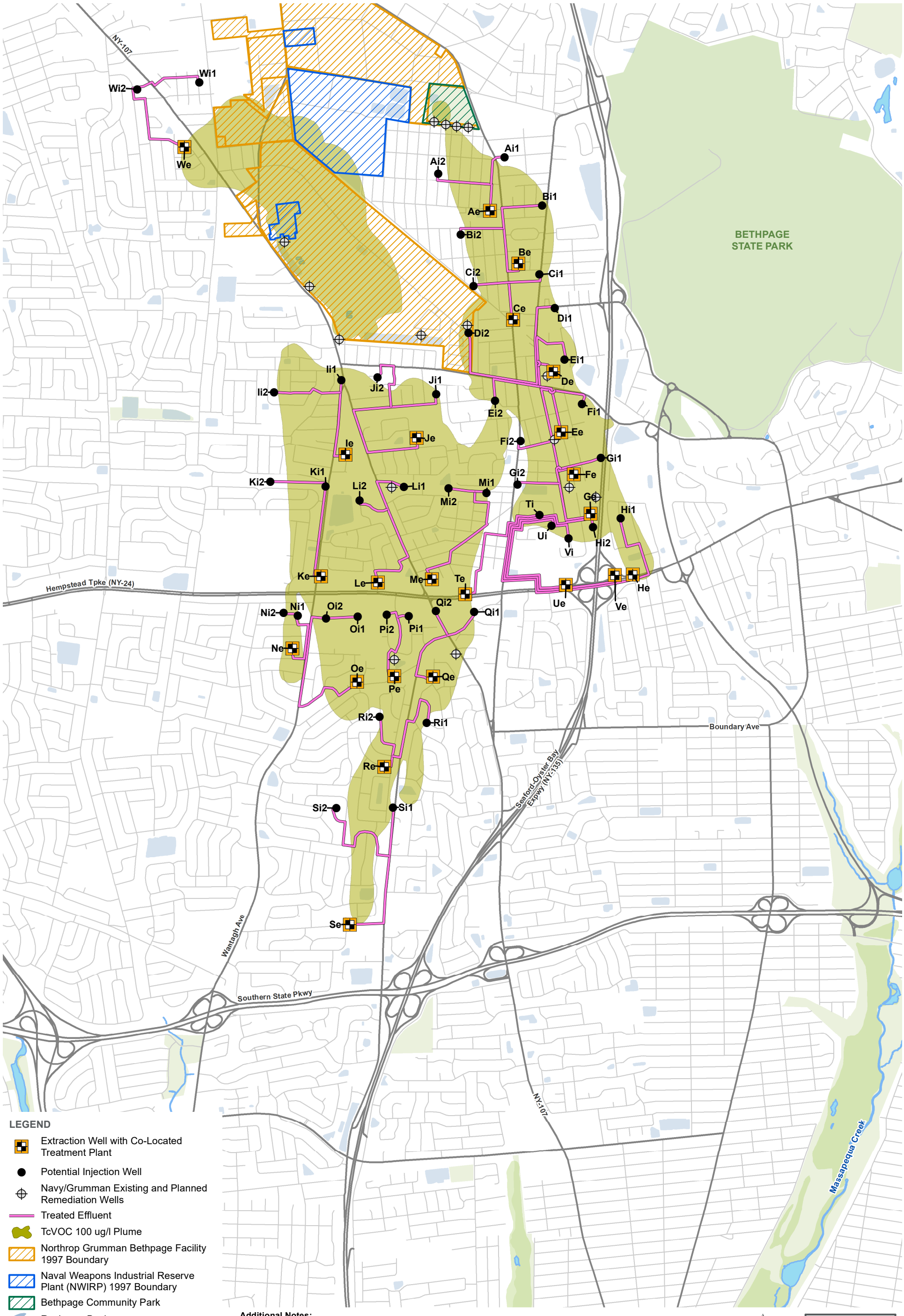
ALTERNATIVE 3B

PLUME MASS FLUX REMEDIATION – CENTRALIZED TREATMENT PLANTS WITH A CENTRALIZED RECHARGE BASIN

NYSDEC SITE # 130003

FIGURE 10

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation



LEGEND

- Extraction Well with Co-Located Treatment Plant
- Potential Injection Well
- Navy/Grumman Existing and Planned Remediation Wells
- Treated Effluent
- TcVOC 100 ug/l Plume
- Northrop Grumman Bethpage Facility 1997 Boundary
- Naval Weapons Industrial Reserve Plant (NWIRP) 1997 Boundary
- Bethpage Community Park
- Recharge Basin

See Feasibility Study report text for additional information.
Base Layer (roads, parks, basins, surface water) Sources: Nassau County GIS

Additional Notes:
ug/l - micrograms per liter
TCVOC - Total Chlorinated Volatile Organic Compounds (subset list of site contaminants of concern)
Basemap information provided by Nassau County GIS.

0 Feet 2,000

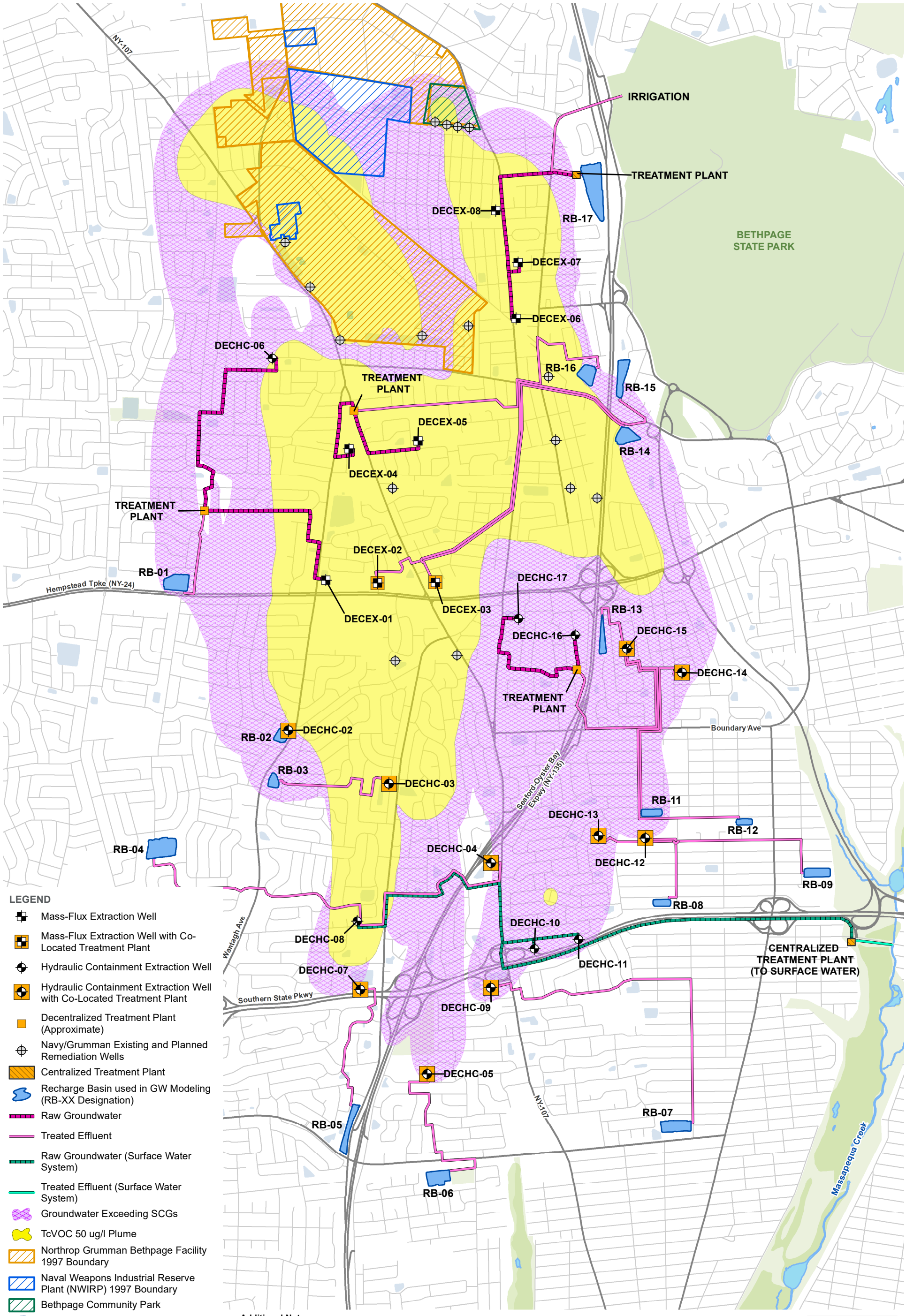
ALTERNATIVE 4
AQUIFER FLUSHING

NYSDEC SITE # 130003

FIGURE 11

HDR

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

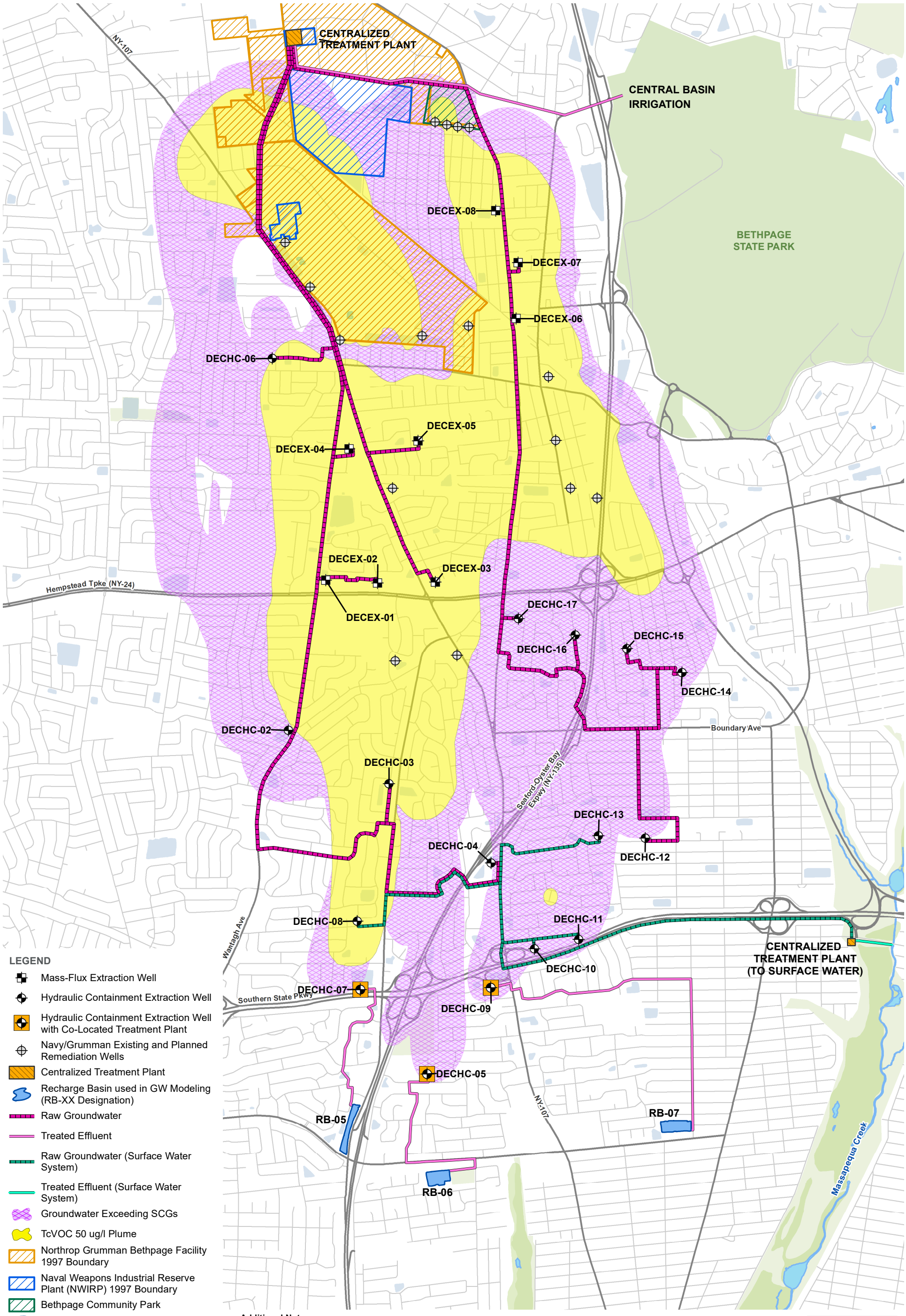


ALTERNATIVE 5A

HYDRAULIC CONTAINMENT OF SITE CONTAMINANTS ABOVE SCGs COMBINED WITH MASS FLUX REMEDIATION – DECENTRALIZED TREATMENT PLANTS WITH VARIOUS DISCHARGE METHODS

NYSDEC SITE # 130003

FIGURE 12



See Feasibility Study report text for additional information.
Base Layer (roads, parks, basins, surface water) Sources: Nassau County GIS

Additional Notes:
ug/l - micrograms per liter
TCVOC - Total Chlorinated Volatile Organic Compounds (subset list of site contaminants of concern)
SCG - Standards, Criteria, and Guidance Values
Basemap information provided by Nassau County GIS.

ALTERNATIVE 5B

HYDRAULIC CONTAINMENT OF SITE CONTAMINANTS ABOVE SCGs COMBINED WITH MASS FLUX REMEDIATION – CENTRALIZED TREATMENT PLANTS WITH A CENTRALIZED RECHARGE BASIN

NYSDEC SITE # 130003

FIGURE 13

NEW YORK STATE OF OPPORTUNITY Department of Environmental Conservation

APPENDIX A

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

Northrop Grumman Bethpage Facility
Operable Unit Number 02: Off-Site Groundwater
Operable Unit Number 03: Former Grumman Settling Ponds and Adjacent Areas Off-Site Groundwater
and
Naval Weapons Industrial Reserve Plant
Operable Unit Number 02: Off-Site Groundwater
State Superfund Projects
Bethpage, Nassau County

Site Nos. 130003A & 130003B

The proposed Amended Record of Decision (AROD) for the Northrop Grumman Bethpage Facility and Naval Weapons Industrial Reserve Plant (NWIRP) sites was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on May 23, 2019. The proposed AROD outlined the remedial measure proposed for the groundwater contamination, referred to as the Navy Grumman groundwater plume, that originated from the Northrop Grumman Bethpage Facility and the NWIRP sites.

The release of the proposed AROD was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting and an availability session were held on June 10, 2019, which included a presentation of an expanded engineering analysis/Feasibility Study (FS) completed by the Department for the Northrop Grumman Bethpage Facility and the NWIRP sites as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed amended remedy. These comments have become part of the Administrative Record for this site. The public comment period for the proposed AROD ended on July 8, 2019. Complete transcripts of the public meeting can be found in Appendix C of the AROD.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

RECEIPT AND IDENTIFICATION OF COMMENTS
Public comments on the engineering analysis/FS and the proposed AROD were received in several forms, including:

- Oral comments made at the June 10, 2019 public meeting;
- Written comments submitted at the public availability session and public meeting held on June 10, 2019;
- Written comments mailed to the Department; and

- Written comments submitted to the Department via e-mail.

Due to the large number of comments received and to allow readers to find the responses to the different types of questions, the comments have been organized as follows:

I. Public Meeting & Availability Session Comments
   A. Public Official Comments
      1. Assemblyman Michael LiPetri
      2. Assemblyman John Mikulin
      3. Town of Oyster Bay Supervisor Joseph Saladino
      4. Nassau County Legislator Rose Walker and Laura Schaefer
   B. Water District Comments
      1. Bethpage Water District
      2. Massapequa Water District
   C. Public Comments

II. Written Comments
   A. Local Government & Water District Comments
      1. Nassau County
      2. Town of Oyster Bay
      3. Bethpage Water District
      4. Massapequa Water District
      5. Town of Hempstead Water Department
      6. South Farmingdale Water District
      7. Oyster Bay Water District
   B. Public Comments
   C. Citizen Groups & Non-Profit Organization Comments
      1. New York Institute of Technology
      2. Citizens Campaign for the Environment
      3. Biltmore Shores Association
      4. Trout Unlimited Long Island Chapter
      5. Sierra Club Long Island Group
      6. Seatuck Environmental Association
      7. South Shore Audubon Society
      8. Long Island Pure Waters, Ltd.
   D. Northrop Grumman Systems Corporation
   E. Department of the Navy
   F. Whiteman Osterman & Hanna LLP
   G. Coughlin Duffy LLP
   H. Napoli Shkolnik

I. Public Meeting & Availability Session Comments

I.A. Public Official Comments

COMMENT 1: On behalf of Assembly District 9, Assemblyman Michael LiPetri voiced support for amending the Record of Decision (ROD) and commented that it is great to see that we are

going to have containment of this plume within the forthcoming time. One of my biggest critiques, is that time frame. Five years to implement the remedy is way too long.

RESPONSE 1: The Department agrees that while significant remediation has occurred, cleanup of the Navy Grumman groundwater plume has taken too long. This has allowed the Navy Grumman groundwater plume to continue to migrate off-site over a large area. Following issuance of the Final Amended Record of Decision (AROD), the Department will commence accelerated negotiations with the responsible parties for implementation of the selected remedy. If the responsible parties fail to agree to implement the remedy, the Department will implement the remedy and subsequently pursue cost-recovery from the responsible parties. Regardless of which entity implements the remedy, it is estimated that a timeframe of approximately five years will be necessary to fully design and build the system infrastructure, given the size of the plume and scope of the project. The design and construction timeframe will, however, be accelerated to the greatest extent practicable while maintaining strict adherence to design and construction best practices. Additionally, the Department expects that the remedial program can be divided into specific components that will allow some phases of the project to begin earlier than other phases. This will allow cleanup of the Navy Grumman groundwater plume to begin well before the five-years indicated in the proposed AROD.

COMMENT 2: On behalf of Assembly District 17, Assemblyman John Mikulin voiced support for amending the ROD, commenting we need to keep working towards the plume cleanup and we must hold the Navy and Grumman responsible**.**

RESPONSE 2: The Department is committed to implementing the AROD in the shortest timeframe possible. As the major responsible parties, the U.S. Navy and Northrop Grumman are legally responsible for the remediation. Following issuance of the AROD, the Department will seek an Order on Consent with the responsible parties for implementation of the remedy outlined in the AROD.

COMMENT 3: On behalf of the Town of Oyster Bay, Supervisor Joseph Saladino supported amending the ROD and indicated that the Town will be providing the Department with written technical comments during the comment period. While the Town agrees with the Department's findings of the options provided in the proposed AROD, the No Further Action (Alternative #1) is not an option. The Town Supervisor indicated that five years to fully implement the cleanup plan is a very long time. The Town applauds the Department for recognizing this and identifying ways to speed-up the process. The Town also indicated that the Department must ensure that the responsible parties, not homeowners, pay for all the past and the future costs associated with remediation for Bethpage, as well as South Farmingdale and all the other water providers that are affected, as well as those communities in the path of the Navy Grumman groundwater plume.

RESPONSE 3: The Department has determined that the "No Further Action" alternative fails to achieve the remedial action objectives for the Navy Grumman groundwater plume and it has therefore been rejected as a viable remedy. The Department is committed to implementing the amended ROD in the shortest timeframe possible (within 5 years). Navy and Grumman are legally responsible for the remediation, including the costs, through their existing commitments associated with the various operable units and this amended ROD. Following issuance of the AROD, the Department will commence negotiations with the responsible parties for implementation of the

selected remedy. If the responsible parties fail to agree to implement the remedy, the Department will implement the remedy and subsequently pursue cost-recovery from the responsible parties. The technical aspects referenced in the comments were provided in writing by the Town of Oyster Bay in a letter dated July 8, 2019. Please see the Town of Oyster Bay comments 45 through 59 and the Department's responses.

COMMENT 4: Nassau County Legislator Rose Marie Walker, speaking on behalf of herself and Legislator Laura Schaefer thanked the Department for the presentation tonight and just wished the Department was involved like this 30-years ago.

RESPONSE 4: Comment noted.

I.B. Water District Comments

COMMENT 5: On behalf of the Bethpage Water District, Superintendent Michael Boufis voiced full support for amending the ROD, commenting this is a huge milestone for the residents of Bethpage and this community. We will comment on this plan as we do every time and I look forward to an expedited cleanup.

RESPONSE 5: Comment noted. Following the June 10, 2019 public meeting, the Department received written comments from the Bethpage Water District in a letter dated July 5, 2019. Please see the Bethpage Water District's comments 60 through 71 and the Department's responses.

COMMENT 6: Bethpage Water District Commissioners including Commissioners John Sullivan, Teri Black, and John Coumatos support the proposed AROD. The Bethpage Water District Commissioners indicated that this is a monumental change in the way we are remediating this plume. The plan may not happen overnight, but the best part of the plan is that it is for the next generation. The commissioners also acknowledged the Bethpage Water District employees in attendance who work to provide safe drinking water to the Bethpage residents on a daily basis.

RESPONSE 6: Comment noted.

COMMENT 7: On behalf of the Massapequa Water District, Superintendent Stan Carey indicated the District fully supports Alternative 5B and will submit official written comments to the plan. But again, thank you and please do your best to implement this remedy in less than five years.

RESPONSE 7: Comment noted. Following the June 10, 2019 public meeting, the Department received written comments from the Massapequa Water District in a letter dated July 3, 2019. Please see the Massapequa Water District's comments 72 through 76 and the Department's responses.

I.C. Public Comments

COMMENT 8: Why not focus the discharge of the treated water in northern areas instead of to the south to expedite the cleanup?

RESPONSE 8: Alternative 5B, the selected remedy, does in fact direct a large percentage of the water to the north to the planned recharge basin in Bethpage State Park. Specifically, of the approximately 17.5 million gallons per day (MGD) that will be extracted, approximately 11 MGD will be directed to the north. A portion of this discharge will be used for irrigation during the summer months.

COMMENT 9: Will health examinations and health investigations be performed for the people near the air stripping stations? The treatment plants need to be monitored to make sure they are not having health effects on the people who live near them.

RESPONSE 9: The treatment plant(s) that will be part of the remedy do not pose an exposure risk to nearby residents, so health examinations and investigations are not planned. The systems will be designed to operate in accordance with applicable Air Discharge Guidance. While the treatment systems are operating, they will be continuously monitored and will be designed to shut down in the event that the equipment is not operating correctly. Both the air and water discharges will be monitored in accordance with NYSDEC Division of Air and Division of Water requirements, respectively.

COMMENT 10: Have you contacted the New York State Parks regarding the proposed recharge basin located in Bethpage State Park.

RESPONSE 10: The Department has been in contact with New York State Parks, Recreation and Historic Preservation regarding the proposed recharge basin in Bethpage State Park, as well as the proposal to provide them with needed irrigation water for the golf course. The conversations have included fully outlining the Department's plan and developing an understanding of what infrastructure needs Bethpage State Park might have and what recharge basin arrangement would work best for them while potentially creating some recreational opportunities for the park.

COMMENT 11: My concern is with 18 million gallons a day being pumped out of the aquifer and returning about 85 percent back to the aquifer. This seems like a lot of water being taken out of the aquifer every day. With this much water being taken I am concerned that this will undermine the support for the ground above it and the ground will begin to settle.

RESPONSE 11: The groundwater modeling and feasibility study evaluated the potential consequences of this pumping regime. The modeling showed that the wetlands will be protected, water wells will not be dewatered, and the pumping will not create salt water intrusion. As far as ground movement, the depth of the plume and local geology indicate that settlement is not a concern. Although approximately 17.5 MGD is a large amount of pumping, this volume only changes the water levels a small amount over a large area. Specifically, based on the USGS groundwater flow modeling completed during the preparation of the FS and proposed AROD, water levels in some of the nearby public water supply wells could decrease approximately 5.3 feet. This small water level change is not sufficient to change the effective stress on the unconsolidated deposits that make up the underlying aquifers. In simplest terms, the soil in the ground has sufficient strength to resist moving under the proposed pumping conditions.

COMMENT 12: If we are asking the U.S. Navy and Northrop Grumman to pay for the remedy, do they get a say in how this works? How do you get them to the table? Please quantify the timeframe for this.

RESPONSE 12: Based on the scientific and engineering studies conducted by the Department, it was determined that the current remedies fail to achieve the remedial action objectives for the Navy Grumman groundwater plume. The responsible parties (U.S. Navy and Northrop Grumman) are legally responsible for the cleanup under New York State Superfund Law. Amending the Record of Decision is a transparent process where we share the proposal and ask for comments before finalizing a remedy in a document called the final Amended Record of Decision (AROD). Once the AROD is final, the Department will commence negotiations with the responsible parties for implementation of the remedy. If the responsible parties fail to agree to implement the remedy, the Department will begin implementing the remedy. This is the process that is required by law. The timeframe to complete the negotiations will be a matter of months, as the Department is committed to commencing implementation of the AROD as soon as practicable.

COMMENT 13: How long are we going to have to wait before you fix this? I know the water is supposed to be good, but there are too many people with cancer; there are cancer clusters in Bethpage.

RESPONSE 13: Approximately five years will be required to fully design and build the system infrastructure for such a large plume area. Groundwater extraction systems will lower the groundwater levels and capture the Navy Grumman groundwater plume within days or weeks of system startup. Within the first year, groundwater monitoring data will begin to show significant measurable improvements in the groundwater quality. The much longer timeframe (an estimated 110 years) shown in the Feasibility Study is the time to fully remediate the entire four-mile long, two-mile wide and 900-foot deep Navy Grumman groundwater plume.

As stated in the draft Health Consultation prepared by the NYSDOH for the Northrop Grumman/NWIRP groundwater plume, people are not currently being exposed to harmful levels of contaminants from the Bethpage plume, although they could have been in the past. Remediation will therefore not eliminate current exposures, because there are none, and it cannot affect past exposures. Rather, it is intended to prevent the contamination from reaching additional drinking water wells and reduce levels at currently affected wells.

COMMENT 14: When you clean the contaminants, 200,000 contaminants are being taken out of the water. Where are you actually disposing of these chemicals?

RESPONSE 14: The 200,000 figure is the number of sample results and not the individual number of specific contaminants present in the groundwater that is being treated. As outlined in the proposed AROD, there are 24 site-related contaminants present in the Navy Grumman groundwater plume. These contaminants present in the groundwater will be removed from the extracted water using a technique referred to as air stripping. This technique uses air flowing through the contaminated water to remove the volatile contaminants. Both the liquid and vapor that come out of the air stripper will then be passed through activated carbon. The activated carbon adsorbs and traps the contaminants on its surface. Monitoring the liquid and vapor will be conducted to determine when the carbon is "spent" and in need of replacement. Typically, the carbon supplier will change out the carbon and remove the "spent" carbon (with the contaminants)

for off-site regeneration, destruction, or disposal at an industrial waste landfill. Both the regeneration and disposal processes are closely regulated, so the contaminants are not released back to the environment. Section 7.1.2 in the Feasibility Study describes the groundwater ex-situ treatment in detail. The specific calculations and sizing for the treatment system will be completed during the remedial design.

COMMENT 15: Why are we not taking some of this very expensive treated water and using it for drinking water purposes, especially since we can blend the water? There are other areas in the country that use water for drinking purposes immediately after treatment.

RESPONSE 15: Most areas in the country (e.g., California) that allow the use of treated groundwater from Superfund sites for drinking purposes as a policy are experiencing significant drought and water shortages. The re-use of the treated water for drinking water purposes was considered as an option during the Navy Grumman plume engineering analysis, but was not pursued. The added costs associated with treating the legacy groundwater contamination and insuring the quality of the water to its customers are additional burdens to water suppliers. Therefore, the treated water will be used for aquifer restoration, habitat enhancement, and irrigation rather than placing it back into the public water supply distribution system.

The New York State Department of Health's (DOH) goal is to ensure that public water systems (PWSs) are designed, operated and optimized to address the unique needs of each water system. DOH's approach to drinking water, consistent with the Recommended Standards for Water Works, is to use the best quality source that is feasibly available.

Public water systems draw water from well-defined sources, treat the water to meet all Federal and State drinking water standards, distribute the water to the public through a system of water mains and storage tanks, and monitor water quality to ensure continued provision of potable water. The entire process involves numerous controls, designed and reviewed by certified professionals, and implemented by trained and certified water operators, to maintain a high level of water quality with the primary goal of public health protection. This is often referred to as a multiple barrier approach to public health protection for drinking water.

Although there may be circumstances where using treated water from a remediation site is feasible, it should only be considered when all other options have been evaluated and found impossible or impracticable and under the most rigorous real-time testing and operational controls possible. Such an option would also need to include contingencies for back up water sources in the event that satisfactory treatment failed to be provided at all times.

COMMENT 16: I would like to know why you are treating 15 percent of the water and placing it into Massapequa Creek where it will end up in the Great South Bay? Why would we spend the money doing that?

RESPONSE 16: Based on discussions with Nassau County and the NYSDEC Division of Fish and Wildlife, along with the review of studies related to Massapequa Creek, it was determined that certain reaches of Massapequa Creek are impaired (high nitrates and phosphorus, low dissolved oxygen and specifically for Massapequa Reservoir a fish consumption health advisory for the pesticide chlordane) and the existing aquatic habitat within Massapequa Creek could benefit from the addition of high quality, treated water. As part of the Feasibility Study, an initial analysis of

potential consequences related to pumping approximately 17.5 MGD from the aquifer and returning approximately 2.8 MGD of treated, high quality water to Massapequa Creek was further evaluated with a USGS groundwater flow model. Specifically, the groundwater flow model was used to quantitatively evaluate changes in streamflow and groundwater levels near Massapequa Creek and the nearby drainages. It was determined that a surface water discharge of 2.8 MGD to Massapequa Creek was feasible and would provide benefits to the surface water flow and overall quality of water in Massapequa Creek.

COMMENT 17: There are studies that show Massapequa Creek is polluted and this may be related to the Navy Grumman groundwater plume. Some of this contamination may be radioactive.

RESPONSE 17: There is no evidence, and it is extremely unlikely, that contaminants associated with the Navy Grumman groundwater plume have reached Massapequa Creek. Prior to discharging treated water into Massapequa Creek as part of the Department's proposed remedy, the water will undergo testing to confirm that it is free of any contaminants. The treated water will also be tested for other constituents including radium-226 and radium-228. Based on this testing, the water will be treated, as needed, for other non-site related contaminants to achieve discharge requirements and to be sure that the discharge will result in an overall improvement to Massapequa Creek water quality.

COMMENT 18: Please make sure you don't add 17.5 million gallons a day to Massapequa Creek.

RESPONSE 18: The amended ROD proposes to discharge approximately 2.8 million gallons a day to Massapequa Creek. Although this rate may vary based on the remedial design, the discharge to Massapequa Creek will be nowhere near 17 million gallons on a daily basis.

COMMENT 19: Please make sure you don't overflow Massapequa Preserve because Sunrise Highway already floods right now during heavy rain storms. During the next heavy storm, it will flood and the homeowners who live on Lake Shore Drive (Massapequa Park) are going to be concerned with the rising water levels.

RESPONSE 19: Based on the analysis completed as part of the Feasibility Study, the proposed addition of approximately 2.8 MGD of treated water to Massapequa Creek will not produce flooding in the area around Massapequa Preserve. Specifically, this analysis included a review of data continuously collected at a United States Geological Survey (USGS) stream gage located on Massapequa Creek (USGS Stream Gauge Station #01309500). The recent flow data indicates the mean flow in Massapequa Creek is approximately 8 cubic feet per second (cfs). Approximately half of this mean flow (approximately 4 cfs) is groundwater which is discharged to the creek and contributes to the stream flow. The stream flow and gage height are largely a function of the recent rainfall amount and intensity. Based on a review of long-term water levels collected at the USGS stream gage, the addition of 4.4 cfs (2.8 MGD) of treated water will only raise the height of the stream at the gage by approximately one inch. During rainfall events the flow in Massapequa Creek routinely increases by an order of magnitude (a factor of ten) or more due to surface runoff. For example, on July 22, 2019 the flow was 4 cfs and the stream level at the gage was 0.7 ft. Following 1.41 inches of rainfall on July 23, 2019, the flow peaked at 90 cfs and the stream level at the USGS gage increased approximately 0.7 feet to 1.4 feet.

During the remedial design for the Department's remedy selected in the final AROD, each drainage structure and known location of historical flooding will be examined (e.g., to assure adequate capacity). The remedial system will be designed to temporarily reduce or stop the surface water discharge in anticipation or arrival of major storms where surface runoff will be high. With the pumping reduced/ceased, the remedial system would not be contributing significant additional flow during major storm events. Additionally, an Operation, Maintenance, and Monitoring Plan will be prepared that will describe how the groundwater remedy will be operated during heavy precipitation events, including how the discharge to Massapequa Creek may be suspended before, during, and immediately after large precipitation events.

COMMENT 20: We want the NYSDEC to work with the communities and to notify residents if you will be working or drilling wells in our neighborhoods. If residents are trying to sell their homes, the residents should be aware of what cleanup work will be occurring.

RESPONSE 20: The Department is committed to keeping the community informed regarding the on-going drilling and well installation activities occurring in the local neighborhoods. As part of the Department's fast-track extraction well drilling program, a total of four high capacity extraction wells were installed in 2018 and 2019 and five vertical profile borings were drilled in residential areas. Before starting these drilling activities, the Department and its contractors carefully considered the siting of each location to minimize disturbances to the area. Several weeks before starting the drilling program, site specific drilling notices were prepared and hand-delivered by the Department to the property owners near the drilling locations. The notices provided the public with a description of the work, the anticipated duration, and also provided the residents with contact information for Department staff. A similar process will be followed for the future drilling and well installation activities.

COMMENT 21: The home values are affected by the presence of the groundwater contamination/plume and the drilling equipment in our neighborhoods.

RESPONSE 21: Comment noted. Prospective purchasers, realtors, and sellers can contact the Department project manager and/or the NYSDOH project manager to discuss the site status or to discuss specific investigation and cleanup questions related to the project.

COMMENT 22: We appreciate that 85% of the water will be recharged into the ground and 15% will be used to help Massapequa Creek. An earlier plan proposed to discharge 100% of the treated water into Massapequa Creek.

RESPONSE 22: For details related to the Department's analysis of discharging treated water to Massapequa Creek, see the Responses to Comment #16 and Comment #19.

COMMENT 23: The groundwater cleanup plan dismisses and does not discuss the issue of radium and radon.

RESPONSE 23: The Department is not dismissing the presence of radium-226 and radium-228 in groundwater. The remedy outlined in the Department's proposed AROD was designed to address 24 groundwater contaminants associated with the former Naval Weapons Industrial Reserve Plant (NWIRP) site and the former Northrop Grumman Bethpage Facility. This primarily

includes contaminants referred to as volatile organic compounds (VOCs). The primary contaminant of concern in the groundwater is the VOC trichloroethene (TCE). Radium-226, radium-228, and radon are not considered site-related contaminants of concern. While there are combined radium-226 and radium-228 results greater than the drinking water maximum contaminant level (MCL) of 5 pCi/L in groundwater near the site, these detections above the MCL are not unique to this area. Specifically, a review of groundwater quality data provided by the Nassau County Department of Health (NCDOH) shows that combined radium has exceeded the MCL of 5 pCi/L at 23 different water supply well locations throughout Nassau County. These sporadic detections throughout Nassau County are consistent with USGS studies designed to assess the natural occurrence of radium-226 and radium-228 in groundwater in aquifers in other parts of the United States. Additionally, Department staff have reviewed approximately 600 historic operational documents and completed scans for radionuclides using sensitive hand-held instrumentation of buildings and properties formerly operated by Northrop Grumman. Based on this evaluation, there is no evidence indicating that disposal of radium occurred at the former NWIRP and Northrop Grumman properties.

While radium does decay, or break down to form radon, the source for radon gas in buildings is from underlying soil and not from groundwater. Groundwater is not considered to be a significant source of radon gas intrusion into overlying structures. As described below, this is further explained in the Environmental Protection Agency's (EPA's) "Basic Information about Radon in Drinking Water" factsheet:

"Most of the radon in indoor air comes from soil underneath the home. As uranium breaks down, radon gas forms and seeps into the house. Radon from soil can get into any type of building - homes, offices, and schools - and build up to high levels in the air inside the building. Radon gas can also dissolve and accumulate in water from underground sources (called ground water), such as wells. When water that contains radon is used in the home for showering, washing dishes, and cooking, radon gas escapes from the water and goes into the air. It is similar to carbonated soda drinks where carbon dioxide is dissolved in the soda and is released when you open the bottle. Some radon also stays in the water."

Based on this, there is no need to test structures over the Navy Grumman groundwater plume for radon beyond that normally recommended for naturally occurring radon.

Based on the review of water quality data, the assessment on possible radium sources, and the understanding of radon gas entry into structures, the alternative included in the proposed AROD does not include a plan to address radium-226, radium-228, and radon. It should be noted that if groundwater extracted from the aquifer as part of the Department's remedy contains radium above the MCL of 5 pCi/L, then it will be treated to below MCLs before it is discharged to a recharge basin/s or Massapequa Creek or used for irrigation purposes.

While the proposed AROD does not include a plan to address radium-226 and radium-228, to understand the origin of radium detections in groundwater near the former NWIRP and Northrop Grumman sites, the Department is completing a comprehensive radium assessment. This assessment includes the evaluation of radium-226 and radium-228 sampling results from nearly 3,000 groundwater samples. The Department expects to have this assessment completed in early 2020.

COMMENT 24: Regarding the U.S. Navy's plan to cleanup PCBs in the on-site soil, we would like to see something in the Department's plan to at least monitor groundwater for PCBs and to determine if there is a need to further remediate this contaminant as well.

RESPONSE 24: PCBs generally adhere to the soil particles rather than migrate though the soil into the groundwater. While the U.S. Navy is currently implementing a cleanup program to address on-site PCB soil contamination and Northrop Grumman will also be completing a cleanup program in 2020 to address PCB soil contamination in the Bethpage Community Park area, groundwater monitoring will be performed to evaluate these remedies. In both cases, the groundwater in the areas where PCB contamination exists in the on-site soil is captured by the existing on-site groundwater extraction and treatment system and is properly treated. Long-term groundwater quality monitoring for PCBs will be performed to assess the remedies and to determine if treatment is needed to address PCB groundwater contamination at the on-site groundwater extraction and treatment systems.

COMMENT 25: As a community member I think it would be very important to incorporate within the plan a formalized community advisory board. This community advisory board could assist with evaluating progress of the cleanup, holding the responsible parties accountable, and keeping the public educated during the cleanup process.

RESPONSE 25: The Department is committed to keeping the community informed and remains accountable to the public for the timely and proper implementation of the remedy. The June 10, 2019 availability session and public meeting are examples of the on-going efforts to keep the community informed. At this time, a formalized community advisory board is not planned. During the remedial design a Community Liaison Plan will be developed that will serve as a roadmap to the sources of information regarding the remediation. The plan will function as a guide on the best ways to communicate information regarding the on-going activities, answer questions, and to raise and resolve issues. During the construction phase of the project, regular community updates will be provided that will report on upcoming activities and the on-going progress. The community always has the option to contact the Department with questions. Our staff will be working closely with the community throughout the life of this project. Please visit the project web site (http://www.dec.ny.gov/chemical/35727.html) and make sure to sign up for the NYSDEC listserv (https://www.dec.ny.gov/public/65855.html). Additionally, information on the investigation and cleanup of the Northrop Grumman and NWIRP sites can be found on-line through the DECinfo Locator mapping application at the following link: https://gisservices.dec.ny.gov/gis/dil/.

COMMENT 26: The words "Bethpage Plume" in very large letters stared at me from the newspaper. I state emphatically Bethpage and its residents are not responsible for this devastation. Identify the responsible parties at every turn.

RESPONSE 26: The Department is aware of the public's sensitivity when referring to this site as the "Bethpage Plume". Please note that the Department's proposed AROD, the Feasibility Study, availability session graphics, presentation, and handouts refer to the plume as the Navy Grumman groundwater plume. There is no mention of the "Bethpage Plume" anywhere in the documents. This historical reference to the site appeared in earlier documents and was widely adopted by the press. In hindsight it was not an appropriate reference and we encourage others to follow our lead in referring to this plume as the Navy Grumman groundwater plume.

COMMENT 27: Where do people go in the community to get tested or evaluated to see who has been damaged by this water? My doctor has told me I have elevated levels of heavy metals – aluminum, arsenic, barium, cadmium, cesium, lead, mercury and tin. The highest levels are cesium and thallium that maybe related to radiation.

RESPONSE 27: Because the community is served by public water suppliers that must deliver water that meets NYSDOH Part 5 requirements, the community is not being damaged by consuming water from public water suppliers. The NYSDOH recently completed a Health Consultation that evaluated human exposures to contaminants from the Navy Grumman groundwater plume that may have occurred prior to the 1980s. Exposure is important because without exposure, that is, contact with contaminants, there can be no health effects. The Health Consultation concluded that people have not been exposed to harmful levels of contaminants from the Navy Grumman groundwater plume since 1976. Prior to 1976, use of drinking water from one Bethpage Water District well could have harmed people's health due to high levels of trichloroethene (TCE). TCE has been classified as carcinogenic to humans by the US EPA. People exposed to relatively high levels of TCE in the workplace have been found to have an increased risk of liver cancer, kidney cancer, and non-Hodgkin lymphoma. TCE exposure has also been associated with effects on the immune system and developmental effects such as congenital heart defects. Cancer is a reportable disease in New York State, and cancer data are considered complete on a statewide basis since diagnosis year 1978. Due to the long latency of cancer, any cancers caused by exposure to TCE in drinking water could still be occurring years after exposure ended. However, the increased lifetime cancer risk from past long-term exposures to drinking water containing TCE at the average concentration found in the most contaminated Bethpage well as calculated in the Health Consultation (between 3 in 100,000 and 8 in 100,000) would not be detectable against the average lifetime cancer risk in the general population (about 38%, or 38,000 in 100,000 for all cancers, or 4.8% or 4,800 in 100,000 for liver and kidney cancers and non-Hodgkin lymphoma). Individuals with concerns about their health should speak with their physician.

COMMENT 28: I am concerned that the plan you are putting in place will overstress the Long Island Aquifer and could drastically affect the overall yield of aquifer.

RESPONSE 28: During an approximate two-year period, the USGS developed a comprehensive groundwater flow model of this area to simulate groundwater flow. Using an iterative process, the USGS groundwater flow model was then used to design remedial alternatives that would achieve capture of the Navy Grumman groundwater plume while at the same time minimizing impacts to the environment; including the Long Island aquifer. While the remedy in the Department's proposed AROD involves the withdrawal, treatment, and management of approximately 17.5 MGD, the proposed remedy returns the majority of this treated water (approximately 14.7 MGD) to the Long Island Aquifer through the use of recharge basins. The return of water to the Long Island Aquifer through the use of recharge basins was specifically incorporated into the proposed remedy to minimize adverse impacts to the aquifer system.

COMMENT 29: Will the pumping cause emerging contaminants (1,4-dioxane and any new contaminants) and nitrate to move downward from the shallow aquifer into the deeper aquifers?

RESPONSE 29: Alternative 5B uses a series of strategically placed extraction wells to maximize the withdrawal of the site contaminants. While a natural downward movement of groundwater already exists, the operation of the extraction wells may cause some additional downward movement of groundwater. However, any 1,4-dioxane or nitrates that may move downward would be captured and treated by the groundwater remedy.

COMMENT 30: It makes no sense to do anything other than supply the treated water as drinking water. If you think about it, 17 billion gallons a day. The most water ever pumped out by Massapequa Water District per day was about 18 million gallons. So, there is no reason why Plainview, Farmingdale, Bethpage couldn't use this water, it would conserve the water for the future.

RESPONSE 30: For clarification, the Department's proposed remedy includes the extraction of contaminated groundwater at a rate of approximately 17.5 *million* gallons a day and not 17 *billion* gallons a day. Regarding the re-use of treated water for drinking water purposes, please see the Response to Comment #15.

COMMENT 31: What role will the USGS and HDR play throughout this project and will monitoring continue to assess possible changes in the footprint of the plume?

RESPONSE 31: The Department intends to continue our partnership with the USGS and HDR. In addition to the existing groundwater monitoring performed by the U.S. Navy and Northrop Grumman, implementation of the Department's proposed remedy will include a long-term groundwater quality monitoring program. This long-term groundwater monitoring program will not only be used to evaluate the effectiveness of the remedy, but will be used to monitor changes to the extent of the plume.

COMMENT 32: No one has offered testing on private properties to look at what is in the soil or what may be in the vapor coming up from the plume. How is this groundwater contamination impacting my property?

RESPONSE 32: Outside of strategically placed groundwater monitoring wells for the sampling and analysis of groundwater samples from within the Navy Grumman groundwater plume, there is no need to sample off-site properties for site contaminants. The groundwater contamination is deep beneath the ground surface and is overlain by clean groundwater. Furthermore, both the U.S. Navy and Northrop Grumman operate soil vapor containment systems to not only eliminate contamination that remains in on-site soil, but to prevent off-site soil vapor migration. Northrop Grumman also operates two on-site groundwater containment systems using nine remediation wells to prevent the continued off-site migration of groundwater containing site contaminants. Both the U.S. Navy and Northrop Grumman perform shallow and deep monitoring of these systems to confirm that contaminants are no longer leaving the sites and to document that the systems maintain capture of both soil vapor and groundwater.

Homes in the area are connected to public water and do not rely on individual private homeowner wells for drinking water purposes. The public water supplies already perform routine monitoring in accordance with the NYSDOH drinking water requirements.

Twenty-four properties located directly adjacent to site were found to have impacts to soil by site-related contaminants as a result of soil being redistributed before structures were constructed. Northrop Grumman conducted soil removal actions on properties that were found to have soil impacts at concentrations greater than the Residential Soil Cleanup Objectives (6 NYCRR Part 375 Section 6-8) and there is no longer an exposure concern for these properties.

Off-site soil vapor intrusion sampling has been completed at 26 locations in nearby residential areas to evaluate the potential for vapor intrusion to occur. This included the collection of sub-slab vapor, indoor air, and outdoor air samples. Based on this sampling, six structures were found to be impacted by soil vapor intrusion of site-related contaminants and sub-slab depressurization systems were installed to mitigate impacts to indoor air. It has been demonstrated that the Navy's soil vapor containment system serves to mitigate the impacts to these structures and the sub-slab depressurization systems have been removed from these structures. Subsequent sampling of these structures verifies that there are no impacts to indoor air occurring.

COMMENT 33: There has been no study, no monitoring, and no analysis of the health impacts of these very toxic chemicals on the people in this community. So, while the plan addresses the groundwater, there has got to be a study and funds for monitoring and compensation offered to the people who have already been made sick.

RESPONSE 33: Please see the Response to Comment #27.

II. Written Comments

II. A. Local Government & Water District Comments

Mr. Brian J. Schneider, the Deputy County Executive for Parks and Public Works, Nassau County, submitted a comment letter dated July 8, 2019 which included the following comments (Comments 34 to 44):

COMMENT 34: At no time must treated water from the remedial system(s) be used for public water supply.

RESPONSE 34: The proposed alternative does not include a provision for water re-use as a drinking water source. As outlined in the proposed AROD, treated water will be managed by using recharge basins and beneficial re-use as irrigation water at Bethpage State Park or as streamflow augmentation in Massapequa Creek.

COMMENT 35: Vapor Phase Carbon Treatment should be used at all remedial treatment plants when packed tower aeration is in use.

RESPONSE 35: As outlined in the proposed AROD (Page 21), the extracted air stream containing the volatile contaminants would be treated prior to discharge to the atmosphere using vapor-phase granulated activated carbon (GAC).

COMMENT 36: The discharge of treated water should be tested for combined radium-226 and radium-228 in addition to any other Contaminants of Concern associated with the plume.

RESPONSE 36: Water discharged to recharge basins or Massapequa Creek or used for irrigation purposes will be tested and treated to below SCGs according to Federal and State regulations including the MCL of 5 pCi/L for combined radium-226 and radium-228.

COMMENT 37: Testing of waters entering recharge basins should occur at a frequency that ensures water quality standards are not exceeded.

RESPONSE 37: Water discharged to recharge basins or Massapequa Creek or used for irrigation purposes will be tested at a frequency that is consistent with Federal, State, and local regulations to ensure water quality standards are not exceeded.

COMMENT 38: Both the Nassau County Department(s) of Health/Public Works and local water suppliers should be notified regarding the location and start dates for the installation of new extraction or monitoring wells. Local residents should also be notified when wells are to be installed in proximity to their homes.

RESPONSE 38: The Nassau County Department(s) of Health/Public Works and local water suppliers will be notified as to the location and start dates for the installation of new extraction or monitoring wells. Local residents will also be notified when wells are to be installed in the vicinity of their homes (see Response to Comment #20).

COMMENT 39: The potential effects of hydraulic mounding (localized raising of the groundwater table) on any localized groundwater contamination should be modeled with respect to any treated water being recharged at Bethpage State Park.

RESPONSE 39: The potential effects of hydraulic mounding (localized raising of the groundwater table) from water being recharged at Bethpage State Park was evaluated with the USGS groundwater flow model during the preparation of the FS and proposed AROD. The Department expects that additional groundwater flow modeling will be performed to support the remedial design. This groundwater modeling will further assess the potential for hydraulic mounding near the proposed recharge basin located in Bethpage State Park.

COMMENT 40: Potential effects of discharging approximately 2.2 MGD of treated water into Massapequa Creek should be examined and modeled. The treated effluent from this remedy must be of sufficient quality and temperature to support fisheries including trout.

RESPONSE 40: For clarification, the Department's proposed remedy includes the discharge of treated water at a rate of approximately 2.8 MGD to Massapequa Creek and not 2.2 MGD. As described in Response to Comment #39, the Department expects that additional groundwater flow modeling will be performed to support the remedial design. This groundwater modeling will be used to further assess the potential effects of discharging approximately 2.8 MGD of treated water into Massapequa Creek. Based on current modeling, this additional discharge will beneficially impact stream flows and the habitat quality provided by the creek.

COMMENT 41: The construction of three decentralized groundwater treatment plants south of Southern State Parkway must be coordinated with NCDPW.

RESPONSE 41: In addition to many aspects of implementing the remedial elements of Alternative 5B, the construction of decentralized groundwater treatment plants south of the Southern State Parkway will be coordinated with NCDPW.

COMMENT 42: The proposed installation of up to 23.5 miles of piping along County roadways for the conveyance of treated and untreated water must be compared to and coordinated with scheduled roadway improvements including resurfacing.

RESPONSE 42: The proposed installation of up to 23.5 miles of piping along County roadways for the conveyance of treated and untreated water will be compared to and coordinated with the NCDPW and any scheduled roadway improvements including resurfacing.

COMMENT 43: Any potential construction and traffic issues related to the installation of the 24 extraction wells must be reviewed.

RESPONSE 43: The Department will coordinate review of potential construction and traffic issues related to the installation of the 24 extraction wells with the NCDPW.

COMMENT 44: Any potential use of Nassau County owned recharge basins must also be reviewed for potential drainage impacts (i.e., capacity and flooding).

RESPONSE 44: The Department will coordinate review of the potential use of Nassau County owned recharge basins and the potential drainage impacts (i.e., capacity and flooding) with NCDPW.

Honorable Joseph Saladino, the Town of Oyster Bay Supervisor, submitted a comment letter dated July 8, 2019 which included the following comments (Comments 45 to 59):

COMMENT 45: Based on the fact that contamination remaining in the source areas continues to impact public water supplies, the existing Records of Decision ("RODs") are inadequate in their treatment of the source areas and deficient in addressing the offsite plume and must be amended.

RESPONSE 45: Both the U.S. Navy and Northrop Grumman continue to implement remedial actions to address source areas in accordance with existing RODs. This includes excavation and off-site disposal and in-situ thermal techniques to address contaminated soil; operation of soil gas containment systems to not only eliminate soil contamination, but to prevent off-site soil vapor migration; and the operation of two on-site groundwater containment systems with nine remediation wells to prevent the off-site migration of site contaminants in groundwater. The two on-site groundwater containment systems withdraw approximately 5.8 million gallons of contaminated water per day from the nine groundwater extraction wells and have removed over 200,000 pounds of VOC contamination from the aquifer since operation began in 1998. Operation of these two systems has produced an area of clean water downgradient of the groundwater containment systems. The groundwater contamination that continues to impact nearby public water supplies is related to contaminants that were historically released from the U.S. Navy and Northrop Grumman sites and that have since migrated from these sites before the influence of the on-site groundwater containment systems. This off-site groundwater contamination is being addressed as part of the proposed AROD as well as in the existing RODs. Based on the cleanup

work that is on-going to address source areas, combined with the effectiveness of the soil gas and groundwater containments systems, the remedies selected in earlier RODs to address source areas do not need to be amended. The following OU2 and OU3 RODs for the Northrop Grumman Bethpage Facility Site (130003A) and OU2 for the NWIRP Site (130003B) are the subject of this AROD and will therefore be amended:

1. 130003A and 130003B, Operable Unit 2 Groundwater, March 2001;
2. 130003A, Operable Unit 3, Former Grumman Settling Ponds and Associated Groundwater, March 2013; and
3. 130003B, Operable Unit 2, Groundwater, Department of the Navy, January 2003.

COMMENT 46: The existing ROD for OU3 at the former Grumman Settling Ponds (now part of Bethpage Community Park) is inadequate and must be amended to provide complete cleanup.

RESPONSE 46: Northrop Grumman is currently implementing the remedial program for OU3 per the 2013 ROD. This includes in-situ thermal techniques to address deep VOC contaminated soil (design and construction is underway), excavation and off-site disposal to address shallow PCB and metals contaminated soil (design is underway with cleanup to occur upon completion of the in-situ thermal remediation), and the operation of a groundwater extraction and treatment system to address deep off-site groundwater contamination referred to as the RW-21 Area (various stages of design and construction are currently underway). The OU3 remedy also includes the operation of a soil gas containment system to remove VOC soil contamination and prevent off-site migration of soil vapor, and operation of a groundwater extraction and treatment system to remove VOC groundwater contamination and to prevent off-site migration. While the remedy has only partially been implemented to date, the initial data suggests that the remedy is working and is effective at removing site contaminants and preventing continued off-site migration. Per the 2013 ROD, Northrop Grumman will continue to perform monitoring to assess the performance and effectiveness of the remedy. Should monitoring indicate that the current remedy is not effective in meeting the remedial action objectives, the Department will require that Northrop Grumman make the necessary adjustments to the remedy.

COMMENT 47: The cleanup goal for VOCs in soil must meet DEC's "protection of groundwater" soil cleanup objectives, not a less protective goal.

RESPONSE 47: While the 2013 Record of Decision indicates that the protection of groundwater soil cleanup objective for the VOC source area applies, a soil cleanup objective of 10 ppm for total VOCs was established during the remedial design per 6 NYCRR Part 375-6.5, which provides an exception to protection of groundwater soil cleanup objectives (SCOs) when:

1. The on-site source is addressed by the remedial program.
2. An environmental easement will be put in place which provides for a groundwater use restriction on the site.
3. The remedy includes controls or treatment to address off-site migration.
4. Groundwater quality will improve over time.

As described in the Department's Response to Comment #46, Northrop Grumman continues to operate a soil gas containment system to remove VOC soil contamination and prevent off-site

migration of soil vapor and a groundwater extraction and treatment system to remove VOC groundwater contamination and to prevent off-site migration.

COMMENT 48: The cleanup goal for VOCs in groundwater must meet the New York State Groundwater Quality Standards for a drinking water sole-source aquifer to be consistent with the cleanup goals of the off-site plume, otherwise the source area presents a continuous and long-term threat to re-contaminating the off-site groundwater.

RESPONSE 48: As described in Response to Comment #45, Northrop Grumman operates the groundwater containment system (at the Bethpage Community Park) with four remediation wells to prevent the off-site migration of site contaminants. This on-site groundwater containment system withdraws approximately 220 gallons per minute of contaminated water from the four groundwater extraction wells and has removed over 2,000 pounds of VOC contamination from the aquifer since operation began in 2008. Operation of this system has produced an area of clean water downgradient of the groundwater containment systems. Based on operation of the groundwater containment system, the residual contamination does not present a threat to the quality of off-site groundwater.

COMMENT 49: The cleanup goal for PCBs and metals in soil must be amended to meet DEC's unrestricted use soil cleanup objectives, given the presence of children at the Park, and the school and residential properties in close proximity.

RESPONSE 49: As the soil cleanup objectives (restricted residential SCO) for this area were based on the anticipated future use and are protective for that use, the remedy does not need to be modified by incorporating unrestricted use SCOs. The Grumman Access Road right-of-way area will be excavated to remove PCB and chromium contaminated fill from an approximately 1,000-foot-long area beneath and adjacent to the access road. Soil will be removed to achieve 1 ppm in the upper two feet and 10 ppm of PCBs below two feet as well as the restricted residential SCO for chromium in the upper two feet. This allows the use and development of the controlled property for restricted residential, as defined by Part 375-1.8(g). Restricted residential use SCOs are objectives applied statewide for public parks that are used for active recreation, as will be the case at the Park. The existing remedy requires a site cover to allow for restricted residential use of the Park. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper two feet of exposed surface soil will exceed the applicable SCOs. Where the soil cover is required it will be a minimum of two feet of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for restricted residential use. The soil cover will be placed over a demarcation layer with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d). The soil cover will be placed site-wide, including in the area of the recharge basins, town pool and playground, as needed to assure restricted residential SCOs in the upper two feet of the OU3 area are achieved.

COMMENT 50: DEC must require investigation for the presence of 1,4-dioxane in source areas and amend the RODs to include cleanup of the source areas for 1,4-dioxane as appropriate.

RESPONSE 50: The emerging contaminant 1,4-dioxane was commonly used as a solvent

stabilizer and not as a separate product that would have been stored and possibly released from sources different from where chlorinated solvents were released. The existing RODs have/are currently addressing VOC source areas and areas of the groundwater plume where high contaminant concentrations exist. The U.S. Navy is currently designing an advanced oxidation process treatment system to address 1,4-dioxane in groundwater in the GM-38 Area. Additionally, both the U.S. Navy and Northrop Grumman are designing the RE-108 and RW-21 Area treatment systems respectively to address 1,4-dioxane in groundwater. Furthermore, Northrop Grumman will be required to add treatment to the two on-site containment systems for 1,4-dioxane if groundwater results for this parameter exceed a standard that is expected to be promulgated in the near future.

COMMENT 51: A comprehensive assessment of potential PFAS presence in all the source areas and the groundwater plume must be conducted, followed by remediation as appropriate; otherwise, the FS and AROD are neglecting a major group of contaminants whose potential presence would result in the need for significant revisions to these documents.

RESPONSE 51: Both the U.S. Navy and Northrop Grumman completed comprehensive groundwater sampling programs for per- and polyfluoroalkyl substances (PFAS) in 2018. Specifically, the U.S. Navy collected groundwater samples from 27 monitoring wells for PFAS analysis and Northrop Grumman collected groundwater samples from 32 monitoring wells for PFAS analysis. This sampling was performed as part of the statewide evaluation of remediation sites to better understand the presence of these emerging contaminants in groundwater. While low concentrations of PFAS were detected in some groundwater samples, the data does not suggest there is a need for revisions to the existing decision documents. Furthermore, both Northrop Grumman and the U.S. Navy would be required to add treatment to the existing groundwater extraction and containment systems (two on-site containment systems and the GM-38 system) and the two planned off-site groundwater containment and treatment systems (RE-108 Area system and RW-21 Area system) for PFAS if groundwater results for these parameters exceed future standards that are promulgated.

COMMENT 52: The remedy design and construction timeframe of approximately 5 years indicated in the AROD is too long considering the relatively rapid movement of the plume toward the high value public drinking water well fields.

RESPONSE 52: The design and construction timeframe will be accelerated to the greatest extent practicable while maintaining strict adherence to design and construction best practices. Please also see the Department's Response to Comment #1.

COMMENT 53: The State must give serious consideration to the use of the design build process and break the project into four (4) individual components: (1) hydraulic containment wells and interconnected piping; (2) transmission main from the hydraulic containment wells to the central treatment facilities located on the Bethpage Navy-Grumman site; (3) a central treatment facility located at the existing Navy-Grumman Bethpage site; and, (4) effluent injection wells and piping.

RESPONSE 53: The Department will give consideration to using the design-build process and to dividing the project into logical components during the design and construction of this remedy. Please note that the use of injection wells to manage treated water was considered but was not

retained as part of the proposed remedy due to implementability concerns.

COMMENT 54: The Town strongly recommends that a preliminary construction schedule should be provided which details the DEC's priority in the implementation of the remedy and the expected timeframe to accomplish the necessary individual tasks. Once the final AROD is issued, then either Northrop Grumman and the Navy, or the DEC, must be held in strict conformance to the implementation schedule.

RESPONSE 54: A preliminary design and construction schedule will be developed that details the implementation of the remedy and the timeframe to complete each task. As the remedy is implemented, the Department will continue to oversee cleanup and to ensure these activities are occurring in accordance with 6 NYCRR Part 375 (Environmental Remediation Programs) and the preliminary design and construction schedule.

COMMENT 55: The leading edge of the plume in the vicinity of Southern State Parkway is inadequately delineated given that it is primarily based on two clusters of vertical profile borings and monitoring wells that are approximately 1.3 miles apart.

RESPONSE 55: The leading edge of the plume in the vicinity of Southern State Parkway has been defined with six vertical profile borings (DEC-VPB-1, VPB133, VPB145, VPB146, VPB147, and VPB167) and 12 monitoring wells (MW-VPB1D1, MW-VPB1D2, RE133D1, RE133D2, BPOW6-1, BPOW6-2, BPOW6-3, BPOW6-4, BPOW6-5, BPOW6-6, TT102D, and TT102DD). Additional VPBs and monitoring wells may be installed during the remedial design to aid in siting and designing the groundwater extraction wells.

COMMENT 56: The selected remedy must be amended to include injection of treated water into hot spot areas (e.g. areas with total VOCs greater than 1,000 parts per billion (ppb)) to accelerate the plume cleanup faster than timeframes projected for the recommended remedy.

RESPONSE 56: The timeframe outlined in the FS and AROD for Alternative 5B are estimates for the amount of time it would take for the entire SCG plume to be remediated to the SCGs. The timeframe to remediate the hotspots with the Mass Flux wells under Alternative 5B would be much quicker; on the order of 20-30 years for the areas with total VOCs greater than 1,000 ppb. Therefore, injection wells that are commonly associated with high costs and long-term operation and maintenance challenges are not needed to accelerate the cleanup process.

COMMENT 57: The AROD does not adequately address the development of alternate water supplies for the Bethpage Water District.

RESPONSE 57: Some aspects of the development of alternate water supplies for the Bethpage Water District are underway as the BWD recently began operating a well in Bethpage State Park and is currently installing a new well near Bethpage State Park. The proposed AROD indicates that the Bethpage Water District Plants 4, 5, and 6 pumping wells would be transitioned over time from public water supply wells to remedial wells and to allow Bethpage Water District to continue to meet municipal demands without these wells, the remedy includes a provision for development of an alternate water supply. The details of an alternative water supply will be part of the subject of discussions with the Bethpage Water District.

COMMENT 58: If Northrop Grumman and the Navy do not agree to implement the remedy, what provision has the DEC made for an alternate location, or would the DEC attempt to acquire the property by eminent domain.

RESPONSE 58: The proposed AROD indicates that a centralized treatment plant will be located in the area of the former Northrop Grumman property. The exact location of the centralized treatment plant will be identified during the remedial design. If New York State implements the remedy, where possible, preference will be given to publicly owned or currently vacant properties for siting the centralized treatment plant. The use of eminent domain will be considered after all other property acquisition options have been considered.

COMMENT 59: If Northrop Grumman and the Navy do not implement the remedy, and the State moves forward while seeking cost recovery, the State must use all available legal and contracting mechanisms to rapidly implement the remedy.

RESPONSE 59: If New York State implements the remedy, the design and construction timeframe will be accelerated to the greatest extent practicable while maintaining strict adherence to design and construction best practices. The Department fully expects that all available legal and contracting mechanisms will be used to rapidly implement the remedy.

Mr. Michael Boufis, the Superintendent with Bethpage Water District, submitted a comment letter dated July 5, 2019 which included the following comments (Comments 60 to 71):

COMMENT 60: With the pending drinking water standards for emerging contaminants, the existing ONCT and GM-38 treatment systems must be retrofitted to include treatment for the removal of 1,4 Dioxane and PFOS/PFOA.

RESPONSE 60: Both Northrop Grumman and the U.S. Navy would be required to add treatment to the two on-site containment systems (Northrop Grumman) and the GM-38 groundwater extraction and treatment system (U.S. Navy) for 1,4-dioxane and PFOS/PFOA if groundwater results for these parameters exceed future standards that are promulgated. The U.S. Navy recently completed a pilot test for the installation and operation of advanced oxidation process (AOP) technology at the GM-38 treatment plant to address 1,4-dioxane groundwater contamination. The U.S. Navy expects this AOP system to be operating at the GM-38 treatment plant in 2020. Furthermore, both Northrop Grumman and the U.S. Navy would be required to add treatment to the RW-21 Area and RE-108 Area groundwater extraction and treatment systems to address 1,4-dioxane and PFOS/PFOA if groundwater results for these parameters exceed future standards that are promulgated. Both the RW-21 Area and RE-108 Area groundwater extraction and treatment systems are currently under various stages of design and construction.

COMMENT 61: The NYSDEC must make a determination if treatment for radium 226 + 228 should also be provided at the existing treatment systems.

RESPONSE 61: While the radionuclides radium-226 and radium-228 are not considered site-related contaminants of concern, if groundwater extracted from the aquifer contains radium above the MCLs, then it would require treatment to below MCLs before it is discharged to the recharge basins. Sampling of the effluent for the three treatment plants operated by Northrop Grumman indicates that combined radium-226 and radium-228 concentrations ranged from 2.05 to 2.38

pCi/L and were below the MCL of 5 pCi/L. Similarly, based on recent sampling at the GM-38 Area groundwater extraction and treatment system, combined radium-226 and radium-228 concentrations from the extraction well (RW-1) and the treatment plant effluent were 1.19 and 3.12 pCi/L respectively and were below the MCL of 5 pCi/L.

COMMENT 62: The Public Water Supply Contingency Plan must be updated. The Bethpage Water District specifically requested that the Public Water Supply Contingency Plan be updated to address issues included as Comments #63 – #68 below.

RESPONSE 62: The Department will evaluate the existing Public Water Supply Contingency Plan that was developed in accordance with the March 2001 Record of Decision. The Public Water Supply Contingency Plan was developed for the design, construction, operation, and maintenance of wellhead treatment systems based on the results of groundwater samples collected from outpost (early warning) monitoring wells. Based on this re-evaluation, the Public Water Supply Contingency Plan will be updated as necessary.

COMMENT 63: A new public supply well assessment must be conducted using the USGS groundwater model.

RESPONSE 63: The Public Water Supply Contingency Plan, including a new public water supply well assessment using the USGS model, will be updated as necessary.

COMMENT 64: All outpost monitoring wells need to be reassessed for proper location and depth using the USGS groundwater model, and supplemental outposts wells need to be included if necessary.

RESPONSE 64: As mentioned in the Department's Response to Comment #63, the Public Water Supply Contingency Plan, including a new public water supply well assessment, will be updated as necessary. This will also include an evaluation of the existing outpost monitoring wells using the USGS model. Furthermore, an Operation, Maintenance, and Monitoring Plan will be completed that outlines the operation and maintenance of the remedy, the performance monitoring of the remedy, and the reassessment of the outpost monitoring wells.

COMMENT 65: The current new public supply well assessment plan only applies to currently un-impacted wells. The plan needs to address rising contaminant concentrations in wells that already include wellhead treatment and the need for enhanced treatment.

RESPONSE 65: The Public Water Supply Contingency Plan will be updated, as necessary, to include a section that specifically addresses the currently impacted public water supply wells.

COMMENT 66: The plan calls for the commencement of negotiations with affected water suppliers by Northrop Grumman or the Navy. The NYSDEC has no role. Negotiations between water suppliers and the PRPs without the NYSDEC is inappropriate and unreasonable. The NYSDEC should take on this responsibility.

RESPONSE 66: There are already multiple agreements in place between water suppliers and Northrup Grumman or the Navy as it relates to wellhead treatment. If negotiations between those

parties do not result in adequate resolution now or in the future, the Department is ready and willing to participate in those discussions as appropriate.

COMMENT 67: The list of plume contaminants must be updated in the plan, including 1,4 Dioxane, PFOS/PFOA, radium, and any other currently unknown contaminants that may exist within the plume that are currently unregulated or undetected.

RESPONSE 67: As needed, the Public Water Supply Contingency Plan will be updated to reflect emerging contaminants and other currently unknown contaminants that may be associated with the NWIRP and Northrop Grumman Bethpage Facility sites. As described in Response to Comment #23, radium-226 and radium-228 are not considered site-related contaminants of concern. The Department is however completing a comprehensive assessment to understand the origin of radium detections in groundwater near the former NWIRP and Northrop Grumman sites. The Department will determine if radium should be added to the list of site-related contaminants included in the Public Water Supply Contingency Plan based on this assessment.

COMMENT 68: The District completed a treatment system improvement at Plant 4 for nearly $8 million. The plan did not address this required upgrade, and the NYSDEC did not support the Water District. The District started negotiations with Northrop Grumman and were purposely strung along. With no NYSDEC support, we were forced to sue for reimbursement and were unsuccessful, so our taxpayers bore the brunt of the entire treatment plant upgrade cost. In addition, the plant is still being impacted by the plume and Northrop Grumman has stopped paying for O&M. Revision to the plan is required to reimburse the taxpayers of the Water District for the $8 million in capital costs and the O&M costs for the plant.

RESPONSE 68: The Department will determine if the Public Water Supply Contingency Plan needs to be updated in order to address this issue. The Department will consider all added municipal costs, including any unreimbursed costs incurred by water suppliers, in claims it may have against any and all responsible parties.

COMMENT 69: As recognized in our current and past plans, the operation of Plants 4, 5 and 6 provides a significant ancillary benefit of removing the majority (80% - 85%) of all the off-site mass being remediated from the plume. So as not to lose that remedial benefit, and as the plan relies on the continued operation of the wells, the NYSDEC must take the lead in establishing the strategy and use of the wells as the Water District proceeds with its plan to ultimately deactivate them from public drinking water use.

RESPONSE 69: As the Bethpage Water District correctly points out, the proposed AROD indicates that the Bethpage Water District Plants 4, 5, and 6 pumping wells would be transitioned over time from public water supply wells to remedial wells. To allow Bethpage Water District to continue to meet municipal demands without these wells, the remedy includes a provision for development of an alternate water supply. The transitioning of the water supply wells to remedial wells and the details regarding the development of an alternative water supply will be the subject of discussions with the Bethpage Water District.

COMMENT 70: The plan includes a cost of $17 million for "alternate supply" for the Bethpage Water District. We believe this estimate is low, to accomplish the scope of work necessary to fully achieve the alternate supply as described above. Our opinion of the cost of this work is roughly $40 million - $60 million.

RESPONSE 70: The Department based the $17 million for an alternate supply for the Bethpage Water District on an estimate contained in a letter from Congressman Thomas Suozzi to the Secretary of the Navy dated May 10, 2018. The Department will be developing refined costs associated with developing an alternative water supply as work progresses.

COMMENT 71: Mass removal in both RE-108 and RW-21 can provide significant benefit in mitigating/minimizing the contaminant impact to all affected public supply wells and should already be in operation. The lack of progress must not be tolerated. We urge the NYSDEC under its new plan to accelerate to the extent possible the start of meaningful off-site plume remediation.

RESPONSE 71: The Department agrees that removal of high concentrations of site contaminants from the RE-108 and RW-21 areas is important. This is why the Department has included eight mass flux wells in these areas as part of Alternative 5B in the proposed AROD. The Department will continue to facilitate expedited cleanup of the RE-108 and RW-21 areas. The U.S. Navy recently completed the drilling of an extraction well (RW-4) in the RE-108 area and expects to begin pumping contaminated water from this well for treatment in 2020. Northrop Grumman is currently seeking access to property to begin the installation of conveyance piping needed for the RW-21 area and expects to begin removing and treating contaminated water from this area in early 2021. To expedite remedial work plan and access approvals for the RW-21 Area, the Department participates in bi-weekly conference calls with the Town of Oyster Bay and Northrop Grumman. The Department has also participated in initial meetings with the U.S. Navy and the Town of Hempstead and Nassau County to discuss the scope of the RE-108 groundwater extraction and treatment system in an effort to expedite work plan approvals and access approvals. The Department expects that these project coordination meetings will continue as the remedial design and remedial construction of the RE-108 system continues.

Mr. Stan Carey, the Superintendent with the Massapequa Water District, submitted a comment letter dated July 3, 2019 which included Comments 72 to 76 below. Massapequa Water District also re-submitted the July 27, 2012 comments that the Massapequa Water District issued to the Department for the Northrop Grumman Operable Unit 03 Proposed Remedial Action Plan (PRAP) to be included as part of the Administrative Record. (The comments in the July 27, 2012 Massapequa Water District were generally not supportive of the earlier proposed remedy as Massapequa Water District determined that it was not protective of the drinking water supply.)

COMMENT 72: The proposed plan would include treatment for 1,4-dioxane at the various treatment facilities. We believe PFOS/PFOA treatment should also be included in the plan. Additionally, the ONCT, GM-38, RE-108, and RW-21 treatment systems should also have treatment for 1,4-dioxane and PFOS/PFOA removal.

RESPONSE 72: As part of the remedy detailed in the Department's proposed AROD, groundwater will be tested and treated to the Federal and State SCGs before it is discharged to recharge basins, Massapequa Creek, or used for irrigation purposes. This testing will include the analysis of perfluorinated compounds (PFOS/PFOA). The treatment plants included as part of

Alternative 5B will be designed with the flexibility to add treatment components for managing possible future contaminants.

As described in Response to Comment #50, both Northrop Grumman and the U.S. Navy would be required to add treatment to the two on-site containment systems (Northrop Grumman), GM-38 groundwater extraction and treatment system (U.S. Navy), RW-21 Area groundwater extraction and treatment system (Northrop Grumman), and the RE-108 Area groundwater extraction and treatment system (U.S. Navy) for 1,4-dioxane and PFOS/PFOA if groundwater results for these parameters exceed future standards that are promulgated.

COMMENT 73: The 2003 Public Water Supply Contingency Plan is now 16 years old and was based on the Northrup Grumman groundwater model. The plan must be updated based on current information and the new USGS groundwater model, with specific attention to the following.

- Update the threats to downgradient public supply wells;
- Confirm the proper number, location, depth and screen interval of all outpost monitoring wells;
- Confirm appropriate trigger values and expand the list of plume related contaminants;
- Establish an appropriate protocol if a trigger value is detected so that the Water District is supported by the NYSDEC if negotiations with the PRPs must commence, including time schedule from start of negotiation to implementation of treatment; and
- Include reimbursement to the Water District by the PRPs for reasonable costs associated with our due diligence and required professional participation in the program. We have spent over $400k to date, primarily in conducting our own assessments due to the lack of confidence we had with the PRPs and the Northrop Grumman groundwater model. Based on the proposed remedy, our assessments were validated, and we believe the Water District should be reimbursed.

RESPONSE 73: As described in Response to Comment #62, the Department will evaluate the existing Public Water Supply Contingency Plan to address the specific concerns identified by the Massapequa Water District and the nearby water districts. Based on this evaluation, the Public Water Supply Contingency Plan will be updated as necessary.

COMMENT 74: Redefine a "hot-spot" as necessary. Please specifically call it out as being no longer relevant and omitted or please describe it.

RESPONSE 74: Since the proposed remedy (Alternative 5B) relies on a mass flux approach combined with plume containment to achieve the remedial action objectives, the Department will no longer be using the term "hot-spot" when referring to areas with high concentrations of site contaminants.

COMMENT 75: RE-108 and RW-21 treatment areas have been identified for over 10 years and remediation in either location is still not taking place. Significant benefit in mitigating/minimizing the contaminant impact to all affected public supply wells would be realized the sooner remediation actually starts happening. We urge the NYSDEC under this plan to accelerate to the extent possible the start of meaningful off-site plume remediation in these locations.

RESPONSE 75: As described in Response to Comment #71, the Department agrees that removal of high concentrations of site contaminants from the RE-108 and RW-21 areas is important in achieving the remedial action objectives outlined in the Department's proposed AROD. As such, the Department will continue to facilitate expedited cleanup of the RE-108 and RW-21 areas.

COMMENT 76: The schedule for installing extraction wells to contain the leading edge of the plume must be accelerated. Remediation at the leading edge can be accomplished in 2 to 3 years, and we further urge the NYSDEC to accelerate that aspect of the overall program.

RESPONSE 76: The design and construction timeframe will be accelerated to the greatest extent practicable while maintaining strict adherence to design and construction best practices. The Department expects to be able to divide the project into logical components during the design and construction of this remedy and this will allow some components of the remedial system to be brought on-line while other components are under construction. This will be evaluated during the early part of the remedial design.

Mr. John L. Reinhardt, the Commissioner with the Town of Hempstead Department of Water, submitted a comment letter dated July 5, 2019 which included the following comments (Comments 77 to 86):

COMMENT 77: Given the continued progress of the contaminants in groundwater and the anticipated five year implementation timeline, we have concerns about the preliminary sites proposed for extraction wells, especially on the southern limits of the plume. Additionally, given the fact that nearly one third of the extraction wells and a number of the decentralized treatment facilities will be located in the Town of Hempstead, the Town and its residents must be included in final siting of facilities.

RESPONSE 77: The number and location of extraction wells will be determined during the remedial design based on pre-design sampling. It is expected that the pre-design sampling will include the installation of additional vertical profile borings/monitoring wells, the collection and analysis of groundwater samples, and additional USGS groundwater flow modeling. The groundwater flow modeling will be used to optimize the placement of extraction wells to capture the leading edge of the Navy Grumman groundwater plume and this process will factor in movement of the plume front relative to the anticipated start of the remedy. The Department will continue to keep the Town of Hempstead Department of Water and the Town of Hempstead residents updated during the remedial design.

COMMENT 78: At numerous points in the report it is stated that single walled HPDE piping would be used for conveyance of untreated water from hydraulic containment wells to treatment facilities.

RESPONSE 78: Groundwater will be conveyed from the Mass Flux extraction wells to the centralized treatment plant using double walled pipe due to the potential of high concentrations of COCs in groundwater. It is expected that groundwater will be conveyed from the hydraulic containment wells to the centralized treatment plant or decentralized treatment plants using single walled pipe due to the anticipated low concentrations of COCs in groundwater as described in the FS and proposed AROD. The results of groundwater sampling completed during the remedial

design will be used to confirm where double walled and single walled conveyance piping will be used.

COMMENT 79: As it is discussed that the implementation would take five years to complete, it is assumed that the plan would be implemented and systems placed online as they are completed. Has any consideration been made as to what systems would take priority, those at the southern margins to halt progress, or those in areas of higher concentrations?

RESPONSE 79: As described in the Department's Response to Comment #76, the Department expects to be able to divide the project into logical components during the design and construction of this remedy. This project structure would allow some components of the remedial system to be brought on-line while other components are under construction. The potential benefits and drawbacks associated with beginning with either the mass flux wells or the hydraulic containment wells will be fully evaluated by the Department early in the remedial design process.

COMMENT 80: The Levittown Water District wells 7A, 8A, and 13 were out of service during the period 2010-2015 that was used to calculate the average pumping from municipal wells in the USGS model.

RESPONSE 80: As summarized in Response to Comment #77, Alternative 5B will be further evaluated with groundwater flow modeling as part of the remedial design. The pumping rates for the Levittown public water supply wells will be re-evaluated and more recent pumping rates will be used in future groundwater modeling if necessary.

COMMENT 81: In numerous places throughout the documents, the three Levittown wells (7A, 8A and 13) are not included in the total number of public wellheads with treatment.

RESPONSE 81: The proposed AROD identifies six separate water plants where the U.S. Navy and Northrop Grumman provided wellhead treatment based on the Public Water Supply Protection Program. While it is recognized that the three Levittown wells (7A, 8A and 13) require treatment, these wells were not included in the total number of public wellheads with treatment because the U.S. Navy and Northrop Grumman did not provide the funding for treatment at these locations to address contaminants associated with the Navy Grumman groundwater plume.

COMMENT 82: Table 8-3 does not include the three well fields located in Levittown. Given the proximity of the proposed DECHC-02 to Levittown 7A, 8A, and 13, the effect of the proposed remedy on these wells must be considered.

RESPONSE 82: The USGS groundwater flow model was used to evaluate the potential effect the proposed remedy could have on the Levittown public water supply wells during the preparation of the FS. Based on the groundwater flow modeling, the potential effect the proposed remedy would have on these wells was minimal and therefore not included on Table 8-3. The Levittown 7A, 8A, and 13 wells will be included in tables created during future modeling completed as part of the remedial design.

COMMENT 83: Figure 13 (AROD) shows the westerly edge of the SCG plume crossing in to the Levittown 5A and 6B well field. Allowing the contaminants to continue to migrate towards these

wells unchecked and relying on the public supply wells to pump and treat the plume is counter to cleanup guidelines.

RESPONSE 83: Alternative 5B was not designed to rely on the Levittown 5A and 6B well field to remediate the westerly edge of the Navy Grumman groundwater plume. Instead, Alternative 5B was designed using the USGS groundwater flow model to hydraulically contain the entire SCG plume using a network of groundwater extraction wells. These groundwater extraction wells have been located to protect the existing water supply wells; including the Levittown 5A and 6B wells. The placement of extraction wells along the westerly edge of the Navy Grumman groundwater plume will be further evaluated with groundwater flow modeling as part of the remedial design.

COMMENT 84: What commitment is made for the continued operation of the system after the 30 years considered in the financial analysis.

RESPONSE 84: The cost estimate presented in the FS includes funds to pay for the construction along with the long-term operation and maintenance of the remedy (30-years). While a 30-year timeframe is used as a basis of comparison between each of the alternatives included in the proposed AROD, it is expected that Alternative 5B will require approximately 110 years to meet the remedial action objectives. The operation of the components of the remedy would therefore continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

COMMENT 85: Safeties must be installed on all treatment systems components to immediately cease pumping in any situations where a system component may have failed. Additionally, there must be localized monitoring of recharge basin levels and the effect recharge has on groundwater levels and surrounding homes.

RESPONSE 85: An Operation, Maintenance, and Monitoring Plan (OMM) will be prepared that outlines the operation of the remedy (including monitoring system components) according to best practices. The OMM plan will include a performance monitoring plan that will address recharge basin monitoring and the mounding of the water table near the recharge basins. It is expected that the remedial system will also be designed to systematically reduce or stop the discharge of treated water to recharge basins in anticipation or arrival of major storms where surface runoff will be high.

COMMENT 86: The conceptual plan for the chosen remedy indicates that one third of the wells will be installed within the limits of the Town of Hempstead. Prior to selection of final well and treatment system locations the Town of Hempstead and its residents must be included in the process via informative mailings, meetings with Town officials and public presentation meetings.

RESPONSE 86: As described in Response to Comment #25, due to the complexity of the project and the implementation in a heavily developed area within Nassau County, the Department staff will be working closely with the community throughout the design and construction of this project. Furthermore, the Department expects to continue with the monthly conference calls with the water districts; including the Town of Hempstead Department of Water.

Mr. Francis J. Koch, the Superintendent with the South Farmingdale Water District, submitted a comment letter dated July 5, 2019 which included the following comments (Comments 87 to 96):

COMMENT 87: South Farmingdale Water District (SFWD) Well No. 3 appears vulnerable located on the edge of the greater than 50 ppb plume. Adjustments to proposed extraction well locations or an additional extraction well to protect this or any drinking water well should be included in the refined detailed process of the design stage and implementation plan.

RESPONSE 87: The USGS groundwater flow modeling was completed to not only develop remedial alternatives that would prevent the continued expansion and migration of the Navy Grumman groundwater plume, but that would also reduce contaminant concentrations in the currently impacted public water supply wells. To specifically reduce contaminant concentrations in the currently impacted public water supply wells, the proposed Alternative (Alternative 5B) includes a network of mass flux wells designed to complement the planned U.S. Navy and Northrop Grumman RE-108 and RW-21 groundwater containment systems, respectively. The Department will use the USGS groundwater flow model during the remedial design to evaluate what actions may be needed to protect the South Farmingdale Water District public water supply wells; including Well No. 3.

COMMENT 88: The SFWD requests reconsideration of proposed extraction and containment well locations shown under Alternative 5B to achieve protection for all of the District's supply well fields.

RESPONSE 88: As described in Response to Comment #87, the Department will further evaluate protection to the SFWD public water supply wells with the groundwater flow model during the remedial design. The results of this evaluation will be provided to the SFWD.

COMMENT 89: The SFWD requests the NYSDEC provide hydraulic model output figures showing the capture zones of the SFWD wells.

RESPONSE 89: As described in Response to Comment #88, the Department will provide the SFWD with the results of the groundwater flow modeling completed during this remedial design. This will include figures showing the capture zones of the SFWD water supply wells.

COMMENT 90: We request documentation from the NYSDEC supporting the statement that the SFWD wells will not be negatively impacted during the implementation and operation of Alternative 5b.

RESPONSE 90: The statement in the FS that the SFWD wells will not be negatively impacted during the implementation and operation of Alternative 5B was in reference to the amount of water level drawdown in selected SFWD wells, potentially caused by Alternative 5B. The documentation is provided in Table 8-3 of the FS.

COMMENT 91: We encourage the NYSDEC to sequence the mass flux wells ahead of the southernmost containment wells.

RESPONSE 91: As described in Response to Comment #79, there are benefits and drawbacks associated with beginning with either the mass flux wells or the hydraulic containment wells and

the Department will fully evaluate these early in the remedial design process.

COMMENT 92: Please continue to keep SFWD informed.

RESPONSE 92: As described in Response to Comment #25, due to the complexity of the project and the implementation in a heavily developed area within Nassau County, the Department staff will be working closely with the community throughout the life of this project. Furthermore, the Department expects to continue with the monthly conference calls with the water districts; including SFWD.

COMMENT 93: As proposed for Bethpage Water District, we request consideration for development of an alternative water supply source outside of the plume impact area for the South Farmingdale Water District.

RESPONSE 93: As detailed in the proposed AROD, three Bethpage water plants have been most impacted by the groundwater plume originating from the NWIRP and Northrop Grumman Bethpage Facility sites. Specifically, Bethpage Water District Plants 4, 5, and 6 are immediately downgradient of the NWIRP and Northrop Grumman Bethpage Facility sites, are within the central portion of the groundwater plume, were the first to require wellhead treatment, and groundwater withdrawn from some of these wells has exhibited continuous increases in contaminant concentrations over time. While these three Bethpage Water District plants are operated to meet municipal demands, they indirectly remove significant amounts of site-related contaminants from the aquifer system through water extraction and treatment. Although this removal provides an added remedial benefit, this use of public water supply wells to indirectly remove groundwater contamination is not a preferred option over the long term. Therefore, it is the intent of the Department and NYSDOH to transition the Bethpage Water District Plants 4, 5, and 6 pumping wells over time from public water supply wells to remedial wells. To allow Bethpage Water District to continue to meet municipal demands without these wells, a provision for development of an alternate water supply in the future is required and included as a common component of each remedial alternative. With implementation of Alternative 5B, the Department expects to prevent site contaminants from impacting the currently un-impacted public water supplies and to reduce contaminant concentrations in the currently impacted public water supplies. Based on this, the Department does not feel development of an alternate water source for the SFWD is necessary.

COMMENT 94: The SFWD believes that all new and proposed treatment facilities (including RE-108 and RW-21) should provide treatment for the removal of 1,4-dioxane and PFOS/PFOA, and the existing ONCT and GM-38 treatment systems should be retrofitted to include treatment for these emerging contaminants.

RESPONSE 94: Please see the Response to Comment #72.

COMMENT 95: The SFWD urges the NYSDEC under this plan to accelerate to the extent possible the start of meaningful, off-site plume remediation in the RE-108 and RW-21 areas, as mass removal could provide significant benefit in mitigating/minimizing the contaminant impact to affected public supply wells.

RESPONSE 95: As described in Response to Comment #71, the Department agrees that removal

of high concentrations of site contaminants from the RE-108 and RW-21 areas is important and the Department will continue to facilitate expedited cleanup of the RE-108 and RW-21 areas by Navy and Northrup Grumman, respectively.

COMMENT 96: The 2003 Public Water Supply Contingency Plan, based on the Northrop Grumman groundwater model, is outdated and uninformed as to the current threats and impacts of the plume on public supply wells. We expect NYSDEC will update this Plan in consideration of the USGS groundwater model and additional information that has become available over the past 16 years. This updated Plan must:

- Confirm the location and screen depth of each outpost monitoring well, reassess their positions, and require construction of supplemental outpost wells if necessary;
- Update the list of plume contaminants to include 1,4-dioxane, PFOS/PFOA, and other currently unknown contaminants that may exist within the plume that are currently unregulated or undetected, and confirm appropriate trigger values;
- Establish the protocol for exceedance of a trigger value that involves the NYSDEC in negotiations between the affected water supplier and Northrop Grumman/Navy, and state the maximum duration allowable between negotiation initiation and treatment implementation; and
- Extend the Plan to include public supply wells where treatment has been provided, but enhancement may be required due to rising concentrations or the arrival of additional contaminants.

RESPONSE 96: As described in Response to Comment #62, the Department will evaluate the existing Public Water Supply Contingency Plan to address the specific concerns identified by the South Farmingdale Water District and the nearby water districts. Based on this evaluation, the Public Water Supply Contingency Plan will be updated as necessary.

Mr. Robert J, McEvoy, Richard P. Niznik, and Michael F. Rich III, the Board of Commissioners with the Oyster Bay Water District, submitted a comment form which included the following comment:

COMMENT 97: The Oyster Bay Water District strongly agrees with the proposed amended remedy addressing the Navy Grumman plume cleanup.

RESPONSE 97: Comment noted.

II. B. Public Comments

COMMENT 98: I have extreme concern regarding the ground stabilization. In the case where millions of gallons of water are being extracted daily, will there be any adverse effects on the support of the ground above? When you are extracting this large amount and only recharging a smaller percentage, will this undermine the stability of our ground soil? Should I be concerned about sink holes and my house shifting?

RESPONSE 98: As described in the Department's Response to Comment #11, subsidence or consolidated settlement will not occur as a result of implementing Alternative 5B and you do not need to be concerned about the formation of sinkholes or your house shifting. As the Magothy

aquifer is very permeable, large amounts of water can be pumped from the aquifer without causing significant changes in water level (pore or fluid pressure) in the aquifer that could cause subsidence. Furthermore, over seventy-five percent of water extracted from the aquifer will be treated and then immediately returned or recharged back to the aquifer. Therefore, subsidence or consolidated settlement will not occur while implementing Alternative 5B.

COMMENT 99: Several residents submitted comment letters that supported the Department's proposed AROD to address the Navy Grumman groundwater plume cleanup. Many of these letters asked that the cleanup be completed in less than the five years outlined in the proposed AROD.

RESPONSE 99: Comments noted. As described in the responses to earlier comments, the design and construction timeframe will be accelerated to the greatest extent practicable while maintaining strict adherence to design and construction best practices.

COMMENT 100: I agree with the Alternative 5B plan but do not want the pipeline going down North Windhorst Avenue. Please use the alternative location along the utility easement adjacent to King Kullen Headquarters being purchased by Stop and Shop on Central Avenue. Why should we have our streets torn up? I'm also concerned with potential damage to our existing water and sewer lines with all of the drilling.

RESPONSE 100: The final location of the underground conveyance piping will be determined during the remedial design in consultation with the Town of Oyster Bay or the Town of Hempstead and the Nassau County Department of Public Works. Where possible, locations will be selected to avoid disturbances to the Town of Oyster Bay and the Town of Hempstead communities. The installation of underground conveyance piping under Alternative 5B is very similar to the installation of other types of underground utilities (e.g., sewer lines, telephone lines, electrical lines, etc.). Prior to installing underground conveyance piping, the existing underground utilities are identified. This allows the engineer to appropriately design the underground conveyance piping and avoid disruptions to the existing underground utilities. A narrow, short section of shallow trench will be excavated, the underground piping installed, and the excavation backfilled and re-surfaced.

COMMENT 101: There is a significant amount of piping and conduit that will need to be run through the public streets. Will consideration be given to using trenchless technologies to minimize the impact to residents?

RESPONSE 101: The potential application of trenchless technologies will be evaluated during the remedial design. Trenchless technologies will be used, where appropriate, to install underground piping and to minimize potential impact to residents.

COMMENT 102: One of the discharge areas for the treated groundwater is Massapequa Creek. This body of water contains brook trout native to New York. What treatment standards will be applied to ensure protection of this population of native fish? Will this include factors besides chemical, such as temperature and dissolved oxygen?

RESPONSE 102: As described in the Department's Response to Comment #17, water discharged to Massapequa Creek will be treated to Federal, State, and local SCGs including temperature and dissolved oxygen.

COMMENT 103: Can more detail be provided as to the location of the Centralized Treatment Plant that discharges to Massapequa Preserve (near the northwest corner of Massapequa Preserve)? Would areas of Massapequa Preserve be cleared in order to site this building? There are few remaining areas of open space in this area of Nassau County, and would not want to lose any from this valuable preserve?

RESPONSE 103: The exact location of a water treatment plant will be determined during the remedial design in consultation with the Nassau County Department of Public Works and the NYS Department of Transportation. It is possible that the treatment plant would be constructed outside of the Massapequa Preserve in the right-of-way area adjacent to the Southern State Parkway.

COMMENT 104: I do not see any remediation plans for the radium or radon. There are also no plans to test for the radium source or any plans to test any homes, schools or commercial buildings on the plume for radon levels. I think the radium issue needs to be addressed.

RESPONSE 104: Please see the Response to Comment #23.

COMMENT 105: With the digging that will be required for the extensive piping that will need to be put in place, I am hoping every single provision will be put in place to ensure that there are no risks to air quality. I am hoping air pollution detectors will be utilized during the entire process and contingencies are put in place in the event of any breach of air quality.

RESPONSE 105: While the remedy outlined in the Department's proposed AROD includes the installation of approximately 23.5 miles of underground piping, the majority of this piping will not be installed on the former U.S. Navy and Northrop Grumman properties. Instead, the majority of the underground piping will be installed beneath or near existing roads or in public right-of-way areas where site-related contamination is not expected. During the installation of the underground piping however, the contractors will work in accordance with a Community Air Monitoring Plan (CAMP). A CAMP is always required to be followed during construction activities at contaminated sites for the protection of a downwind community from potential contaminant releases that may originate during remedial work activities. Although a CAMP is not required in areas where site-related contamination is not present, out of an abundance of caution, a CAMP will be followed during pipeline installation. Instruments used to measure volatile organic compounds (VOCs) and particulates (i.e. dust) are typically set up at the downwind perimeter of work areas to monitor air quality. The real-time monitoring results are compared to action levels to determine if the monitoring frequency needs adjustment, if corrective actions are necessary, or if work shutdown is necessary.

COMMENT 106: Please change the name of the plume to the Grumman-Navy Plume and stop using the Bethpage Plume. This will serve as a reminder to the public as to who is responsible for this awful mess!

RESPONSE 106: As described in the Response to Comment #26, the Department refers to the plume as the Navy Grumman groundwater plume and we encourage others to follow our lead in referring to this plume as the Navy Grumman groundwater plume.

COMMENT 107: Compile a database that tracks the health issues of residents which includes canines and felines. I can assist in database management as I know access and other software. Mathematical analysis needs to be conducted once data is obtained and cross referenced with other parts of the country. I am a Math Professor so again I can help with this.

RESPONSE 107: The NYSDOH routinely collects information about several types of health outcomes. The NYS Cancer Registry collects mandatory reports of all malignant cancers (except selected skin cancers) from physicians, dentists, laboratories, and other health care providers. Similarly, information about birth defect diagnoses are collected within the NYS Congenital Malformations Registry, and information about other birth outcomes is collected from birth certificates. Collection of information about animal health is outside the purview of NYSDOH.

COMMENT 108: The soil needs to be addressed more than it has been at a recent meeting. I have a garden that is watered regularly. I recall in past meeting discussions about the soil were conducted but you need to make the public more aware as to what is going on with the soil (when tests were/are conducted and what the results are).

RESPONSE 108: Water used to irrigate your garden is provided by the local water districts and does not contain site-related contaminants. The water districts are regulated by the New York State Department of Health and must be in compliance with the drinking water standards. The Department is working with both the U.S. Navy and Northrup Grumman to clean up soil located on the former U.S. Navy and Northrop Grumman properties. Both the U.S. Navy and Northrop Grumman periodically hold meetings to update the public on these cleanup activities. Please also see the Department's Response to Comment #32. Please visit the NYSDEC project web site (http://www.dec.ny.gov/chemical/35727.html) and make sure to sign up for the NYSDEC listserv (https://www.dec.ny.gov/public/65855.html) to receive announcements from the NYSDEC on project-related activities. Information on meetings held by the U.S. Navy and the cleanup activities being completed by the U.S. Navy can be found at the following U.S. Navy website:

https://www.navfac.navy.mil/products_and_services/ev/products_and_services/env_restoration/installation_map/navfac_atlantic/midlant/nwirp_bethpage.html.

COMMENT 109: I am concerned about Senator Schumer's comments about a company from California that relied on invalid lab results (or something of that nature) for past cleanup work. I would like some credible information regarding this.

RESPONSE 109: The Department believes that this comment relates to a recent newspaper article involving work performed by a U.S. Navy contractor at a site in California. The Department reviews and approves all work plan and design documents prepared by the U.S. Navy and Northrop Grumman and provides oversight during field investigation and cleanup activities. Furthermore, samples are analyzed by independent and certified laboratories using approved methodologies. Following laboratory analysis, the analytical results undergo a thorough review by a third-party data validator.

COMMENT 110: I am concerned about the high levels of 1,4-dioxane and PFOAs in our water. I read they are very difficult to filter out and I hope that the proposed plan includes proper filtration of these chemicals from our water at the plant stage.

RESPONSE 110: As part of the remedial design, groundwater samples will be collected and analyzed to determine the concentrations of site contaminants in groundwater. The groundwater samples will also be analyzed for 1,4-dioxane and the per- and polyfluoroalkyl substances (PFAS). The results of the groundwater samples will be used to appropriately design treatment systems. The water will be treated to meet the federal and state standards, criteria, and guidance values (SCGs) before it is discharged to recharge basins, Massapequa Creek or used for irrigation purposes. Also, public water suppliers affected by the Navy Grumman groundwater plume are required to meet New York State Department of Health drinking water standards for public water suppliers. When standards are promulgated for 1,4-dioxane and per- and polyfluoroalkyl substances, and if these compounds are present at concentrations above the standards, the water suppliers will be required to treat the water distributed to customers to remove these emerging contaminants in accordance with NYSDOH requirements.

COMMENT 111: I'm also concerned about the "fiscally responsible" conversation when discussing which scenario to choose. If there is a plan that will better rid Bethpage of this contamination I believe it needs to be considered even if it's more expensive. I was not thrilled by the wording used at the public meeting.

RESPONSE 111: The evaluation of the remedial alternatives is based on a comparison of eight criteria. One of the criteria is cost effectiveness. As outlined in the proposed AROD, Alternative 5B was selected as the Department's preferred remedy based on a comparison of these eight criteria. Based on this evaluation, Alternative 5B is protective of human health and the environment and was determined to be the most cost-effective because it includes extraction of groundwater from the central portion of the plume combined with hydraulic containment of the entire Navy Grumman groundwater plume. Alternative 5B was determined to be less expensive than Alternatives 4 and 5A, but more expensive than Alternatives 2A, 2B, 3A, and 3B.

COMMENT 112: "Hotspot" treatment in the attempt to quickly remove the high levels of contamination from our water may not be sufficient to adequately remediate the broad spectrum of chemicals found under our homes. The contaminants being addressed include primarily trichloroethylene (TCE), among other volatile organic compounds. In addition, elevated levels of radium and 1,4-dioxane have been detected in the plume and there needs to be adequate flexibility is the plan to study AND remove those contaminants. New contaminants continue to be identified in the plume for which existing wellhead treatment has been ineffective. Until these new contaminants were discovered, over 30,000 people, including children and pregnant women, drank (and in the case of 1,4-dioxane, continue to drink) water containing these contaminants. In addition to radium, contaminants in the plume such as perfluorooctanoic acid (PFOA), perfluorinated octanoic sulfuric acid (PFOS) and other unregulated contaminants are likely to be discovered in the future. The plan should be flexible to address these and other emerging contaminates and systems should be built to quickly and easily add the necessary treatment methods without extensive rework, redesign, delays and their associate costs.

RESPONSE 112: Please see the Response to Comment #110. Additionally, to address possible future contaminants, the water treatment plants will be designed with the flexibility to add treatment components if necessary.

COMMENT 113: The alarming discovery of radon, a known cause of lung cancer and the natural decay product of radium has been detected at high levels in Bethpage schools and no other known formal sampling of radon intrusion has occurred within the plume area. While most detected radium could be naturally occurring, it is still a significant hazard in drinking water and should be addressed as a known contaminant. A wider sampling for all known contaminants in homes should be performed as we know the water beneath these homes has been affected. The detection of radium within the plume only came about after Senator Schumer demanded disclosure as part of a formal report issued to the United States Congress. The Navy's inappropriate silence regarding radium was revealed by a lawsuit filed by the local community group, Long Island Pure Water. In 2018, the Navy finally conducted sampling for radium and detected levels up to 9.3 pCi/L. This is nearly double acceptable level for drinking water and Bethpage is the only area on Long Island to have this level. The Navy somehow concluded that the radium detection was likely not the result of a release at NWIRP or Grumman property, but instead is naturally occurring. We, the community members disagree.

RESPONSE 113: Please see the Response to Comment #23. Routine testing has not shown a violation of drinking water standards for radium for the Bethpage Water District. All Bethpage wells in active use are regularly tested for radium and many other contaminants, both man-made and naturally-occurring. Out of an abundance of caution, Bethpage Water District took a water supply well offline that occasionally showed elevated concentrations of radium, not inconsistent with some naturally-occurring radium concentrations, and that well is not currently used for drinking water.

COMMENT 114: As community members, we would like to be a part of the official NYS plan and have a seat at the table during discussions, press releases and news conferences. Too often we find out about meetings, decisions and plans only after elected officials, federal, state and other agencies have made press releases. A local board of knowledgeable residents should be included in semi-annual open meetings to keep the community aware of construction progress, impending changes, road closures and other events including discovery of new contaminants that could affect our daily lives. The US Navy has been using this process for nearly 30 years and it helps keep the residents and elected official in touch with the community issues regarding this extensive operation. As a formal part of the process, community members would be empowered to request additional testing for specific concerns just as Senator Schumer was able to do.

RESPONSE 114: As described in Response to Comment #25, due to the complexity of the project and the implementation in a heavily developed area within Nassau County, the Department staff will be working closely with the community throughout the life of this project. Furthermore, it is expected that a representative from the U.S. Navy Restoration Advisory Board (RAB) would be incorporated into a Community Liaison Plan as part of the implementation of the proposed remedy.

COMMENT 115: The plan envisions a network of wells, pipes, pumping stations and treatment facilities which will cause extensive road construction over the next 20 years. Involvement in the design and selection of sites in the past has been an issue and we the residents seek to improve this

process. Piping layout should try to minimize distance traveled, utilize less traveled roadways and include a plan for subsequent roadway resurfacing. Coordination with the state, county and towns to improve the scheduling of road work is imperative to minimize cost and reduce travel disruption. Treatment facilities in the Alternative 5B plan will be mostly located in industrial zone near the NWIRP but at least 3 are located in residential communities near the Southern State Parkway. These should be sited in such a way as to minimize local resident impact as both operating noises and heavy construction vehicles could impact their daily routines.

RESPONSE 115: The Department will be coordinating construction activities with the Nassau County Department of Public Works, the Town of Oyster Bay, the Town of Hempstead, and the New York State Department of Transportation in an effort to minimize potential impacts to residents.

COMMENT 116: At a minimum, the DEC should authorize a board to oversee and/or conduct a comprehensive radiological material investigation throughout the plume (which will include radium and the intermediary breakdown components including Radon) as that is vital to protect human health. In home radon sampling should be performed to rule out any exposure. Additionally, the DOH should be directed to conduct a larger health study of all affected areas based on the water distribution networks to determine if any unusual patterns exist with regard to cancers, heart disease, reproductive issues or autoimmune disease including thyroid issues.
These studies must be funded by the State with the responsible parties ultimately picking up the cost (Northrop Grumman & the Navy). We cannot allow any more time to pass while our families, friends and neighbors wait for information and action from our government on matters that greatly impact their lives and safety.

RESPONSE 116: Please see the Responses to Comment #23 and Comment #27.

COMMENT 117: Is it possible for the plume to migrate at a faster rate than the current rate, in turn, possibly contaminating the Massapequa Wells before the plan is entirely implemented?

RESPONSE 117: Groundwater moves at a very slow rate (typically less than one foot per day). The U.S. Navy and Northrop Grumman have implemented an extensive groundwater monitoring program that allows the Department to track the location of the Navy Grumman groundwater plume and monitor contaminant concentration changes over time. The Department's proposed remedy has been specifically designed to expedite cleanup of the plume by installing eight extraction wells in areas where high concentrations of site contaminants exist and to prevent the continued migration of the plume by installing 16 hydraulic containment wells along the margins of the plume. The 16 hydraulic containment wells have been located to prevent the Navy Grumman groundwater plume from impacting the currently unimpacted public water supply wells; including the Massapequa Water District public water supply wells.

COMMENT 118: Currently the proposed remedy was selected to achieve certain goals which include: "reduce contamination in currently impacted wells", "reduce the volume and contaminant concentrations", and "Protect the Long Island Aquifer and the region's water resources by returning treated water to the water system". My concern is that it does not state that the treatment will eliminate the contaminants. Does this mean that the "treated" water that will be returned to the Long Island Aquifer and the Massapequa Creek, will still contain contaminants? And if so, do

we have to worry about toxins and chemicals becoming absorbed by our surrounding soil and eventually becoming airborne?

RESPONSE 118: No, the treated water will no longer contain site contaminants. The contaminated groundwater will be removed from the Long Island Aquifer using a series of extraction wells. Once the contaminated water is removed, the water will undergo treatment at the surface using state-of-the-art technology to meet the Federal and State SCGs. Once the water is treated (contaminants removed) it will then be discharged to recharge basins, Massapequa Creek, or used for irrigation purposes.

COMMENT 119: Can we be assured that reducing the level of contaminants to state standards is enough to say that our health and our children's health is not at risk?

RESPONSE 119: The NYSDOH has promulgated Maximum Contaminant Levels (MCLs), that are the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. These MCLs are conservatively set at levels that research has shown are not likely to cause adverse health effects, and that will provide a sufficient margin of protection against adverse health effects for all members of the population, including sensitive subgroups who may be particularly vulnerable or sensitive to the effects of contaminant exposure, such as young children and the elderly.

COMMENT 120: There is no mention of radiological elements or any remediation for groundwater or soil for these contaminants.

RESPONSE 120: Please see the Response to Comment #23.

COMMENT 121: Natural attenuation at sites, contaminated to this degree, should not be considered a form of remediation.

RESPONSE 121: The remedy outlined in the Department's proposed AROD does not rely on natural attenuation to address contamination in the Navy Grumman groundwater plume. Instead, the proposed alternative relies on a network of mass flux wells to expedite cleanup of the plume and hydraulic containment wells to prevent continued migration of the plume. The Department's proposed AROD actually points out that natural attenuation alone in many areas of the off-site plume would not significantly contribute to attaining groundwater quality standards.

COMMENT 122: I ask that radionuclides are included in all water testing on LI whether it is naturally occurring, or accidentally placed into the drinking water public wells by businesses.

RESPONSE 122: Groundwater collected from municipal water supply wells have been and will continue to be tested for the radiological parameters required by the NYSDOH consistent with the Federal Safe Drinking Water Act (1976) including the Radionuclides Rule.

COMMENT 123: Solute ion linear alignment (SILA) and the solute ion monopole motor (SIMM) should be given very serious consideration as means to dramatically reduce the costs and safety issues to the local residents by the long-term presence of the plume.

RESPONSE 123: As part of the remedial design, water treatment technologies will be evaluated to determine the most appropriate treatment technology to achieve the SCGs prior to placement of the treated water in recharge basins or Massapequa Creek, or used for irrigation purposes at Bethpage State Park.

COMMENT 124: Failure to contain the several toxic plumes may have extreme and serious effects on the Massapequa Preserve and the Great South Bay.

RESPONSE 124: The Department's proposed remedy is designed to hydraulically contain the Navy Grumman groundwater plume and prevent migration toward Massapequa Preserve and the Great South Bay.

COMMENT 125: Exploratory drilling should be completed in all directions around the U.S. Navy and Northrop Grumman sites to determine if unanticipated drift of the groundwater plume has occurred.

RESPONSE 125: As part of the remedial design, additional vertical profile borings will be drilled and groundwater monitoring wells will be installed to refine the horizontal and vertical extent of the Navy Grumman groundwater plume. This information will also be used to assist in designing the groundwater extraction wells and selecting the optimum locations for the extraction wells.

COMMENT 126: Health studies of all personnel who ever worked at Bethpage Community Park and Bethpage High School must be completed.

RESPONSE 126: There is no data available that suggests people who have worked at the Bethpage Community Park or the Bethpage High School have been exposed to site-related contaminants during their employment. Therefore, health studies of these individuals is not warranted.

COMMENT 127: Piping of the toxic waste plumes to one centralized treatment area should be considered.

RESPONSE 127: The Department did evaluate the use of both centralized and decentralized treatment plants in the FS and the proposed AROD. Based on this evaluation, it was determined that two centralized treatment plants and three smaller decentralized (local) treatment plants would be the most effective approach to treat and subsequently manage contaminated groundwater removed from the Navy Grumman groundwater plume.

COMMENT 128: Will the June 10, 2019 public meeting be recorded or otherwise made available to persons who cannot attend the meeting in person?

RESPONSE 128: The public meeting was not recorded, but the Department has placed the public meeting slides on the project website (https://www.dec.ny.gov/chemical/35727.html). Additionally, the complete transcripts of the public meeting can be found in Appendix C of the AROD.

COMMENT 129: Will residents living on the numbered streets and the general area near the Bethpage Community Park be included in the remedy outlined in the Department's proposed plan?

RESPONSE 129: While residents living on the numbered streets will not be directly included in the remedy, this part of the Town of Oyster Bay is within the Navy Grumman groundwater plume and the area where the remedy outlined in the Department's AROD will be implemented.

COMMENT 130: Is anyone testing the current air quality at the Grumman Northrup buildings? What is coming out of the smoke plumes on a daily basis? The air in and around Grumman (where Nassau County houses the Office of Emergency Management) smells foul?

RESPONSE 130: Yes. During investigation and cleanup activities, both the U.S. Navy and Northrop Grumman perform community air monitoring in accordance with NYS Department of Health guidelines. Additionally, both the U.S. Navy and Northrop Grumman perform air monitoring of the two on-site and one off-site groundwater extraction and treatment systems in accordance with the Department approved Operation, Maintenance, and Monitoring plans. The air monitoring results are provided to the Department and demonstrate that the air discharges comply with the NYSDEC Division of Air Resources regulatory requirements.

Northrop Grumman no longer performs manufacturing at their Bethpage facility. The exhaust stacks referenced in the comment are likely associated with the natural gas-fired CALPINE Bethpage Power Plant that is located on the former Northrop Grumman Bethpage Facility property and near the Nassau County Office of Emergency Management. The emissions from this power plant are regulated by the NYSDEC Division of Air Resources. The NYSDEC Division of Air Resources have not received significant complaints about air quality in the area in the past year and a half.

II. C. Citizen Groups & non-Profit Organizations

Ms. Sarah Meyland, Director, Center for Water Resources Management, New York Institute of Technology, submitted a comment letter dated June 25, 2019 which included the following comments (Comments 131 to 147):

COMMENT 131: In general, the May 2019 AROD report is a substantial improvement upon the first remediation plan released by the NYS DEC in 2016. It presents a serious look at alternative approaches for how to remediate the largest contaminated groundwater plume in New York State. It also is a stark illustration of what can go wrong when a major source of groundwater contamination is left substantially unaddressed for nearly 50 years. If for no other reason, the Navy-Grumman facilities at Bethpage, N.Y. will become a classic case study of what not to do in a sole source aquifer and the consequences of delaying action until the problems have reached monumental proportions.

RESPONSE 131: Comment noted.

COMMENT 132: There is insufficient attention given to the radiation contamination present in the soil and groundwater related to the Navy-Grumman activities at Bethpage, N.Y. This point was made numerous times at the public meeting held at Bethpage High School on June 10, 2019.
The presence of radium as a pollutant of concern is mentioned only once (see NYSDEC proposed AROD page 13) in the main AROD report. It noted that "… Bethpage Water District removed

Well 4-1 from service in February 2013 because of the periodic detection of radium." However, there were other occasions and detections of radium that were not addressed in the AROD. The explanation that radium and related radioactive materials are from natural sources in the aquifer is not credible and unsupported by the evidence. The failure to present a reasonable case for where this contaminant is from undermines a willingness to trust this plan in the eyes of the public.

RESPONSE 132: Please see the Response to Comment #23.

COMMENT 133: The clear statement that reliance on "natural attenuation" as an effective remediation strategy was not successful, is an appreciated recognition. According to the AROD, under the "natural attenuation" strategy, the plume continued to migrate an additional 8,000 feet from a point north of Hempstead Turnpike. At the time, this point was originally identified as the leading edge of the plume in the *Feasibility Study, 2000.* (AROD, pg. 12)
Natural attenuation should not be used in settings such as Long Island where migration of VOC plumes can lead to substantial damage to the aquifer, high cleanup costs and a risk to public health.

RESPONSE 133: Comment noted.

COMMENT 134: In several sections of the AROD, it is reported that VOC contamination above the 5 parts per billion (ppb) standard has been detected near the base of the Magothy Aquifer. At one point, TCE is reported to be present at a depth of 820 feet below the ground surface (See AROD, pg. 18). At another point in the AROD, it is noted that the deepest contamination detected for any contaminant was that of toluene which was found at a depth of 980 feet below ground level. This detection was not only the deepest but also it was discovered south of the Southern State Parkway (See NYSDEC proposed AROD Exhibit A, pg. 2). This speaks to the fact that portions of the plume have already migrated past the Southern State Parkway.

The very deep contamination in the Magothy Aquifer raises several points of concern that are not adequately covered in the AROD. The AROD does not address the difficulty of locating and capturing extremely deep contamination. This is likely the deepest contamination of any aquifer in the State of New York. There will be many complicating factors that will arise in the remediation process at this depth. The AROD is silent on how this aspect of remediation will be successfully accomplished.

RESPONSE 134: Where required by the amended remedy, groundwater contaminated with toluene or any other contaminants of concern above the Federal and State SCGs at great depth will be extracted with large diameter wells in a similar manner as the shallow extraction wells and municipal water supply wells in Nassau County. The Department has already installed four large diameter groundwater extraction wells. One of these extraction wells was installed to a depth greater than 700 feet beneath the ground surface and one was installed to a depth greater than 600 feet beneath the ground surface using reverse rotary drilling techniques. While a remedial design will be completed to define the details of the remedy, it is expected that similar reverse rotary drilling techniques will be employed to install groundwater extraction wells to greater depths.

COMMENT 135: Another concern is, what will be the impact on the Lloyd Aquifer from contamination so deep into the aquifer system? It is known that there are gaps and thin areas in the Raritan Clay layer that separates the Magothy and Lloyd aquifers. The AROD does not discuss

to what extent concern for the Lloyd Aquifer was included in this remediation plan or the FS 2019. The concerns here would include any indication that contamination is leaking into the Lloyd.

RESPONSE 135: The Department's proposed remedy evaluated the potential effects to the Lloyd Aquifer with the USGS groundwater flow model. Based on this, Alternative 5B was designed to prevent groundwater containing contaminants of concern above the Federal and State SCGs from entering the Raritan Clay and the Lloyd Aquifer. A review of boring logs for the area near and downgradient of the former NWIRP and Northrop Grumman sites shows very few borings were drilled through the Raritan Clay. One boring that was drilled through the Raritan Clay shows that the Raritan Clay is approximately 100-feet thick.

COMMENT 136: There are several additional issues related to the Lloyd Aquifer raised by the AROD. First, there is no mention of the impact on the Lloyd Aquifer that could be expected if the water table elevation is lowered in the Glacial Aquifer along with a drop in hydraulic head in the Magothy Aquifer. These changes are likely due to the groundwater withdrawal of roughly 18 MGD beneath the footprint of the plume. The AROD is silent on the potential negative impact on recharge into the Lloyd Aquifer. This impact should be better understood and addressed.

RESPONSE 136: The plan evaluated the potential effects to the Lloyd Aquifer. Groundwater flow modeling shows that groundwater that flows from the Lloyd Aquifer to the ocean, or Great South Bay, will not significantly change if Scenario 5B is implemented. Therefore, the recharge to the Lloyd will not be significantly changed. Unlike the 2016 Remedial Options Report that provided a cursory evaluation of plume containment and included the discharge of all treated water to the surface, the Department's proposed Alternative 5B returns the majority of the treated water to the Long Island Aquifer system. This approach was specifically applied to minimize or avoid impacts to the environment; including adverse impacts to the Lloyd Aquifer.

COMMENT 137: The AROD is silent on the issue of future water wells for the Bethpage Water District after it turns over Wells 4, 5, and 6 for use solely for remediation and not water supply. (See pg. 22 – 23; Also, Appendix B, pg. 6) It should be made clear that the Lloyd Aquifer should not be pursued as a future source for replacing these 3 wells. Creating a new stress on the Lloyd in the same area where considerable contamination could invade the Lloyd would be a bad idea.

RESPONSE 137: Future BWD wells as part of the development of an alternate water source will not rely on the Lloyd Aquifer.

COMMENT 138: The AROD implies that saltwater intrusion will not be a problem due to the implementation of the preferred remedy. Saltwater intrusion is mentioned on pg. 22 of the AROD and in Appendix B, pg. 13, in the discussion of the preferred remedy, 5-B. In this remedy, a total of 2.8 MGD of treated groundwater is intended to be returned to the Glacial Aquifer south of Southern State Parkway *via* recharge basins. In addition, 2.8 MGD of treated groundwater is proposed to be returned to Massapequa Creek for stream augmentation. (See pg. 22 and Appendix B, pg. 13)

As for the water returned to the Massapequa Creek system, little of this water will recharge to the aquifer. The majority of the water will drain from the creek into the surface water systems to the south. The treated water recharged from the three recharge basins south of Southern State Parkway

will enter the shallow aquifer system with little replenishment contributing to the Magothy Aquifer.

Therefore, under the preferred remedy, mitigation of saltwater intrusion is inadequate.

Recharge from the proposed 10-acre recharge basin in the northern extension of Bethpage State Park is unlikely to help prevent saltwater intrusion directly south of the plume. Recharge from the recharge basins at the leading edge of the plume is too shallow to significantly protect the Magothy.

RESPONSE 138: The USGS spent two years creating a comprehensive groundwater flow model (that used MODFLOW-2005 [Harbaugh, 2005]) of the area near the former NWIRP and Northrop Grumman sites that would not only simulate groundwater flow, but would also allow the Department to understand potential impacts (of various remedial alternatives) on the positioning of the freshwater-saltwater interface. Based on an evaluation of saltwater intrusion using the USGS groundwater flow model, the methods used to manage treated water under Alternative 5B adequately prevent saltwater intrusion.

The potential effect each remedial alternative could have on the saltwater interface in the Magothy aquifer was evaluated with the USGS groundwater flow model and subsequently in the FS. The groundwater flow model was used to quantify the subsea discharge for the upper glacial, Magothy, and Lloyd aquifers under each of the remedial alternatives. This involved an iterative modeling process where the numbers, locations, and pumping rates of extraction wells and the locations of recharge basins were adjusted to achieve hydraulic capture of both the 50 ppb plume and the SCG plume while at the same time minimizing the potential effects to the environment. The potential for saltwater intrusion was specifically assessed by comparing groundwater flow rates through the General Head Boundary (GHB) into and out of the Magothy for each alternative to the groundwater flow rates through the GHB into and out of the Magothy for the baseline alternative (Alternative 1). While the groundwater flow modeling suggested there may be small changes in boundary conditions, these slight changes are not expected to affect the position of the saltwater-freshwater interface under the implementation of Alternative 5B. It should be noted that additional groundwater flow modeling will be completed to further evaluate the potential effects to the saltwater interface during the remedial design program.

The treated water returned to Massapequa Creek under Alternative 5B is intended to provide additional flow to Massapequa Creek and improve aquatic habitat and not necessarily recharge the aquifer. It is expected however, that there are surface water and groundwater interactions throughout Massapequa Creek and that at times, the augmented flow will provide recharge to the underlying groundwater system.

COMMENT 139: The hydrologic model used to evaluate groundwater conditions under the various alternative remedies is not sufficiently developed, at this point in time, to give definitive predictions on saltwater intrusion.

RESPONSE 139: As described in Response to Comment #138, the potential effect each remedial alternative could have on the saltwater interface in the Magothy aquifer was evaluated with a USGS groundwater flow model that used MODFLOW-2005 (Harbaugh, 2005). The modeled area extended south of the site to the South Shore to evaluate the potential for saltwater intrusion. It should be noted that the Department expects to complete additional groundwater flow modeling to further evaluate the potential effects to the saltwater interface during the remedial design

program.

COMMENT 140: It is recommended that additional water should be recharged using injection wells into the deeper Magothy Aquifer south of Southern State Parkway. This is intended to add additional water to the Magothy to mitigate the intrusion that will be the natural consequence of removing so much water (17.5 MGD) within the footprint of the plume. It does not appear that the 2.8 MGD currently proposed in alternative 5-B will be adequate using recharge basins as a way to hold out the ocean.

RESPONSE 140: Please see the Responses to Comments #138 and #139 regarding the evaluation of salt water intrusion. As detailed in these earlier responses, based on the USGS groundwater modeling, the implementation of Alternative 5B would not be expected to affect the position of the saltwater-freshwater interface. However, the potential need for injection wells south of Southern State Parkway will be further evaluated during the remedial design.

COMMENT 141: The recharge of 11.7 MGD of treated water at a constructed recharge basin in Bethpage State Park will be a good way to return remediated groundwater back into the aquifer system (See pg. 22). However, it appears that there has not been sufficient investigation through modeling or other means to reliably predict how this water will benefit the remediation plan. The recharged water is unlikely to flow back into the plume area. Recharge directly north of the plume would be a better site for large-scale recharge. The location of the recharge at Bethpage State Park is likely a site of convenience rather than a site based on an ideal design.

The other point to make about the proposed recharge at Bethpage State Park is that there is no discussion of impacts that can be anticipated due to this recharge. Groundwater recharge will raise the water table beneath the basin. There should be a discussion of what changes large-scale recharge will create in groundwater conditions and flow.

RESPONSE 141: Based on USGS groundwater flow modeling, and as would be expected, water table mounding occurs beneath the constructed recharge basin located in the vicinity of Bethpage State Park under Alternative 5B. As described in the Response to Comment #138, the groundwater flow modeling was an iterative process that was meant to model hydraulic capture of the 50 ppb and the SCG plumes while at the same time minimizing the potential effects to the environment. This included sizing the recharge basin within Bethpage State Park to prevent excessive water table mounding. The potential location for a recharge basin within Bethpage State Park was selected not out of convenience, but to minimize disruptions to the Town of Oyster Bay community and to avoid the potential acquisition of private properties. In response to the specific concerns related to the lack of water-reuse raised after the release of the 2016 Remedial Options Report, the Department pursued the use of recharge basins, streamflow augmentation, and re-use for irrigation purposes for managing treated water as part of this analysis. These water management approaches provide environmental protection and allow for beneficial re-use of treated water.

COMMENT 142: The discharge of 2.8 MGD of treated groundwater into the Massapequa Creek and preserve is insufficiently reviewed and evaluated. A more detailed justification of this action and an assessment of impacts are needed. A specific assessment is needed to understand how the creek will respond when the 2.8 MGD is added during a major runoff event that drains into the creek watershed. Any recharge that does occur beneath the creek bed will be shallow recharge

and drain readily into the local estuary. Large stream flows in the creek may re-suspend heavy metals or other pollutants retained in the stream bed. Additional investigation of the sensitivity of the ecosystem of Massapequa Preserve should be conducted.

RESPONSE 142: Please see the Response to Comment #19. An initial analysis of potential consequences related to pumping 17.5 million gallons of water per day from the aquifer and returning approximately 2.8 million gallons a day of treated, high quality water to Massapequa Creek was completed during the Feasibility Study. The Department does however expect to have additional studies of Massapequa Creek completed as part of the remedial design.

COMMENT 143: A review of the proposed AROD shows that a variety of remedies were envisioned and evaluated. Remedy 5-B appears to be a good match with the goals of the program. The following key points and concerns are summarized: The position of the saltwater interface south of the plume is not known with any degree of precision. It is therefore not realistic to claim that issues of saltwater intrusion have been adequately addressed.

RESPONSE 143: Please see the Response to Comment #138. As part a groundwater sustainability analysis of Long Island's aquifers, the USGS is completing saltwater-interface mapping program (https://www.usgs.gov/centers/ny-water/science/saltwater-interface-mapping-long-island-new-york?qt-science_center_objects=0#qt-science_center_objects) to better understand the current position of the saltwater – freshwater interface across Long Island. As previously mentioned, the Department expects to complete additional groundwater flow modeling to further evaluate the potential effects to the saltwater-freshwater interface during the remedial design. This modeling will incorporate any new USGS information on a better-defined position of the saltwater-freshwater interface to ensure that remedial pumping does not cause significant saltwater intrusion.

COMMENT 144: On page 22 of the AROD is the following statement:
"The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impractical or not feasible." The DEC needs to be very clear with the public that it will see this remediation through to the end. We see many times in remediation cases where cleanup is determined to be completed only to have pollution reappear some months later. We do not want this statement to be a convenient escape clause at some time in the future. The local community will live this this program for decades to come. We expect the DEC to be dedicated to seeing this through to the successful and complete remediation.

RESPONSE 144: Cleanup of the Navy Grumman groundwater plume is a priority for New York State. The proposed AROD has specific remedial action objectives and the remedy will continue to be operated until the remedial objectives have been achieved. As described in Response to Comment #25, the Department will keep the community informed during implementation of the remedy.

COMMENT 145: Radioactive materials should be fully addressed in a comprehensive cleanup of this site.

RESPONSE 145: Please see the Response to Comment #23.

COMMENT 146: The impacts to Massapequa Creek need to be more completely reviewed and addressed.

RESPONSE 146: As described in Response to Comments #16 and #19, while the Department expects to complete additional studies of Massapequa Creek as part of the remedial design, the initial analysis completed during the FS suggests that the discharge of 2.8 MGD of treated water to Massapequa Creek is feasible and would provide benefits to the surface water body.

COMMENT 147: The pros and cons of large-scale recharge at Bethpage State Park should be fully discussed and any negative aspects addressed.

RESPONSE 147: The use of a recharge basin in the vicinity of Bethpage State Park was quantitatively evaluated by the USGS using the groundwater flow model and was described in the FS. As described in Response to Comment #39, the Department does expect that additional groundwater flow modeling will be performed during the remedial design to further assess the use of a recharge basin in the vicinity of Bethpage State Park.

Ms. Adrian Esposito, the Executive Director for Citizens Campaign for the Environment (CCE), submitted a comment letter dated July 1, 2019 which included the following comments (Comments 148 to 152):

COMMENT 148: To ensure continued stakeholder involvement, it is of the utmost importance that the plan chosen for the cleanup includes a formalized public education and public involvement component. There should be an established community advisory board or similar entity that operates throughout the plan's implementation to ensure that the community can stay involved and informed on the remediation progress.

RESPONSE 148: The Department agrees with CCE that given the complexity of this project combined with its implementation in a heavily developed area of Nassau County, that an education and outreach program is important to the success of implementing Alternative 5B. As described in Response to Comment #25, the Department staff will be working closely with the community throughout the life of this project.

COMMENT 149: While the DEC's proposed remedy comprehensively addresses groundwater contamination from the plume, there is also significant soil contamination which must be addressed. CCE recommends the proposed remediation plan include strategies to address soil contamination caused by the plume that is threatening the aquifer

RESPONSE 149: Please see the Response to Comment #45.

COMMENT 150: The community and elected officials' statements at the June 10, 2019 public hearing made it clear that 5 years is simply too long to wait. Communities impacted by the Navy Grumman plume have had adverse effects for far too long. A 5 year implementation plan should be shortened with a goal of 2 years.

RESPONSE 150: While the proposed AROD indicates that five years is necessary to fully design and build the system infrastructure for such a large plume area, the Department does expect that the remedial program can be divided into specific components that will allow some phases of the

project to begin earlier than other phases. This will allow cleanup of the Navy Grumman groundwater plume to begin before the five-years indicated in the proposed AROD. Please also see the Department's Response to Comment #1.

COMMENT 151: CCE is highly concerned that the radium issue is being prematurely dismissed. We urge the DEC to evaluate this concern in greater detail. The Navy and Northrop Grumman should be responsible for implementing treatment strategies needed to address radium as a contaminate in the plume.

RESPONSE 151: Please see the Response to Comment #23.

COMMENT 152: 1,4 Dioxane has been identified as a probable carcinogen for humans by the EPA. As the DEC is aware, the NYS Health Department is due to establish an MCL for this contaminate in 2019. The remediation plan must be reflective of this upcoming drinking water standard and therefore, needs to include the Advanced Oxidation technology that is required in order to remove this toxin from the groundwater.

RESPONSE 152: As described in the proposed AROD, and also in the Department's Response to Comment #110, groundwater extracted from the Navy Grumman plume will be tested and treated to meet Federal and State SCGs before it is recharged to the aquifer, discharged to Massapequa Creek, or used for irrigation purposes at Bethpage State Park. This testing will include the emerging contaminant 1,4-dioxane and treatment for 1,4-dioxane will be provided if groundwater results for this parameter exceed a standard that is expected to be promulgated in the near future.

Mr. Philip Healey, the President for Biltmore Shores Civic Association, submitted a comment letter dated July 2, 2019 which included the following comments (Comments 153 to 154):

COMMENT 153: We firmly believe that this proposal will significantly impact our and other communities in the surrounding area. It is our belief that a full EIS must be conducted to better understand the long and short term impacts. Specifically, of the increased flow of fresh water will have on the impact of the movement of hazardous lake sediment from generations of the liberty plume, and sediment laden with heavy metals. The carrying capacity of the lakes and the effects on the raising of local ground water levels and the effect of the treated water volume will have on the capacity of the lakes to absorbed routine and seasonal storm events. The effect of raised levels of water on the existing parkland trees, and ecology.

RESPONSE 153: As described in Response to Comment #19, an initial analysis of potential consequences related to pumping 17.5 million gallons of water per day from the aquifer and returning approximately 2.8 million gallons a day of treated, high quality water to Massapequa Creek was completed during the Feasibility Study. As detailed in the Feasibility Study and the AROD, adverse impacts to the creek are not expected. The Department does however expect to have additional studies of Massapequa Creek completed as part of the remedial design. This is expected to include the completion of a Fish and Wildlife Resources Impact Analysis (FWRIA) to evaluate actual or potential impacts to fish and wildlife resources.

COMMENT 154: We need a detailed analysis on how the plan will handle the discharge of treated

water during and after extreme storm events such as in Hurricane Sandy or Irene. There must be a plan to fairly distribute the discharged water into the other creeks such as Seaford creek, and Unqua Creek.

RESPONSE 154: Please see the Responses to Comment #16 and Comment #19. Under the Department's proposed alternative (Alternative 5B), treated water will be discharged to Massapequa Creek and not to the nearby surface water drainages (e.g., Seaford Creek, and Unqua Creek, etc.).

Mr. Michael Russell, the President for Long Island Trout Unlimited, submitted a comment letter dated July 3, 2019 which included the following comment:

COMMENT 155: Long Island Trout Unlimited (LITU) believes that, if it has not been performed, prior to implementation of a solution, that a thorough and complete environmental assessment must be conducted. There are three (3) key issues that would be of particular interest to LITU, which this environmental assessment should address:

1. The chemical composition of the treated water which will be discharged directly into Massapequa Creek. (Any residue, ph. change, biological or radiological contamination, etc.)

2. The temperature of the treated water that will be discharged directly into Massapequa Creek and what impact this will have to the Creek.

3. The impact on stream flow in nearby streams (i.e. East Meadow Brook, Cedar Swamp Creek, Bellmore Creek, Seamans Creek, Seaford Creek, Carman Creek, Amityville Creek, Strongs Creek, Neguntatogue Creek and Santapogue Creek).

In addition, what type of monitoring will be performed on Massapequa Creek and other streams during and after the project?

RESPONSE 155: Please see the Response to Comments #19 and #154. Additionally, the Department does expect to have additional studies of Massapequa Creek completed as part of the remedial design. These studies will include an evaluation of the temperature and chemical composition of the treated water being placed into Massapequa Creek. Furthermore, water discharged to Massapequa Creek will be tested and treated to below SCGs according to Federal and State regulations. The type of surface water and groundwater monitoring that will be performed during implementation of the remedy will be detailed in a Monitoring Plan that will be part of an overall Site Management Plan.

Dr. Charles Bevington, the Chair for the Sierra Club Long Island Group, submitted a comment letter dated July 8, 2019 which included the following comments (Comments 156 to 160):

COMMENT 156: It seems that there is a lack of research in the remedy regarding the Massapequa Creek and surrounding wetlands. More generally, we feel that there are real problems with removing and sending a large amount of recycled water to the ocean via Massapequa Creek, thereby adversely affecting the volume of water in our aquifers, our only source of drinking water. Is the aquifer water to be lost a significant percentage as noted above? Has the USGS and the DEC determined the quantity of the aquifer(s)? Has "augmenting" a stream or creek been done before for the purposes of cleaning up a major plume? If so, can we get the research and long-term results?

RESPONSE 156: Please see the Response to Comment #16. It is not uncommon that treated water from remediation sites is discharged into nearby surface water bodies. Based on discussions with Nassau County and the NYSDEC Division of Fish and Wildlife and the review of reports related to Massapequa Creek, it was determined that Massapequa Creek could benefit from the addition of high quality, treated water to the surface water system.

As detailed in the Response to Comment #28, the Department, in cooperation with the USGS developed a comprehensive groundwater flow model to design remedial alternatives that would achieve capture of the Navy Grumman groundwater plume while at the same time minimizing impacts to the environment; including the Long Island aquifer. While the remedy in the Department's proposed AROD involves the withdrawal, treatment, and management of approximately 17.5 MGD, the proposed remedy returns the majority of this treated water (approximately 14.7 MGD) to the Long Island Aquifer through the use of recharge basins. The return of water to the Long Island Aquifer through the use of recharge basins was specifically incorporated into the proposed remedy to minimize adverse impacts to the aquifer system.

COMMENT 157: Discharging a large amount of water into Massapequa Creek for many years is likely to have a negative impact on the environment and wildlife found within this important Nassau County Preserve. A more detailed evaluation of potential impacts to Massapequa Creek and the Massapequa Creek Preserve would need to be completed during the remedial design.

RESPONSE 157: As described in Responses to Comment #19 and #154, the Department does expect to have additional studies of Massapequa Creek completed as part of the remedial design.

COMMENT 158: The question of radon and radium was asked. The presence of radioactive compounds is completely ignored in the remedy.

RESPONSE 158: Please see the Response to Comment #23.

COMMENT 159: Recycled water typically contains trace amounts of organic wastewater-derived compounds (OWCs) for which the potential ecological risks must be balanced against the benefits of an augmentation project. There is concern that emerging contaminants, i.e. unregulated but biologically active organic compounds, may be present in recycled water and will impact on the aquatic environment and the underlying groundwater. Emerging contaminants include a wide variety of chemically disparate compounds, including pharmaceuticals, endocrine disruptors, and residues of perfluorochemical surfactants (PFCs).

RESPONSE 159: Groundwater extracted, treated, and discharged to recharge basins, Massapequa Creek, and used for irrigation purposes is not wastewater originating from homes or industries and it does not contain septic wastes. Therefore, it would not contain organic wastewater-derived compounds, including pharmaceuticals, endocrine disruptors and residues of perfluorochemical surfactants (PFCs). As part of the remedial design, groundwater samples will be collected and analyzed to determine the concentrations of site contaminants in groundwater. The groundwater samples will also be analyzed for emerging contaminants (per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane). The results of the groundwater samples will be used to appropriately design treatment systems. The water will be treated to meet the federal and state standards, criteria, and guidance values (SCGs) before it is discharged to recharge basins, Massapequa Creek or used for irrigation purposes.

COMMENT 160: The DEC must consider that the construction of an industrial treatment plant within the boundaries of Massapequa Preserve constitutes an alienation of parkland and also that Massapequa Preserve is "perpetually preserved" under Nassau County law, which prohibits building construction. This would constitute a change of use for an open space and have legal hurdles as well as a negative environmental impact.

RESPONSE 160: As described in the Department's Response to Comment #103, the exact location of a water treatment plant will be determined during the remedial design in consultation with the Nassau County Department of Public Works and the NYS Department of Transportation. It is possible that the treatment plant would be constructed outside of the Massapequa Preserve in the right-of-way area adjacent to the Southern State Parkway.

Mr. Enrico Nardone, the Executive Director for the Seatuck Environmental Association, submitted a comment letter dated July 8, 2019 which included the following comments (Comments 161 to 164):

COMMENT 161: We commend New York State for its commitment to aggressively address the Navy Grumman groundwater plume and are generally supportive of the proposal to remediate the contamination. The involvement of the U.S. Geological Survey (USGS) is especially reassuring; we have worked with the USGS Regional Office over the past several years and are confident in their assessment of the plan's potential impacts to groundwater and other hydrological conditions.

RESPONSE 161: Thank you for your support of the Department's proposed remedy. Comment noted.

COMMENT 162: We primarily write to express our general support for the plan to augment the base flow rate of Massapequa Creek. While we think the calls for additional assessments to accurately determine proper augmentation rates, seasonal timing *and temperatures* have merit, we are well aware of the overall erosion of base stream flow that has occurred in Massapequa Creek over the past 80+ years (*see*, Rozell, 2010, Simmons and Reynolds, 1982, and Spinello and Simmons, 1992). These impacts, which have been well documented by USGS, have resulted from both the intense development of the watershed (which prevents precipitation from recharging into the ground water system) and high levels of pumping for sewage treatment systems that discharge into coastal waters.

The decrease in historic base flow, together with a half-dozen impoundments, several major road crossings and other factors, have long ago combined to reduce the overall ecological health of Massapequa Creek. While this altered state may provide suitable habitat for warm-water fish and some other species, greater ecological benefits, including improved conditions for diadromous fish, could be realized by efforts to restore (to the extent possible) the stream's natural base flow, connectivity and overall health. Massapequa Creek is simply not a pristine system that needs protection; rather, it is a severely altered and highly compromised waterway that needs restoration. Improving overall base flow is not a panacea, but it's a step in the right direction.

RESPONSE 162: Thank you for your support of the Department's proposed remedy. Comment noted.

COMMENT 163: In addition, we also support the plan to discharge treated water through irrigation at nearby golf courses. The plan's use of treated water for irrigation purposes will, in our opinion, help further efforts to promote the adoption of water reuse strategies on Long Island. Seatuck has been pushing NYSDEC and other state and local entities to embrace water reuse as a tool to help address both water quality and quantity issues across the region; we think the adoption of the practice in the Navy Grumman plan will provide high profile exposure and support for its efficacy and wide potential applicability, including in the case of treated wastewater.

RESPONSE 163: Thank you for your support of the Department's proposed remedy. Comment noted.

COMMENT 164: Finally, we are pleased by the plan's overall strategy (with the exception of the two situations discussed above) to discharge the majority of the treated water into recharge basins. Nassau County, as is well known, has suffered dramatic drawdowns of the water table in many locations as a result intense development and high pumping rates. Given this history, and its impact on ecological health, it is critical that all opportunities to recharge water back into the aquifer be seized.

RESPONSE 164: Thank you for your support of the Department's proposed remedy. The majority of the treated water (approximately 14.7 MGD) will be returned to the Long Island Aquifer through the use of recharge basins.

Mr. Michael Sperling, the President for the South Shore Audubon Society, submitted a comment letter dated July 8, 2019 which included the following comments (Comments 165 to 168):

COMMENT 165: The preferred alternative would add 1.2 cfs into Massapequa Creek. Discharging a large amount of water into Massapequa Creek for many years is likely to have a negative impact on the environment and wildlife found within this important Nassau County Preserve. The South Shore Audubon Society objects to altering the Preserve's basic ecology in this way.

The FS acknowledges and SSAS supports the need for further study: "A more detailed evaluation of potential impacts to Massapequa Creek and the Massapequa Creek Preserve would need to be completed during the remedial design. Measurable differences from the increased stream flow may include variations in creek water temperature due to discharge of colder groundwater, reductions in salinity as the creek reaches brackish areas, lowered capacity to convey storm water, and possible alterations to wetland areas and biota associated with the creek.

Any study of Massapequa Creek should extend to the Bay and assess the cumulative impacts on the watershed. The water discharged into Massapequa Creek could potentially alter the ecology of the Bay as well as the Creek.

RESPONSE 165: As described in Response to Comment #19 and #154, the Department does expect to have additional studies of Massapequa Creek and the Massapequa Creek Preserve completed as part of the remedial design.

COMMENT 166: We feel that there are real problems with removing and sending to the ocean via Massapequa Creek a large amount of freshwater, thereby adversely affecting the volume of

water in our aquifers, our only source of drinking water. We would prefer that the treated groundwater to be discharged into Massapequa Creek be instead used to recharge our aquifers.

RESPONSE 166: Please see the Response to Comment #16.

COMMENT 167: Of particular concern is how the water discharged into Massapequa Creek will affect major runoff events. Recharge in the creek bed will be shallow and drain into the local estuary, and large stream flows may re-suspend pollutants retained in the creek bed.

RESPONSE 167: Please see the Response to Comments #19 and #153.

COMMENT 168: According to M. H. Plumlee, "recycled water typically contains trace amounts of organic wastewater-derived compounds (OWCs) for which the potential ecological risks must be balanced against the benefits of an augmentation project" and "regulatory or project-specific criteria (acceptable concentrations of priority OWCs) would enable assessment of ecosystem impacts and demonstration of practitioner compliance" (Sci Total Environ. 2012 Nov 1; 438: 541-8).
Further, E. Hoehn states, "There is concern that emerging contaminants, i.e. unregulated but biologically active organic compounds, may be present in recycled water and will impact on the aquatic environment and the underlying groundwater. Emerging contaminants include a wide variety of chemically disparate compounds, including pharmaceuticals, endocrine disrupters, and residues of perfluorochemical surfactants (PFCs)" (Water Sci Technol. 2007; 56 (11): 59-64).

Preliminary and ongoing testing, as well as a plan to treat OCWs and emerging contaminants are necessary.

RESPONSE 168: Please see the Response to Comment #159.

Mr. Nicholas Rigano, representing Long Island Pure Waters, Ltd., submitted a comment letter dated July 8, 2019 which included the following comments (Comments 169 to 174):

COMMENT 169: It is apparent that NYSDEC will not investigate or remediate the radioactive materials contained in the plume. A formal comprehensive investigation into radium, radon and other radioactive materials must be immediately conducted within the Plume.

RESPONSE 169: As described in in Response to Comment #23, several radium groundwater sampling events have already been completed and the Department is currently completing a comprehensive assessment on the origin of radium detections in groundwater near the former NWIRP and Northrop Grumman sites. Furthermore, if groundwater extracted from the aquifer contains radium above the MCL of 5 pCi/L then it will be treated to below the MCL before it is discharged to a recharge basin/s or Massapequa Creek or used for irrigation purposes as part of the remedy detailed in the proposed AROD.

COMMENT 170: The remediation plan will not commence for 5 years. This is an unnecessarily long period of time.

RESPONSE 170: Please see the Response to Comment #1.

COMMENT 171: The remediation plan calls for a remedial period of 110 years. More wells

within the plume are needed to extract the contaminants at a faster pace. Remediation over a century is simply not acceptable. We further question the accuracy of this estimate.

RESPONSE 171: The timeframe outlined in the FS and proposed AROD for Alternative 5B is an estimate for the amount of time it would take for the entire SCG plume to be remediated to the SCGs. This estimate is based on what is called a batch flushing groundwater model. The timeframe to remediate the hotspots with the eight proposed mass flux wells included under Alternative 5B would be much quicker on the order of 20-30 years for the areas with total VOCs greater than 1,000 ppb. The groundwater flow modeling completed by the USGS was specifically designed to remediate the Navy Grumman groundwater plume while at the same time minimizing environmental impacts associated with the withdrawal of large volumes of water from the aquifer. The installation of additional groundwater extraction wells to extract the contaminants at a faster pace have an increased potential for adverse impacts to the Long Island Aquifer system and the associated surface water resources.

COMMENT 172: Even after the 110 years of remediation, levels at 50 ppb, which is 10 times groundwater standards, and in the event of 1,4-dioxane likely 50 times groundwater standards, will be left in the ground to persist indefinitely. This is unacceptable. The remediation goal must be to extract all contaminants above standards.

RESPONSE 172: Per the Response to Comment #171, the timeframe outlined in the FS and proposed AROD for Alternative 5B is an estimate for the amount of time it would take for the entire SCG plume to be remediated to the SCGs. This analysis does not suggest that contaminants will persist after 110 years at concentrations greater than 50 ppb. The emerging contaminant 1,4-dioxane is a contaminant of concern and is included in the analysis to achieve the SCGs in the cleanup the Navy Grumman groundwater plume. Therefore, 1,4-dioxane will not be left to persist in the groundwater.

COMMENT 173: The community (tens of thousands of people) is currently being supplied with 1,4-dioxane contaminated water at more than ten (10) times New York State's Recommended MCL and approximately thirty (30) times the level at which EPA says there is no risk to human health (0.35 ppb). This is unacceptable. An alternative drinking water supply should be provided to the community until a proper treatment system is in place.

RESPONSE 173: The drinking water provided by the Water Districts meets all of the NYSDOH drinking water requirements. While an MCL is being established for the emerging contaminant 1, 4-dioxane, water districts are preparing for treatment to remove 1,4-dioxane. Specifically, the Bethpage Water District is currently using advanced oxidation processes to remove 1,4-dioxane to concentrations below the recommended MCL value of 1 ppb. Please also see the Department's Response to Comment #119.

COMMENT 174: As the plume has migrated to a nine (9) square mile area on DEC's watch spanning five (5) decades, the community has no faith that this plan will be implemented, human health will be protected and the environment will be restored. A panel of independent experts must be appointed to oversee the process to ensure that human health and the environment are protected. The costs of the panel must be funded by the New York State superfund and reimbursed by the Navy and Grumman. Long Island Pure Water's professionals (experts and attorneys) as well as

the community members of the Navy Restoration Advisory Board have unparalleled knowledge and experience with respect to subsurface contamination on Long Island generally and with respect to the plume specifically. The panel should be comprised of Long Island Pure Water's professionals, community members of the Navy Restoration Advisory Board, among others.

RESPONSE 174: Comments received on the proposed AROD during the 45-day comment period and during the public meeting were very supportive of the Department's proposed remedy. As described in Response to Comment #25, the Department staff will be working closely with the community throughout the life of this project.

II. D. Northrop Grumman Systems Corporation

Mr. Edward J. Hannon, the Environmental, Safety, Health, and Medical Manager with Northrop Grumman Corporation Aerospace Systems submitted a 48-page letter dated July 8, 2019 which included the following comments (Comments 175 to 193):

COMMENT 175: NYSDEC did not adequately evaluate the current approved ROD Remedy.

RESPONSE 175: The NYSDEC adequately evaluated the current "approved ROD Remedy" as Alternative 1 (No Further Action) in the Feasibility Study, the proposed AROD, and in a United States Geologic Survey (USGS) groundwater flow modeling program. Alternative 1 included the following remedial components that are part of the "current approved ROD Remedy" (the OU2 and OU3 RODs):

- Operation of the On-Site Containment System (five groundwater extraction wells);
- Operation of the Bethpage Community Park Groundwater Containment System (four groundwater extraction wells);
- Operation of the GM-38 Groundwater Extraction and Treatment System (currently two groundwater extraction wells);
- Future operation of the RW-21 Area Groundwater Extraction and Treatment System (three groundwater extraction wells);
- Future operation of the RE-108 Groundwater Extraction and Treatment Systems (three to five groundwater extraction wells);
- Continued wellhead treatment at six public water supplies; and
- Continued implementation of the Public Water Supply Contingency Plan.

Alternative 1 was carried through the Comparative Analysis of Alternatives (Section 9) of the FS. The evaluation of the No Further Action alternative (Alternative 1) was also included in the proposed AROD "Basis of Selection" section (proposed AROD Exhibit D) but was eliminated from the evaluation because the No Further Action alternative would allow for continued migration of areas of the plume with high concentrations of site contaminants, which would threaten public water supplies that do not currently require treatment for site contaminants.

Furthermore, the FS relied on a comprehensive groundwater flow model constructed by the USGS to compare groundwater extraction alternatives. This included groundwater flow modeling of the No Further Action alternative (Alternative 1) to assess if the "approved ROD Remedy" would capture the SCG plume. The results show that Alternative 1 would not capture the SCG plume. Therefore, the No Further Action alternative ("approved ROD Remedy") fails at achieving one or more of the following Groundwater RAOs for Environmental Protection:

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable;
- Hydraulically contain the Navy Grumman groundwater plume, reduce its volume and contaminant concentrations, and prevent its further expansion and migration;
- Prevent the discharge of contaminants to surface water; and
- Prevent adverse impacts to the quantity or quality of the groundwater resources associated with the Nassau-Suffolk Sole Source Aquifer.

COMMENT 176: NYSDEC failed to consider the Northrop Grumman proposal identified as the Improved Remedial Alternative (IRA), or any variant thereof, in the proposed AROD or FS.

RESPONSE 176: Northrop Grumman shared the concept of an IRA with the Department when the USGS and NYSDEC were nearing completion of the groundwater flow modeling and the FS was being finalized. The Department completed initial groundwater flow modeling of the Northrop Grumman proposal identified as the Improved Remedial Alternative (IRA) and presented these results to Northrop Grumman on November 28, 2018. Based on the groundwater flow modeling for the IRA, there were large areas of the SCG plume that were not contained by the proposed IRA groundwater extraction wells. It should also be noted that the Northrop Grumman presentation of the proposed IRA to the Department indicated that the installation and operation of select groundwater extraction wells would only occur "if necessary," and only after public water supplies were at significant risk of contamination above SCGs. Furthermore, the proposed work did not commit Northrop Grumman to operating the extraction wells. Instead, the proposed work indicates that Northrop Grumman would "consider" operating such wells based on data obtained during a remedial design.

COMMENT 177: The nature and extent of the groundwater contamination depicted in the proposed AROD and the FS is inaccurate.

RESPONSE 177: The plume shells were created using the laboratory results of nearly 3,000 groundwater samples collected from a combination of vertical profile borings (VPBs) and monitoring wells. When VPB groundwater sample results conform to a defined, understood, and verified conceptual flow model or contaminant distribution (as the VPB data do), then it is scientifically acceptable and consistent with practice in the environmental remediation field, to rely on the VPB results. During the preparation of the plume representations, when groundwater data was available from both permanent monitoring wells and VPBs at the same depth and similar location, the analytical results from permanent monitoring wells were given preference. These scientifically acceptable techniques, [as confirmed by Ed Hannon on Pages 39-40 in a letter to Jason Pelton on July 8, 2019 and confirmed by Emagin in Appendix F Page 2 of 5 of the Arcadis Groundwater Flow and Solute Transport Modeling update (Attachment 1),] were applied in combination with the USGS groundwater flow modeling and particle tracking analysis to create accurate depictions of the Navy Grumman groundwater plume.

COMMENT 178: The NYSDEC over stated the potential for migration of contaminated groundwater and exaggerated perceived threats to water supply wells at the southern edge of its projected plume.

RESPONSE 178: The analysis performed by NYSDEC has not over stated the potential for migration of contaminated groundwater and the perceived threats to water supply wells at the southern edge of the plume have not been exaggerated. Groundwater flow modeling and particle tracking analysis completed by the USGS show that the pumping of the current and future Navy/Northrup Grumman remedial wells (Alternative 1) when combined with the nearby public water supply pumping would not hydraulically contain the SCG plume. In particular, the USGS modeling shows particles started within the SCG plume migrated past the current and future Navy/Northrup Grumman remedial wells and the current public water supply wells. With these particles flowing past these wells, the USGS modeling showed a potential for site contaminants to encounter currently unimpacted public water supply wells and possibly surface water resources. Even without groundwater flow modeling and particle tracking analysis, the conclusion that the Navy Grumman groundwater plume continues to threaten public water supply wells remains true. This is based on the Department's understanding of solute transport processes, based on over 30 years of experience studying groundwater plumes in the Magothy aquifer on Long Island.

COMMENT 179: NYSDEC relied on insufficient and old data.

RESPONSE 179: The SCG plume was defined with approximately 350 groundwater samples collected from monitoring wells and over 2,600 groundwater samples collected from VPBs.

Given the scale of the plume (approximately 4.3 miles in length and 2.1 miles wide), creating accurate representations of the plumes would have been impracticable using groundwater samples (approximately 350) collected exclusively from monitoring wells. Therefore, the groundwater monitoring well results were combined with VPB groundwater results, when appropriate, to depict the groundwater plume. VPB data were collected by the Navy, Northrup Grumman, and NYSDEC over a 19 year period (2000 to 2018). Twenty of the VPBs drilled south of Bethpage Community Park from 2000 to 2006 were not used to depict the plume representations for the following reasons:

- These VPBs are located in the internal portions of the plume and were not used to define the outer limits of the SCG plume;
- 14 of the 20 VPBs are located north of Hempstead Turnpike and therefore not used to define the outer limits of the SCG plume; and
- These VPBs north of Hempstead Turnpike are located in areas that have a high density of VPBs or monitoring wells when compared to other portions of the plume.

The SCG plume depicts the area containing groundwater with contaminants of concern (COCs) above the SCGs. The SCG plume was constructed in a binary fashion in that groundwater inside of the SCG plume was interpreted to contain COCs above the SCGs and groundwater outside of the plume was interpreted to not contains COCs above the SCGs. The SCG plume does not interpolate the actual concentration of COCs at any location inside of the plume. Therefore, the VPBs drilled between 2000 and 2006 were not needed to define the SCG plume allowing the plume to be defined with data from 2007 – 2018 (12 year period).

Therefore, VPB groundwater data collected over a 12 year period (2007-2018), as well as approximately 350 groundwater samples collected from monitoring wells, were used to construct the SCG plume. However, most of the VPB data that were used to define the southern and western

limits of the SCG plume were collected during a five year period from 2014 to 2018. Therefore, the data used to construct the SCG plume was not old nor insufficient.

COMMENT 180: NYSDEC exaggerated the nature and extent of the groundwater contamination by assuming that all COCs south of the Site can be attributed to former Navy/Northrop Grumman activities.

RESPONSE 180: The FS outlines the process that was used to determine the 24 contaminants of concern related to the Navy/Northrup Grumman Site as outlined in the OU2/OU3 RODs and the Public Water Supply Contingency Plan. The FS also outlines the construction of the database that includes data provided by the Navy, Northrup Grumman, NYSDOH, and the NYSDEC. These data were collected in locations that have the potential to be from the Navy/Northrup Grumman facility. The VOC toluene was specifically listed as a contaminant of concern in the March 2013 OU3 Record of Decision.

A light non-aqueous phase liquid (LNAPL) sample collected from piezometer I-4-PZ located near the Former Grumman Settling Ponds in May 2018 contained toluene at concentration of 3,340,000 ppb. Other site-related compounds including TCE and cis-1,2-DCE were detected in this LNAPL sample at concentrations of 270,000 ppb and 964,000 ppb respectively. Toluene was detected in several groundwater samples collected south of the Southern State Parkway and at concentrations that exceed the SCG of 5 ppb in nine groundwater samples collected from two VPBs (DEC-VPB1 and VPB-167). Specifically, three grab groundwater samples collected from DEC-VPB1 and six grab groundwater samples collected from VPB-167 contained toluene at concentrations exceeding 5 ppb. The highest toluene concentration (14 ppb) was detected in a groundwater sample collected from DEC-VPB1. A groundwater sample collected from a monitoring well (MW-DEC1D1) screened at a similar depth contained toluene at 2.2 ppb. While this monitoring well groundwater sample was collected at a coincident vertical depth, this sample was collected from a monitoring well (MW-DEC1D1) located approximately 90 feet away from DEC-VPB1. Therefore, both samples were used to understand the distribution of toluene in groundwater.

COMMENT 181: NYSDEC relied on invalid, flawed, and incomplete groundwater modeling results. The type of modeling NYSDEC used is inherently limited and cannot justify the proposed Remedy.

RESPONSE 181: Hydraulic containment of groundwater containing COCs above the SCGs can be, and was, effectively evaluated with the USGS groundwater flow model and particle tracking analysis to support the proposed remedy. Specifically, simulation of groundwater flow and advective plume transport included steady state flow modeling using USGS codes MODFLOW-2005 (Harbaugh, 2005), and MODPATH version 6 (Pollock, 2012). For model calibration, hydraulic conductivity and boundary condition parameters were adjusted through automated and manual methods based on matching water-level and streamflow data. The automated calibration software UCODE_2005 (Poeter and others, 2005) was applied to the present steady state conditions MODFLOW model.

Solute transport modeling was not needed as hydraulic containment does not require an analysis of how contaminants move in the aquifer at different rates (speeds) nor does the model or analysis need to factor in dilution (mixing) or dispersion. Therefore, the analysis presented in the FS is based on sound science and engineering principles and sufficient to complete a FS.

The groundwater flow modeling and particle tracking analysis was completed by the USGS in early 2019. With the groundwater flow modeling being completed, the USGS staff prepared a pending publication (Analysis of remedial scenarios affecting plume movement through a sole-source aquifer system, Southeastern Nassau County, New York, expected in early 2020) that is currently under a thorough peer review. The USGS requires peer review for all of its information products that contain scientific and technical information. Northrop Grumman is incorrect in stating that the NYSDEC relied on incomplete groundwater modeling results. As described above, while the USGS publication is under peer review and not final, the groundwater flow modeling is complete.

COMMENT 182: NYSDEC failed to provide critical documentation to support its conclusions.

RESPONSE 182: The NYSDEC provided the FS and proposed AROD at the start of the public comment period. Both of these documents detailed the process that was followed in selecting the proposed alternative. NYSDEC met with Northrop Grumman during five separate meetings and described the development of the groundwater database, plume shells, and the groundwater flow model. The DEC provided the modeling and backup data as soon as practicable for the sake of transparency.

COMMENT 183: NYSDEC failed to provide information supporting its conclusion that the proposed AROD will cause no significant environmental impacts. And NYSDEC failed to provide a cost-effectiveness assessment.

RESPONSE 183: The NYSDEC FS presents the methods and modeling results used to evaluate potential effects to surface water, wetlands, public water supplies, and saltwater intrusion. The results show the potential environmental effects are minimal. The proposed AROD addresses cost-effectiveness on Page 21 of Exhibit D.

COMMENT 184: The groundwater database reflects no "new data."

RESPONSE 184: The groundwater database contains thousands of records that were collected or recorded since the 2000 FS. The NYSDEC FS outlines the construction of the database that includes data provided by the U.S. Navy, Northrup Grumman, Nassau County Department of Health, and the NYSDEC. All of the data were collected from locations that have the potential to have been impacted by activities at the former Navy/Northrup Grumman facility. The groundwater samples (nearly 3,000 samples) within the database used to create the SCG plume were collected after the 2000 FS. The Department's evaluation of these data demonstrates that the interpretations that support the 2000 FS were flawed as described below.

- Examples of flawed interpretations/projections in the 2000 FS include:
    - ***SCGs would be attained in BWD 4-2 in 11 years*** - The 2000 FS prepared by Arcadis Geraghty & Miller for Northrop Grumman predicted that SCGs would be attained in BWD 4-2 in 11 years. Groundwater samples collected since 2000 show that instead of the TCE concentration decreasing from 83 ppb to the SCG, the TCE concentration increased from 83 ppb to 221 ppb (2017 annual average).

- ***SCGs would not be exceeded in BWD 4-1*** - The 2000 FS prepared by Arcadis Geraghty & Miller for Northrop Grumman predicted that SCGs would not be exceeded in BWD 4-1. Groundwater samples collected since 2000 show the concentration of TCE increased to 183 ppb in 2017.
- ***The maximum concentration of TCE would not exceed 11 ppb in BWD 6-2*** - The 2000 FS prepared by Arcadis Geraghty & Miller for Northrop Grumman predicted that the maximum concentration of TCE would not exceed 11 ppb in BWD 6-2. Groundwater samples collected since 2000 show the concentration of TCE increased to 1,940 ppb in March 2017. This is a TCE groundwater concentration that is 175 times higher than the projected value of 11 ppb.
- ***No other water supply wells (other than those mentioned above) would be affected by the Navy/Northrup Grumman plume*** - The 2000 FS prepared by Arcadis Geraghty & Miller for Northrop Grumman predicted that no other water supply wells (other than those mentioned above) would be affected by the Navy/Northrup Grumman plume. Data collected since 2000 shows this interpretation was inaccurate as three separate well fields (South Farmingdale Water District Plant 1, South Farmingdale Water District Plant 3, and New York American Water Company – Seamans Neck Road Water Plant) have required wellhead treatment since 2000.

- The 2000 FS concluded the TCE would undergo natural attenuation. Though factually correct as some very limited natural attenuation is occurring, data collected since 2000 shows the amount of natural attenuation is very small and does not significantly contribute to attaining groundwater quality standards in the off-site portion of the plume not captured by the remedy. Therefore, based on data collected since 2000, this interpretation was inaccurate.

These examples demonstrate fundamental errors in the groundwater flow modeling that was used to support the selection of the current remedy in the 2000 FS. These fundamental errors have been documented using newly collected data; data collected after the 2000 FS. This was accomplished by compiling data from the Navy, Northrup Grumman, NCDOH, and the NYSDEC in one comprehensive database that allowed the organization and evaluation of the data in a holistic manner. This evaluation (from 2017 to 2019) led to the Department's conclusion that the scientific and engineering interpretations used by Northrup Grumman to support the 2000 FS were inaccurate.

COMMENT 185: NYSDEC Selected an Improper SCG for 1,4-dioxane.

RESPONSE 185: The SCG plume was constructed using a SCG of 0.35 ppb for 1,4-dioxane based on USEPA Health based guidance in the absence of a Federal or State standard at the time the plume shells were created and the submission of the FS. The SCG plume will be revised prior to completing the remedial design for the selected remedy to include the 1,4-dioxane standard that is promulgated. An initial evaluation that was completed on the possible influence of a 1,4-dioxane standard of 1.0 ppb (per the NYS Water Quality Council recommendation to the NYSDOH) (instead of the 0.35 ppb value) on the extent of the SCG plume does not suggest there will be a significant impact on the extent of the SCG plume.

COMMENT 186: Since the NYSDEC did not conducted a Fish and Wildlife Resources Impact Analysis ("FWRIA") in connection with the proposed AROD indicates that the NYSDEC believes the existing remedy is fully protective of the environment.

RESPONSE 186: As stated in the proposed AROD, the current remedy is not protective of the Long Island Sole Source Aquifer System. Specifically, under the existing remedies, not only does groundwater contamination continue to migrate south toward unimpacted portions of the Long Island Sole Source Aquifer, but this southward migration is causing contaminant concentrations to increase in off-site groundwater. Groundwater is a natural resource that the State is committed to protecting and restoring. A Fish and Wildlife Resources Impact Analysis is completed to evaluate actual or potential impacts to fish and wildlife resources from site contaminants. The fact that a FWRIA was not completed does not imply that there are no impacts to the environment. As previously mentioned, the Navy Grumman groundwater plume has impacted an approximate 4.3 miles by approximate 2.1 miles wide area of the groundwater resources that make up the Long Island Sole Source Aquifer system.

Per NYSDEC DER-10 (3.10.1(b)), when paragraphs 1 through 4 below apply at a site, it is assumed no FWRIA is needed.

"1. The remediation is directed toward a specific discharge or spill event that does not adversely impact fish and wildlife resources.

2. The AOCs at the site consist solely of an underground storage tank(s) or an underground tank system, with no significant impact on surrounding groundwater or surface water.

3. The site is a point source of contamination to the groundwater (i.e. dry cleaner or gas station) which will be prevented from discharging to surface water, and there is no widespread soil contamination or habitat of an endangered, threatened or special concern species present.

4. There are no ecological resources present on or in the vicinity of the site, determined pursuant to paragraph (c)1 below (e.g. an urban site which is not proximate to a surface water body, wetland or other ecologically significant area)."

Based on DER-10, a FWRIA was not needed as part of the analysis included in the proposed AROD.

COMMENT 187: Alternative 5B causes the undesirable consequence of the northwestern portion of the plume spreading to the south due to the substantial hydraulic effect of the new basin to be constructed in Bethpage State Park and the absence of any remedial extraction south of the former RUCO site.

RESPONSE 187: The groundwater flow modeling completed by the USGS for Alternative 5B does not suggest that the proposed recharge basin located in the vicinity of Bethpage State Park will adversely affect groundwater flow, and hence contaminant migration, in the area south of the former RUCO Polymer Corp. (Hooker Chem).

COMMENT 188: Alternative 5B results in inefficient remediation of groundwater contamination. More than half of the remedial wells of Alternative 5B are nonproductive. Nonproductive wells capture little mass and are inefficient in limiting migration as the wells are sited in extremely low TVOC concentration areas.

RESPONSE 188: Alternative 5B was specifically designed with 8 mass flux wells to address areas of the Navy Grumman groundwater plume with high concentrations (>50 ppb total chlorinated volatile organic compounds) of site contaminants along with 16 hydraulic capture wells to prevent the continued, uncontrolled migration of the SCG plume. Hydraulic containment wells are not evaluated or assessed based on the amount of mass they capture or mass removal efficiency. Instead, the hydraulic containment wells are assessed on their ability to capture groundwater containing COCs above the SCGs. The exact location and number of mass flux and containment wells to be drilled will be subject to further pre-design investigations and remedial design efforts.

COMMENT 189: The NYSDEC is required to select the most cost-effective remedy from amongst similarly effective remedial actions.

RESPONSE 189: In the FS and proposed AROD, each of the alternatives were evaluated relative to the nine remedy selection criteria and this included Cost-Effectiveness. Based on the evaluation in the proposed AROD, Alternative 5B was determined to be the most cost-effective because it included extraction of groundwater from the central portion of the plume combined with hydraulic containment of the entire Navy Grumman groundwater plume. Alternative 5B was determined to be less expensive than Alternatives 4 and 5A and found to be the least expensive alternative at achieving the remedial action objectives with accelerated mass removal in the center of the plume. Other alternatives, including Northrup Grumman's suggested IRA, would not be as effective in removing contaminant mass and in hydraulically containing the Northrup Grumman groundwater plume.

COMMENT 190: The NYSDEC failed to properly evaluate and consider the well-documented, serious implementability problems posed by the proposed remedy.

RESPONSE 190: In the FS and proposed AROD, each of the alternatives were fully evaluated relative to the nine remedy selection criteria, one of which is implementability. The NYSDEC recognizes the challenges associated with implementing remedial programs in heavily developed areas such as the area around the Navy Grumman groundwater plume. Fortunately, many of these challenges can be readily managed by applying standard construction practices. Furthermore, and as detailed in the Response to Comment #25, a Community Liaison Plan will be developed that will serve as a roadmap to the sources of information during the implementation of Alternative 5B. The plan will function as a guide on the best ways to communicate information regarding the on-going activities, answer questions, and to raise and resolve issues. During the construction phase of the project, regular community updates will be provided that will report on upcoming activities and the on-going progress. The NYSDEC has worked with numerous responsible parties during the implementation of remedial programs across New York State to address community concerns. In addition, in 2018, the NYSDEC successfully installed four fast-track groundwater extraction wells in heavily developed areas within the Navy Grumman groundwater plume with only minor disruptions to the surrounding communities.

COMMENT 191: The NYSDEC has considered the concept of "full plume containment" on multiple occasions but repeatedly rejected the concept because, according to NYSDEC, a remedial

option involving "full plume containment" was unnecessary, impracticable and overly disruptive to implement, and not cost effective.

RESPONSE 191: While the Department was not supportive of full plume containment based on earlier data and groundwater flow modeling results, the comprehensive review of groundwater data combined with the groundwater flow modeling completed by the USGS as part of this analysis indicates that full plume containment is not only feasible, but is needed to protect the Long Island Sole Source Aquifer system, reduce impacts to the currently impacted public water supply wells, and eliminate the threat to currently unimpacted public water supply wells. Additionally, see response to Comment #184.

COMMENT 192: The current FS does not provide sufficient analysis to substantiate comparisons among alternatives and conclusions regarding mitigation of potential impacts on the environment. The qualitative conclusions provided do not represent a sufficient characterization of this required element in an FS. Further, because the proposed AROD relies upon the current FS to identify Alternative 5B as the preferred remedy, the failure of the FS to provide an appropriate level of evaluation of environmental impacts also means that the recommendation in the proposed AROD is not adequately supported with regard to this element. There is no assessment of the effect of consistent, year-round discharges to Massapequa Creek, which is now subject to seasonal fluctuation, on habitat usage. There is no consideration of the changes in flow regime relating to Bellmore Creek (approximately 10-fold per the range provided), which would be expected to result in substantial changes in the shoreline and near shore depths, affecting foraging areas for birds and mammals. There is no consideration of the effect on the changes in surface water flow to the wetland systems south of the SSP along Massapequa, Seaford Creek, and Bellmore Creek, which Section 8 of the FS repeatedly asserts are ponded and fed by surface water; consequently, changes in surface water flow regime could substantially reduce the values of wetland habitat.

RESPONSE 192: The 2019 FS was prepared in compliance with DER-10 and included a comparison of alternatives needed to support a FS. The USGS spent nearly two years developing, calibrating, and operating a comprehensive groundwater flow model of the area near the former U.S. Navy and Northrop Grumman sites. This model was not only developed to simulate groundwater flow, but was developed to allow the Department to understand potential impacts to the environment (e.g., aquifer water levels, surface water stream flow, wetland water levels, and freshwater-saltwater interface). The potential effects each remedial alternative could have on the environment were evaluated with the USGS groundwater flow model and subsequently in the FS. This involved an iterative modeling process where the numbers, locations, and pumping rates of extraction wells and the locations of recharge basins were adjusted to achieve hydraulic capture of both the 50 ppb plume and the SCG plume while at the same time minimizing the potential effects to the environment. While this groundwater flow modeling was used to support the FS, additional groundwater modeling will be completed as part of the remedial design to further maximize hydraulic capture of the Navy Grumman groundwater plume and to minimize or eliminate potential impacts to the environment.

COMMENT 193: NYSDEC conducted no assessment of saltwater intrusion.

RESPONSE 193: The Department evaluated the potential effects the remedial alternatives would have on saltwater intrusion and presented the methods and results in the FS. The potential for saltwater intrusion was specifically assessed by comparing groundwater through the General Head

Boundary (GHB) into and out of the Magothy for each alternative to the groundwater through the GHB into and out of the Magothy for the baseline alternative (Alternative 1). While the groundwater flow modeling suggested there may be small changes in boundary conditions, these slight changes are not expected to affect the position of the saltwater-freshwater interface under the implementation of Alternative 5B. As described in earlier responses (e.g., Response to Comments 188 and 192), additional groundwater flow modeling will be completed as part of the remedial design to further maximize hydraulic capture of the Navy Grumman groundwater plume while at the same time minimizing or eliminating potential impacts to the environment.

II. E. Department of the Navy

The U.S. Navy submitted a comment letter on September 6, 2019 which was received by the Department 60-days after the comment period ended. Therefore, the U.S. Navy comments have not been included in the Responsiveness Summary. The Department is in discussions with the U.S. Navy and will address comments and concerns that they have in the context of those discussions.

II. F. Whiteman Osterman & Hanna LLP

Mr. Timothy Duffy, with Coughlin Duffy, LLP submitted a comment letter dated July 8, 2019 which included the following comments (Comments 194 to 195):

COMMENT 194: At Page 8, Section 6: Enforcement Status, the Amended ROD states that the PRPs for the offsite groundwork contamination include Covestro, who is improperly identified as "the current owner of the RUCO Polymer Corp. (Hooker Chem) site (NYS Inactive Hazardous Waste Disposal Site No. 130004)". Please be advised that Covestro is not the current owner of this Site. The current owner is New South Road Realty, LLC. Additionally, Covestro is not the party who is obligated to undertake any remedial activity for the offsite groundwater contamination identified in the Amended ROD

RESPONSE 194: The Department will update the Final Amended Record of Decision to indicate that New South Road Realty, LLC is the current owner of the site (NYS Inactive Hazardous Waste Disposal Site No. 130004).

COMMENT 195: Covestro is not the party who is obligated to undertake any remedial activity for the offsite groundwater contamination identified in the Amended ROD

RESPONSE 195: Some of the groundwater contaminants present in the area defined by the NYSDEC as the Navy Grumman groundwater plume originated from the RUCO Polymer Corp. (Hooker Chem). Potential responsible parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

II. G. Coughlin Duffy LLP

Mr. Michael Sterthous with Whiteman Osterman & Hanna, LLP, representing Occidental Chemical Corp. (Occidental) submitted a letter dated July 8, 2019 which included the following comments (Comments 196 to 199):

COMMENT 196: As referenced in NYSDEC's Inactive Hazardous Waste Site Record, Covestro is no longer the owner of this site.

RESPONSE 196: The NYSDEC will update the Final Amended Record of Decision to correctly identify the current owner of the site (NYS Inactive Hazardous Waste Disposal Site No. 130004).

COMMENT 197: The Hooker-RUCO Site is not identified as a PRP under the current Record of Decision ("ROD") issued for the Grumman/Navy regional plume.

RESPONSE 197: Some of the groundwater contaminants present in the area defined by the NYSDEC as the Navy Grumman groundwater plume originated from the RUCO Polymer Corp. (Hooker Chem). For this reason, the current owner of the RUCO Polymer Corp. (Hooker Chem) site is listed as a PRP. PRPs are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

COMMENT 198: Occidental has been engaged in successful remedial actions under the oversight of the United States Environmental Protection Agency ("USEPA") for both on-site and off-site contamination emanating from the Hooker-RUCO Site which is not part of the Grumman/Navy regional plume being addressed by the proposed AROD and, thus, the Hooker-RUCO site should not be identified as a PRP for the AROD.

RESPONSE 198: As detailed in the Response to Comment #197, PRPs are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

COMMENT 199: The selected remedy for the Grumman/Navy regional plume includes the extraction and recharge of groundwater in the vicinity of the former Grumman/Navy property. Any additional extraction and recharge of groundwater in this area should be carefully assessed to ensure that it avoids any deleterious effects on the existing ONCT System which has been very effective to date.

RESPONSE 199: The groundwater flow modeling completed by the USGS for Alternative 5B does not suggest that the proposed extraction of groundwater combined with the return of treated water to the groundwater system via a recharge basin located in the vicinity of Bethpage State Park will adversely affect groundwater flow, and hence contaminant migration, in the area near the on-site containment systems.

II. H. Napoli Shkolnik

Ms. Lilia Factor with Napoli Shkolnik PLLC Attorneys at Law, representing current and former Bethpage residents, submitted a comment letter dated July 8, 2019 which included the following comments (Comments 200 to 203):

COMMENT 200: We urge you to offer to the public and immediately conduct sampling of all environmental media (soil, soil vapor, indoor and outdoor air, drinking water and groundwater) at any private properties whose owners consent to such testing.

RESPONSE 200: Outside of strategically placed groundwater monitoring wells and groundwater remediation wells for the sampling and analysis of groundwater samples, there is no need to sample off-site properties for site contaminants. The groundwater contamination is deep beneath the ground surface and is overlain by clean groundwater. Furthermore, both the U.S. Navy and Northrop Grumman operate soil gas containment systems to not only eliminate contamination in on-site soil, but to prevent off-site soil vapor migration. Northrop Grumman also operates two on-site groundwater containment systems using nine remediation wells to prevent the off-site migration of groundwater containing site contaminants. Both the U.S. Navy and Northrop Grumman perform monitoring of these systems to confirm that contaminants are not leaving the sites and to document that the systems maintain capture of both soil vapor and groundwater.

Homes in the area are connected to public water and do not rely on individual private homeowner wells for drinking water purposes. The public water supplies already perform routine monitoring in accordance with the NYSDOH drinking water requirements and provide high quality drinking water that complies with NYSDOH drinking water standards.

Off-site soil vapor intrusion sampling has been completed at 26 locations in nearby residential areas to evaluate the potential for vapor intrusion to occur. This included the collection of sub-slab vapor, indoor air, and outdoor air samples. Based on this sampling, sub-slab depressurization systems were initially installed to mitigate vapor intrusion at six locations. The Navy's Site 1 Soil Vapor Extraction System has been shown to be effective at mitigating the potential for these six locations to be impacted by soil vapor intrusion, and the sub-slab depressurization systems have been removed from these structures. Following these actions, the Department, in consultation with the New York State Department of Health, determined that additional soil vapor intrusion evaluations of individual structures was not warranted.

COMMENT 201: The Amended ROD should include an allocation of funds to compensate people who have been exposed to Site contaminants and/or whose properties are within the area of the plume.

RESPONSE 201: The site contaminants present in the Navy Grumman groundwater plume are deep beneath the ground surface and no one is being exposed to these contaminants. Because the site contaminants are deep beneath the ground surface, these contaminants are not impacting properties within the boundaries of the Navy Grumman groundwater plume. Please also see the Department's Response to Comment #27.

COMMENT 202: Another deficiency in the Amended ROD is its failure to address as "contaminants of concern" radioactive substances known to be present in on-site and off-site groundwater. This is a serious oversight, given the existing data from testing conducted by the Bethpage Water District, the School District and the U.S. Navy.

RESPONSE 202: Please see the Response to Comment #23.

COMMENT 203: The new cleanup plan should require that 1,4 – dioxane, a carcinogen known to be part of the plume, be treated and reduced to a maximum level of 1 ppb, as recommended by

the New York State Drinking Water Quality Counsel.

RESPONSE 203: As described in the proposed AROD and as described in the Department's Response to Comment #110, groundwater extracted under Alternative 5B would be tested and treated to meet all SCGs before it is recharged to the aquifer, discharged to Massapequa Creek, or used for irrigation purposes at Bethpage State Park. This testing would include the emerging contaminant 1,4-dioxane. It is expected that advanced oxidation process (AOP) technology would be used for 1,4-dioxane removal, if necessary, based on data acquired during the remedial design.

APPENDIX B

Administrative Record

Administrative Record

Northrop Grumman Bethpage Facility
Operable Unit Number 02: Off-Site Groundwater
Operable Unit Number 03: Former Grumman Settling Ponds and Adjacent Areas Off-Site Groundwater
and
Naval Weapons Industrial Reserve Plant
Operable Unit Number 02: Off-Site Groundwater
State Superfund Projects
Bethpage, Nassau County

Site Nos. 130003A & 130003B

1. *Proposed Amended Record of Decision for the* Northrop Grumman Bethpage Facility *site, Operable Unit* No. 02 and 03 and Naval Weapons Industrial Reserve Plant site Operable Unit No. 02, dated May 2019, prepared by the Department.
2. Referral Memorandum dated February 23, 2017 for Grumman Plume Supplemental Feasibility Study/DEC Compliance with Chapter 543 of the Laws of 2014.
3. Feasibility Study Report for Naval Weapons Industrial Reserve Plant, Bethpage, NY, dated March 1994, prepared by Halliburton NUS Corporation.
4. Record of Decision, Grumman Aerospace, Bethpage Facility, OU1, dated March 1995, prepared by the Department.
5. Record of Decision, Naval Weapons Industrial Reserve Plant, Sites 1, 2, 3, dated March 1995, prepared by Northern Division Naval Facilities Engineering Command.
6. Groundwater Feasibility Study, Grumman Aerospace-Bethpage, NY Site #130003A and Naval Weapons Industrial Reserve Plant Bethpage, NY Site #130003B, dated October 2000, prepared by Arcadis Geraghty & Miller.
7. Record of Decision, OU2 Groundwater Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites, dated March 2001, prepared by the Department.
8. Record of Decision, Naval Weapons Industrial Reserve Plant, OU2 - Groundwater, dated April 2003, prepared by Northeast Naval Facilities Engineering Command.
9. Public Water Supply Contingency Plan, dated July 2003, prepared by Arcadis.
10. Record of Decision for Northrop Grumman Bethpage Facility, OU3, dated March 2013, prepared by the Department.
11. Remedial Options Report, Grumman Aerospace-Bethpage Facility, dated July 2016, prepared by Henningson, Durham & Richardson Architecture and Engineering, P.C. (HDR).
12. Scope of Work, Northrop Grumman-Bethpage Facility/Naval Weapons Industrial Reserve Plant Feasibility Study, dated May 2017, prepared by Henningson, Durham, and Richardson Architecture and Engineering P.C. (HDR).

13. DECVPB-1 and DEC-VPB-2 Data Summary Report, dated 2019, prepared by Henningson, Durham, and Richardson Architecture and Engineering P.C. (HDR).
14. Letter dated July 27, 2012 from Massapequa Water District.
15. Email dated June 5, 2019 from Ms. Nancy Bacon.
16. Email dated June 10, 2019 from Mr. Phil Dehazya.
17. Email dated June 10, 2019 from Ms. Deborah Stellakis.
18. Written Comment Form dated June 10, 2019 from Ms. Deborah Dombek.
19. Email dated June 10, 2019 from Mr. Joseph DiGiacomo.
20. Email dated June 10, 2019 from Mr. Richard Murdocco.
21. Written Comment Form dated June 10, 2019 from Mr. Jeffrey Miraval.
22. Written Comment Form dated June 10, 2019 from Mr. Jeffrey S. Zinn.
23. Email dated June 11, 2019 from Mr. Lawrence Buchman.
24. Email dated June 11, 2019 from Mr. Harold Blau.
25. Email dated June 11, 2019 from Ms. Carolyn Nardiello.
26. Email dated June 11, 2019 from Mr. Rich Fram.
27. Email dated June 11, 2019 from Mr. Richard Lule.
28. Letter dated June 11, 2019 from Congressman Thomas R. Suozzi with the Unites States House of Representatives.
29. Email dated June 11, 2019 from Ms. Allison Lovett.
30. Email dated June 11, 2019 from Ms. Jean Sorrentino.
31. Email dated June 12, 2019 from Ms. Elayne Candiotte.
32. Letter dated June 13, 2019 from Ms. Susan Hopkins.
33. Written Comment Form dated June 13, 2019 from Mr. John Joseph Budnick.
34. Email dated June 14, 2019 from Mr. Christopher Proce.
35. Email dated June 14, 2019 from Ms. Joanne Foley, Legislative Aide to Rose Marie Walker.
36. Email dated June 16, 2019 from Ms. Donna Toman.
37. Email dated June 19, 2019 from Mr. Douglas Nuzzi.
38. Email dated June 21, 2019 from Mr. Asavri Gupte.
39. Letter dated June 25, 2019 from Mr. Thomas Gesauldi.
40. Written Comment Form dated June 26, 2019 from Mr. Michael Kosinski.
41. Letter dated June 25, 2019 from Ms. Sarah Meyland with the New York Institute of Technology.
42. Email dated June 28, 2019 from Ms. Francine Weaver.

43. Letter dated July 1, 2019 from Ms. Adrienne Esposito with the Citizens Campaign for the Environment.

44. Letter dated July 2, 2019 from Mr. Philip Healey with the Biltmore Shores Civic Association.

45. Letter dated July 3, 2019 from Mr. Michael Russell with the Long Island Trout Unlimited.

46. Letter dated July 3, 2019 from Mr. Stan Carey with the Massapequa Water District.

47. Letter dated July 3, 2019 from Mr. Karnig Ohannessian with the Department of the Navy.

48. Email dated July 4, 2019 from Mr. Anthony Fresco.

49. Letter dated July 5, 2019 from Mr. Michael Boufis with the Bethpage Water District.

50. Letter dated July 5, 2019 from Mr. Francis Koch with the South Farmingdale Water District.

51. Letter dated July 5, 2019 from Mr. John Reinhardt with the Town of Hempstead Department of Water.

52. Written Comment Form dated July 5, 2019 from Mr. Robert J. McEvoy, Richard P. Niznik, and Michael F. Rich, III, the Oyster Bay Water District Board of Commissioners.

53. Letter dated July 6, 2019 from Mr. Bill Pavone with U.S. Navy Restoration Advisory Board.

54. Letter dated July 6, 2019 from Ms. Caterina Rasi.

55. Email dated July 6, 2019 from Ms. Mary DeAngelis.

56. Email dated July 6, 2019 from Mr. John Mohlin.

57. Letter dated July 6, 2019 from Ms. Sandra D'Arcangelo.

58. Email dated July 7, 2019 from Mr. Carmine Vasile.

59. Email dated July 8, 2019 from Ms. Jeanne O'Connor.

60. Email dated July 8, 2019 from Ms. Margaret Massone.

61. Email dated July 8, 2019 from Mr. Charles Pleckaitis.

62. Email dated July 8, 2019 from Ms. Theresa Saccardi.

63. Email dated July 8, 2019 from Mr. Marjaneh Issapour with Farmingdale State College.

64. Letter dated July 8, 2019 from Mr. Brian Schneider with Nassau County.

65. Letter dated July 8, 2019 from Supervisor Joseph Saladino with the Town of Oyster Bay.

66. Letter dated July 8, 2019 from Dr. Charles Bevington with the Sierra Club Long Island Group.

67. Letter dated July 8, 2019 from Mr. Michael Sperling with the South Shore Audubon Society.

68. Letter dated July 8, 2019 from Mr. Enrico Nardone with Seatuck Environmental Association.

69. Letter dated July 8, 2019 from Ms. Lilia Factor with Napoli Shkolnik PLLC Attorneys at Law.

70. Letter dated July 8, 2019 from Mr. Nicholas Rigano with Rigano LLC.

71. Letter dated July 8, 2019 from Mr. Timothy Duffy with Coughlin Duffy LLP.

72. Letter dated July 8, 2019 from Mr. Michael Sterthous with Whiteman Osterman & Hanna LLP Attorneys at Law.

73. Letter dated July 8, 2019 from Mr. Edward Hannon with Northrop Grumman Corporation Aerospace Systems.

74. Written Comment Form dated July 8, 2019 from Mr. Bruno Ungania.

75. Written Comment Form dated July 8, 2019 from Ms. Dawn M. Zacchino.

76. Written Comment Form dated July 8, 2019 from Mr. John Masino.

77. Written Comment Form dated July 8, 2019 from Ms. Barbara Ciminera.

78. Written Comment Form dated July 8, 2019 from Mr. Palma Reyhing.

79. Written Comment Form dated July 8, 2019 from Mr. Donald Zacchino.

APPENDIX C

June 10, 2019 Public Meeting Transcripts

In the Matter Of:

PUBLIC MEETING

MEETING

June 10, 2019

STATE OF NEW YORK

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter

of

Proposed Amended Record of Decision Naval
Naval Weapons Industrial Reserve Plant (U.S. Navy)
ad Northrop Grumman Bethpage Facility Sites

PUBLIC MEETING

June 10, 2019

7:00 p.m.

10 Cherry Avenue

Bethpage, New York 11714

A P P E A R A N C E S:

Martin Brand, NYSDEC
Jason Pelton, NYSDEC
Dan St. Germain, HDR
Steve Karpinski, NYSDOH
William Gilday, NYSDOH
Donald Hesler, NYSDEC
Chris Schubert, USGS
Paul Misut, USGS

MR. FONDA: I work for the State Department of Environmental Conservation. Tonight's meeting is on the proposed amendment record of decision for the Naval Weapons Industrial Reserve Plant, U.S. Navy and Northrop Grumman Bethpage Facility Sites. As the agenda before you shows, you will soon see presentations by New York State Department of Environmental Conservation staff, New York State Health Department staff, and consultants working on this project.

It is expected that the presentation will run for approximately 50 minutes. We ask you to hold your questions until the end. As someone who has been involved in several of these remediation meetings related to this site, and someone who plays hockey across the street 20 to 30 times a year, I know and expect that there will be comments and questions relating to these presentations, as there will be many comments and questions. To be fair to all the residents, whether they are from Bethpage, Levittown, Massapequa, or other

communities, we would like to limit the comments to three minutes and questions to two. We do have a hard stop time of 9:30. We can cycle through, if there still remaining time if you still have questions, but this is a large crowd here tonight and I want to be fair to everybody who is here.

We will give the first opportunity to comment the public officials and followed by board district representatives. If you wish to make a comment, there were white cards as you came in, you should fill those cards out. Maybe raise your hand during the course of the meeting and we will hand you some cards. As a presentation is going on, representatives from the state health department are going to remain in the lobby just in case people have some one-on-one questions that they will feel more comfortable asking in a smaller setting rather than a large room. Please keep in mind written and verbal comments count exactly the same, and that the comment period goes to 7/7/19. So if potentially, if you have a long written comment, you can maybe summarize that comment.

I wish to thank the Bethpage School District for hosting this meeting, and from the cards that I have seen -- if I am neglecting anybody -- Assemblyman Michael LiPetri is the elected official. I want to also recognize besides the people you will see in front, we have Karen Gomez, the regional engineer for DEC and we also have Walter Paris for the remediation entity for the DEC.

With that being said, I will hand the meeting over to Martin Brand who will provide an overview of the project. Again, hold your questions until the end. It would be greatly appreciated.

MR. BRAND: Thank you, Bill. Thank you everyone for coming. Not the nicest night to come out. I drove through quite a downpour on the way here and it is still drying out. It's good to see so many people here. This is a big night in this community, it's kind of the next giant leap forward in a longterm problem that you all have been dealing with, some of you, for decades. Some of you are new to it. Others lived with it every single

day. So why exactly are we here? We are here because of a legacy of contamination from the industrial activity of Navy Grumman. We all know they brought good things to this community over many decades, but this right now is their lasting legacy.

Governor Cuomo and Commission Seggos, my boss, have been in the community a number of times. They come to Long Island all the time talking about emergent contaminants and what are quality issues. This is a huge priority for the governor and for my commissioner. And early in 2017, Governor Cuomo, hearing the concerns of the community and the lack of progress of some of the work that Navy Grumman was supposed to be doing in the hotspots -- you will hear more about that later -- directed to DEC to take a new, hard look at the longterm problem here. And we have done just that.

We went out and hired HDR -- you will hear from Dan St. Germain from HDR in a few minutes -- and we also formed a unique partnership with the US Geological survey to bring really the state of the art hydrogeology

experts in the country here to look at this problem. A fresh look at a longstanding issue, come up with some new options, look at hydro containment, look at way to optimize the revenue. And we are very pleased that on May 23rd Governor Cuomo released the engineering report and groundwater modeling report that these guys have created, and started a public comment period. The public comment period runs from May 23rd to July 7th. We are glad you are all here to help us kick this off.

Our new comprehensive investigation of this four-mile long plume is really a bold new look. The technology is better now than it was just a few years ago. The science, the computer power and the brain power that we brought to this problem. I hope you all had a chance to take a look at the exhibits out in front, you will see some of those slides again. You will be able to see the animation of the plume. This is a complicated issue, but frankly the solution is little more simple. The solution is to take action, not to continue

the study, not to continue to talk about it, not to continue to delay, to get out in the field. That's why in 2018 when the governor came down here in Bethpage State Park and talked about his initiatives for the area, Grumman was right there, Navy Grumman and people of Bethpage and the surrounding communities were right there at the screen. We have been out in the community drilling wells as part of this overall program; you will see that in a few minutes. But we have taken action in the last year. We have drilled three wells already and a fourth one is underway right now and part of this remedial plan to share with you.

So this is a good first step. There is a lot of work to be done. There is a lot of cooperation and collaboration that will be required, the local level, state level and then hopefully some cooperation and assistance at the federal level. So we are all with you. I just want to pass on the good wishes of the governor and commissioner that we are here, we will be with you until the job is done. The

bold step, we are going to take it with you and be with you every step of the way.

And when we get done with this public comment period, get done with the plan presentation here, we will be asking the Navy Grumman to step up and implement this plan. But we are not going to wait forever for an answer. We will commit state resources where necessary to get this going, get the system up and running and really start to process to restore this aquifer and restore this community.

So what were the goal? I am going to steal a little thunder from the engineers and geologists here, but I just want to front load it right up front while I have all your interest. But essentially what we want to do is we want to control this group. We want to contain it. We want to stop it in its track, make sure it does not migrate; doesn't contaminate any additional aquifer; doesn't contaminate any additional water supply wells. Your water districts here, Bethpage primary, but all the other districts that are

represented here tonight have done an amazing job over the last four plus decades in making sure that all of you have had clean and safe drinking water to drink. These guys work really hard. I talk to them all the time and they are right here at the front lines and they have been working for you and doing a fantastic job. But we don't want their experience to have to be replicated by other communities down the street from this plume. So that was our primary goal here, prevent further expansion. You will see we have some provisions of the plan to reduce contaminants with inside the plume, try to reduce this time frame down. We want to minimize impacts obviously to the public works well area. We want to make sure that we treat all this water and put it back in the aquifer to the extent possible, so we can maintain the sustainability for the sole source aquifer here. We want to minimize other impacts. We don't want to have salt water intrusion to become a problem now. We don't want to dry out wells. We want to provide some water for habitat.

There is a number of goals here. The primary is to contain this plume and keep it from migrating. You are going to see some of these slides again. But here is the bottom line, essentially. We did the science. You see some of the amazing detail of the map of this plume for the first time, ever. You could look at it in a three-dimensional way. Essentially, the solution is kind of nuts and bolts on the ground engineering. So 24 wells, treatment plants, recharging basins, lots and lots of piping, we are all going to ask you for your help and your collaboration and your patience as we get into this work. We bring a few eggs to make the omelet, we are planning here. And it's going to be costly. You see the capital cost here, 240 million dollars.

So what are we doing tonight? So tonight is a public meeting and it's part of our normal process in New York State DEC. It is part of our super fun program to solicit comments from the public in the community on a proposed plan. So we have done this, it's been an investigation, and you can go online and you

can look at some of the results of that. We do a feasibility study to kind of look at the engineering, look at the cleanup option, come up with a proposed plan, and then we propose this amended record and decision. Essentially what it means is a new plan. A new comprehensive holistic plan to lay on top of the existing plans that are out there, and really start making real progress on it. So that is where we are. So the comment period is open. You can make comments tonight. If you are shy, fill out the cards or give Jason Pelton an email. We really take seriously public input. We have often in the past changed remedies based on public comments. So you guys live here. We are visitors in your community. You live here, you know what works and what doesn't work. So we want to take advantage of your knowledge. So if you tell us that's crazy way to put that, that will never work, you let us know. Obviously we got remedial designs to come up and some things will change. The fine-tuning is done in the engineering plan, but feel free to make a

comment and feel free to make a positive comment as well. If you like something, let us know. We would like to hear that every once in a while. But certainly any comment, this is really your chance to let us know what you are thinking. If we are meeting the needs of the community, we are going in the right direction.

So big first step, we have been at this now about 2017. So we are moving forward. I want to make a couple of key points. One is all the existing commitments and obligations that the US Navy Northrop Grumman has in the community will still have to be met. This does not get them out of any other obligations; doesn't mean they can stop running treatment system; doesn't mean they stop cleaning up source areas; doesn't mean they stop working at the community park. This is on top of everything that they already have. This is an overlay to take care of this large problem.

So their commitments and obligations still stand. They are still under agreements with us, and they will finish their work. And, you know, as I said, we are going to ask them to do

the work. If they don't, we will start this work using state resources and we are going to use all the tools on the proposal, legal, political and social, to get them to commit, to construct and operate this system, but we will be moving forward regardless of their commitment. I just wanted to let you know that.

At this point I am going to introduce Jason Pelton. Jason works for me. He is the project manager of this project for New York State DEC and what I said, that hard look, that fresh look, I am sort of a hard side, Jason is more on the fresh side of things. So he is going to talk to you about kind of a little background information and what went into the plan. So thank you for coming.

MR. PELTON: Thank you, Martin. Before we start talking about the site and the site contaminants, first I want to back up and provide a little bit of background on kind of the Long Island aquifer. We talked a little bit about groundwater and the currents here in the Long Island aquifer system. I will do

that over the next couple of slides, and then we will start talking about some of the investigation work that hardly has been done, and ultimately letting you know where we are at today as part of our expanded engineering analysis investigation.

So the Long Island aquifer system, it's an EPA designated sole source aquifer, represents the drinking water source for just about three million people here on Long Island. Assuming we all use about 90 gallons per day, that is almost 300 million gallons being withdrawn from this rather prolific aquifer here on Long Island. So, needless to say, it's an important resource for both the quantity, 300 million gallons every single day, and also from a qualify perspective. It is used as a drinking water source.

A couple of things I also want to point out, and Martin alluded to the one, is that water districts have to comply with the drinking water standards or they can't use those wells; they are taken out of service. These water districts are regulated by the New

York State Department of Health, and if they don't meet those standards, then those wells cannot be used. Secondly, we are going to be talking a lot about the site contaminants tonight and the contamination in the groundwater, but really the bulk of that contamination that we are referring to is in the groundwater samples that we collect from our strategically-placed groundwater monitoring wells. You have probably seen us around town with large drilling rigs that we use to install these deep wells. So those are groundwater stamps. They are untreated and that is unlike the drinking water provided by the water districts that is treated.

So now we will talk a little about what makes up the Long Island aquifer system and we are going to use this little diagram here. You have got to use your imagination a little bit, but you are looking at Long Island, looking west to east. So out towards the Forks would be out here. You get your bearings, this is the north shore, the sound, barrier island, Atlantic Ocean over here. We know Long Island

is made up of a lot of sand, a lot of gravel. Near the surface that sand and gravel is dry, but as you get deeper and deeper into the aquifer system, you start to get water. The sand and gravel becomes saturated. And if we zoom into that spot where there is water in the ground, you can see the white particles in the sand and gravel, and those little poor spaces are voids around the sand and gravel are filled with water. That is groundwater. It is not dislodged underground lake, river or reservoir. It is water in these small spaces, and because water has to move around, all these little particles, the sand and gravel, sometimes soot and clay, it moves pretty slow. We estimate in this area that groundwater flows at about a rate of about a football field per year, 300 feet per year. Not feet per second like you see in surface water creeks. It moves pretty quick.

The aquifer, as it is shown here, is actually made up of three different aquifers. Near the surface you have number one, that is the upper glacial. Immediately beneath that

you got Magothy aquifer. That actually extends the depth of probably about 700 to 900 feet beneath the ground surface, so quite deep. That is in the middle here. And the bulk of the contamination that we are going to talk about tonight is in this middle portion Magothy aquifer. Beneath that you have got very deep, this Lloyd aquifer, and that's separated from the Magothy by this confinement, commonly referred to as the Raritan clay.

Lastly, we talked a little about wells, but these are just -- these vertical lines here in our diagram are used to represent wells. We use these to drill them, we use drill rigs to install these wells. They allow us to collect groundwater samples to understand where the plume is, where the contaminants are present, not present, how high the concentrations are, and how the groundwater is moving. So they are really important in this whole process. Obviously the water districts use wells similar and are much larger to pump water out of the groundwater drinking source.

So now we are all hydrogeologists. Now

let's talk a little about the site. Here we have our map of Long Island, Nassau County, Suffolk County, the site is located kind of in that east central part of Nassau County. Zooming in a little bit to Nassau County, the blue shading is used to represent the former location of the Navy property, and then the orange outline shading is used to represent the location of the former Northrop Grumman property.

The contamination that we are going to be talking about tonight originated from past industrial practices, manufacturing processes that occurred on the Navy Grumman properties. Some of these manufacturing processes in the industry included the production of airplanes to support the wartime efforts, and also the lunar module during the space race. The contamination originated from the Navy Grumman properties and I am just going to show a real simplified animation showing the plume here.

Originating from the Navy Grumman and extending about four miles to the south. It's about two miles in width and extends the depths

of about 820 and 900 feet beneath the ground's surface. Primary contaminant in the plume is referred to as trichloroethylene, or TCE for short, commonly used in industrial applications as a degreaser. It's not unique for the Navy Grumman site. In fact, across New York State we deal with this contaminate at a lot of our old industrial sites. So since the sites, the Navy Grumman sites, were listed on our New York state registry of hazardous waste for our super fun list.

A lot of cleanup work has been done, and this work has been done in accordance with records of decision, or ROD as we commonly refer to them. These are legal documents that outline the remedy for the cleanup plan for the site, and this work has also been done in accordance with consent orders between the responsible parties and the state, and agreements between the state and responsible parties. We are going to go into some of these activities over the next few slides.

Once again, here is our map. Grumman outlined in orange, Navy outlined in blue. I

know on the previous slide I showed a very simplistic plume, but it's made actually up of three different parts, if you will. You have got the shallower, what we call diffuse plume. It extends, generally, from 50 to 250 feet beneath the ground surface, contaminant concentrations generally around the drinking water standard of five parts per billion to, say, 50 parts per billion. So lower concentrations. In addition to that, you have got two deeper plumes in both cases where you have got the contaminant concentrations that sometimes exceed over a thousand parts per billion. So it is well above that drinking water standard. And these two portions of the plume are deeper, below 300 feet beneath the ground surface, and, in some instances, extend all the way down to eight to 900 feet beneath the ground surface.

So to address the groundwater contamination, both the Navy and Grumman have installed 11 pumping wells or extraction wells to remove the contaminated water from the aquifer. Once it is removed, they treat it and

then manage the water using recharge basins, where it's returned right back into the aquifer system. Since the operation of those pumping wells began -- I think the first of it was back in 1998 -- over 200,000 pounds of contamination have already been removed. And on an average day, these wells remove about seven million gallons of contamination water from the aquifer.

In addition to this treatment, this remedial action, both Navy and Grumman have worked with three of the local water purveyors to provide treatment at six different well fields, and they are shown here on the map. That allows for continued use of these public water supply wells for drinking water purposes.

In addition, we have identified the perimeter of the plume, or on the margins of the plume, downgrading of the plume. There are 16 threatened public water supply wells. To address these threatening water supply wells, the Navy and Grumman do implement early detection of the groundwater monitoring program to determine if the plume is moving towards

those, threatening the public water supply wells and if further treatment will be needed.

Additionally, both Navy and Grumman have completed work on site to address source areas. This is where contaminants might have leaked or been disposed of. This is range from excavating contaminant soil and transporting it off site for disposal to treating it in place using heating techniques, thermal techniques, or solar vapor extraction techniques.

Additionally, Navy and Grumman are addressing the off-site plume, where there is high concentrations of contaminants in the groundwater. These are commonly referred to as hotspots. Specifically the Navy, in that western plume, is currently designing groundwater extraction and treatment system that will include five additional extraction wells. And the North Grumman has installed three wells and are currently designing the treatment system to pull contaminated water out and treat that water from those stream wells over here.

You will hear the term "hotspot"

periodically throughout our presentation. That basically refers to areas within the plume where there is high concentrations of the contaminants; typically over about a thousand parts per billion. With that, I am going to hand it over to Dan St. Germain. He is a our geologist from HDR. He was the lead hydrogeologist for our recently completed expanded investigation and also our feasibility study. He is going to go into some of the details related to those.

MR. ST. GERMAIN: Okay. So the first big task that we had to accomplish was this expanded field investigation to make sure that we understood where the plume was. That kind of dovetailed into an engineering analysis that was completed that we will get into a little bit later in this presentation. You can see here the four major tasks that we had to do, and we will get into each of these individually in just a minute.

So first, we drilled a series of borings down on the Southern State Parkway and we collected a number of different groundwater

samples from these borings so we could determine what the water quality was in each different zone that we collected the sample from. We collected the soil samples so that we could better understand the geology and use those to -- here they are, up here -- fill in the data gaps that we have, so we could further find the plume and begin our engineering study. The deepest we drilled here was 1,060 feet.

This is a picture of the rig, that you may have seen around town, that we have been drilling with. I think right now it's over on north Wantagh Avenue if I am not mistaken. So from the 2018 State of the State Address, Governor Cuomo tasked the DEC, as Martin said, to begin to install fast-track wells. We had first drilled five borings that you can see here. We collected groundwater samples and salt samples just like we spoke of a minute ago. We installed three wells at the location circled in green here. These are large diameter, 14-inch diameter, extraction wells designed to extract large volumes of groundwater. We are drilling right now the

fourth well over near Wantagh Parkway, and that's outlined in orange. Again, here is the picture that you may have seen around town.

So that big task that we have is that there was enormous amount of data that has been collected out of here by both the Navy and Northrop Grumman by the water purveyors. So we needed to get our arms around all of the data that was collected and use it in our engineering study. So we acquired the database that Navy has collected and the data that Northrop Grumman has collected. The water purveyors collect ground samples for their wells and we have that data in our database, and we have data from New York State DEC, and we compiled that all into one large comprehensive database that we can begin to query and get an understanding of what is in this plume.

Jason, a few minutes ago, went through the contaminants that are out here. It's mainly trichlorethylene that involves an organic compound of industrial solvent that he spoke about. But there are other chemicals in the

plume. There are refrigerants in the plume like Freon. There are some stabilizers in the plume called 1,4-dioxane. This task was a very large task for us. It was a lot of work to compile all the data together from the database, that we can take this holistic view of what this plume looked like. And the image to the left is some of the pictures you have seen out in the session before we started here. The plume in purple is a plan view image of what we call the SEG plume, the standard criteria and guidance plume. And MCL would be considered one of those criteria and guidance. The plume in yellow is a volatile organic compound. So if you added up all of the chlorinated volatile organic compounds -- there are many of the in them plume -- if you added them all up -- and the yellow plume represents what is 50 parts per billon. And the plume inside it, kind of grayish yellow plume, is 100 parts per billion.

That was done so that we could begin to see what the internal parts of this plume really looked like. The purple gives us a

great view of its extent and how large it is and how wide it is, and in a minute we will go through how deep it is. But the volatile organic plumes allows us to see what it looked like on the inside and what the core plume looked like. We will get into those in a few minutes.

So this was the depiction of the plume where we started. Three plumes, like Jason talked about, the plume from the Bethpage Community Park, the plume from Navy Grumman, and then this larger overarching shallow plume. And this is a plan view looking down image of what the plume looks like after our work. I hope you can see a few things. I hope you could see how much detail we have here.

So the next couple of slides we are going to look at some three-dimensional image. This is kind of a bleak view. If you were in North Bellmore at 30,000 feet in an airplane and you were looking to the north and northeast and you could look through the ground surface and see what the plume looked like, this is probably what you would see. So you can see that the

plume starts up at the sites, it migrates to the south with groundwater flow, and you might notice that it has what I might describe as an undulated or an irregular surface. That irregular surface is due to a lot of things, but it's in part due to all the municipal pumping that has gone on, and it is in part due to the heterogenous or varying nature of the geology out there; the soots and clays and sandy gravels creating a surface and a plume that is slightly irregular in its shape and depiction.

I promised that we would look at what the core of the plume looked like. This is an oblique view of what the 50 parts per billion plume looks like. You could see it is flowing in the direction of groundwater flow. It starts up at the sites, migrates to the south, southeast. You might notice that there is a little bit of a gap between the site and the plume, and that's the value of all the good work that the Navy and Northrop Grumman have done over the years due to the on-site containment system and the pumping system at

the Bethpage Community Park. It actually works. It has allowed the plume to be disconnected. So that's all good things.

The next figure is what the one thousand PPB plume would look like. So now we are really looking at the core or the heart of what this plume is. You can see a portion of this migrates down from Bethpage Community Park and a portion of this migrates from the Navy and Northrop Grumman facility.

So now we are going to look at the plume from the side. And so if you imagine you were in Levittown and you were looking east, and by magic you were in an elevator down 500 feet and you look straight to the east, you could see this. This is the outside of the plume. Again, standing at Levittown you can see where the facility is to the left of the figure, Hempstead Turnpike towards the center of the figure, and Southern State Parkway toward the right. See the direction of groundwater flow and the effect it has on moving the plume to the south. The plume is four miles long roughly, 800 feet deep. You may notice that

there is a deep diving portion of this plume, and you may notice there is a shallower portion of the plume. And down near the Southern State Parkway, those two plumes are actually separated by three, 400 feet of water. So pretty unique configuration of the distribution of contaminants at this facility.

So now imagine the plume was a layer cave and we are going to cut that layer cave and begin to look at the inside of what this looks like. The red are the high concentrations of the plume, greater that a thousand parts per billion. The blue are the lower parts of the concentration; generally, in this case, 50 or ten parts per billion. And you could see groundwater flow. You could see the same configuration you saw on the side view. You see the shallow plume up there that stayed shallow, relatively low on concentration, 100, 150 parts per billion or lower. And you can see the deep plume where most of the mass is, thousand part per billion, red core of that plume. Most of the mass is down deep in the deeper portion of the plume. This is the

western plume coming from the Navy Northrop Grumman facility.

So now let's look at the eastern plume coming from the recharge basins that we use for the Bethpage Community Park. Same type of configuration, should look very similar. You could see the shallow plume, it is much weaker in concentration. You can see the deeper plume is much higher in concentration and migrates to the south.

So the next task for us was to develop a tool or -- what I forgot to mention earlier was that the DEC partnered with the DOH, USGS, our firm, and HDR, and USGS's role here was to develop a groundwater flow model for us. USGS had created an island-wide model that could be used to evaluate water resources here on the island. They took that model and they cut out the frame work of that model to this smaller model that we are going to use for our site. The framework of the geology, the hydrogeology and all aspects of that original model was all incorporated as the starting place for this new model. You can see some of the statistics here

for the focused area model; 25 layers; each cell is 100-by-100. The physical properties of the aquifer were taken from the island-wide model. And this model was calibrated to the local pumping conditions and the water levels that are out here and stream flows that are out here, so that we had a nice calibrated model to use for our setting.

So we took this calibrated model that the USGC made for us and we incorporated the plume shells that we just talked about earlier. And we, in essence, asked the model to start a particle, in modeling terms a particle, and imagine a particle of water starts at the center of each one of these cells, and we asked the model to calculate a path of that particle as it moves, starting in each cell inside the plume and migrating towards the pumping wells or maybe Massapequa Creek or Great South Bay. And that is what the model was used for and that is how we, in essence, came up with the scenarios that we are going to describe to you in a few minutes.

This was a process. We would put a well

in a particular place and look to see how many particles we captured, and went through this process of adding wells, changing pumping rates, changing depths, until we had all the particles inside the MCL plume or the SEG plume captured by the public systems. The model was used for other purposes, too. The model was used to help us evaluate what the potential effects to the environment were. One of our charges was to do hydraulic containment or hydraulically contain this plume, but to do it in a way that we were not negatively affecting the environment.

So the model was used to help us understand what potential impact it would leave to stream flow, what potential impact to wetlands, what potential impact to the safety over the aquifer and what potential impact to intrusion would be. So very useful tool for us. It's the state of the science in what we do is to use a model like this to help us design the pumping system like this. So this kind of illustrates we started the particles inside the plume, the model told us how they

migrated towards the extraction wells and then the water was then put back into the aquifer; in this particular example the recharge basins. So the model was able to do all of that for us.

So when we create models, USGS did a great job in creating this model. The model isn't taken as gospel or taken as being perfect without going through some processes to make sure that it's working and working correctly. So one of the process we go through is a verification, can we verify that the model is actually producing results that we expect it to produce. And the chart compares the simulated water levels and wells at the site versus measured water levels of the wells, and the closer they are to that line, the more accurate the model is.

We hope you can notice that the yellow dots, which are the wells near the site, are all very, very close to that line. That shows us that the model is verified the closest and very well for us. Not only does it -- was it used to verify the water levels in the aquifer, but it was also used to verify the stream flows

in Massapequa Creek. That was also part of our verification process, to make sure that the model was accurately depicting groundwater flow system.

So one of the first things that I want to show you is if we start a particle inside the SEG plume or MCL plume and we pumped the wells that Navy and Northrop Grumman have committed to put in, that are already operating today or that will operate in the future, these are the particles in red that would not get captured by the system. These are the particles that would start inside the MCL plume, that would not be captures by any of these wells and would migrate to the south and potentially either impact any additional municipal water supply wells or discharge in Massapequa Creek or Bellmore Creek or the other creeks.

I hope you can see the magnitude of the red lines there and how many particles and what portion of the MCL plume it would capture. So our goal, really, here is to capture those red lines. That is, in essence, what we are here to do.

So the DEC and the team had a number of goals and Mark, I think, went through these goals for us earlier, but we will just go through them again. The primary goal was to hydraulically contain the MCL or the SEG plume; to prevent further expansion of that plume facade; to reduce the volume of contaminants inside the plume, not just allow them to migrate all the way to the south to the wells and emanating portions of the aquifer on the way. Put wells in the middle and extract that out where it is and get it out of there now. We design this in a way to minimize the potential in the aquifer water supply wells and wells that are not impacted today, and also we try to do what we could to reduce the concentrations that municipal water supplies already exist. So we are trying to reduce the already impacted municipal water supply water. All the water is going to be treated to our industry and regulatory standards and the majority of the water as you will see in the next few slides is we turn back in the aquifer so we can maintain the safety of the aquifer.

And again all of this was done in a way to minimize the potential effects for the environment. So those were our goals.

All of our work was summarized in the document, that I think is available online to everyone, called a feasibility study. The feasibility study detailed all of the remedial alteratives that we are going to outline for you today. It provides the technical basis for the DEC and their selection of the proposed remedy, and it supports the development of an amended record of decision that is going to come later on.

So the feasibility study goes through a process of comparing and contrasting the scenarios to each other. The first two are called threshold criteria. These first two have to be met with the alternative to move forward. The next five or six are balancing criteria. We are going to use those to compare and contrast the remedies to each other. Then the last one is modifying criteria, and that is the reason we are here today; to have this public meeting to present to you these results;

to get your feedback and input, so that we could potentially modify this to meet your expectations.

So here is the meets of the presentation and feasibility study, if you have read it, we are going to go through a number of these alternatives. The first one is the alternative that we have already talked about. It is called no further action. It's not no action, it's no further action, and it includes all of the work that the Navy and Grumman have committed to today and talked about. The next two alteratives are hydraulic containment scenarios. Those are wells designed to capture the contamination. The next two are what we calm plume mass flux wells. They are wells of the core of the plume and the high groundwater flow areas that is the concept of flux. They are designed to extract the core of the plume as quickly as we could. And alternative four is aquifer flushing, where we are going to extract from the core of the plume. We are going to inject it in injection wells near the pumping wells. We are going to force and flush

it, pushing it to the pumping wells and extract it on the ground very quickly. And the last two are a combination of two and three, where we have hydraulic containment and we have the mass flux wells floating out of the core of the plume.

You may notice that there are A and B alternatives here. A common theme for this is that the A alternatives use local treatment plants and local recharge basins. The B alternatives are the same concept but they are centralized treatment plants and centralized recharge basins. So we will see that as we move through these. Let's get right into the heart of it.

So here is alternative one. Alternative one is further action. You can see the five wells for the on-site containment system at the Navy Grumman property. You can see the four wells of Bethpage Community Park. There is a GM 38 hotspot area that has been pumping for quite a number of years now. North of Grumman has been working on three wells in the RW21 area, and the Navy has been working on three

wells in the RV108 area. So these wells are all part of alternative one. As we have talked about, these wells do not hydraulically contain the entire SEG and MCL plume. They really hydraulically capture the on-site groundwater contamination at two facilities and they remediate the hotspots.

So I am going to show you a whole number of slides very quickly because otherwise I am afraid we will be here for a very long time if I went through each one of these. The two on the left are 2A and 2B. Those are hydraulic containment. You notice the wells are all at the distal end of the plume. They are designed to, in essence, hydraulically capture the SEG and MCL plume. The top approach uses local treatment plants and local recharge basins. The bottom one uses centralized plans and a couple of recharge basins.

Alternative three you might notice is not going after the purple plume anymore. It's going after the yellow plume. That's the 50 parts per billion plume, so it's not full of hydraulic containment. But that aggressively

attacks the core and the high mass areas of this plume. Alternative four is the aquifer flushing approach. You might notice the spiderwebs of piping that would be required out here. It would be incredibly invasive as far as digging up the roads and putting pipelines in. Design to attack, really aggressively the core of this plume. That is the 100 part per billion plume. It's hydraulically contained. Not the SEG plume and not the 50 parts plume. And then the last one on the right is alternative 5A. It's a combination of the hydraulic containment, 2A, but it includes many of the mass flux wells that are out there, to really aggressively attack the core of the plume. Those are six of the alternatives that are outlined in the feasibility study. But it's not the one that has been selected by the DEC for the remedy. That is alternative 5B.

There is a depiction of it here, 24 additional wells -- additional to the 16 that have already been committed by Navy and Northrop Grumman, pumping 18 million gallons a day, which is about 12,000 gallons a minute, if

I am not mistaken -- centralized treatment plants. It's one large treatment plant up at the Bethpage facility, all of that water is going to be directed over to a new proposed recharge basin north of Bethpage, golf courses in Bethpage State Park. Some of that water will be used for irrigation by Bethpage State Park as beneficial use item that prevents them from having to pump their own water in the aquifer out there.

Another beneficial use or aspect of this scenario is that some of the water will be treated at a small separate treatment plant down near the Southern State Parkway and Massapequa Creek and add about four CFS of flow to Massapequa Creek. This alternative hydraulically captures the entire SEG plume or MCL plume. Yes, this will go on for a very long period of time. And this has been designed in a way to minimize potential effects to the environment, minimize the effect of stream flow, minimize the effect to the wetlands, minimize the effect of the aquifer, as most of the water is being put back into the

aquifer, and minimize the potential effect of salt water intrusion. And so that is 5B.

So here is the money slide, literally. You may notice that all the things we talked about earlier are outlined here. Some are centralized treatment recharge, some are decentralized treatment recharge. You can see the number of wells by scenario that are listed up here, pumping rates up here, and you may notice that the capital cost of construction ranges from a low of around $166 million to a high of well over $300 million, and the preferred remedy that has been selected by the DEC, 5B, is actually in the middle of the road. A lot of money, but it's not the highest, most costly alternative here, and it's not the least expensive alternative here.

So with that, I think I am going to turn it back to Jason. This slide basically outlines what we just talked about, and I am going to hand it over to Jason.

MR. PELTON: All right. Well, I am not going to tell you anything new because Dan just stole my thunder. You have seen this

slide already, I will go through it pretty quick. Let me actually back up here. As Dan mentioned, we are proposing alternative 5B. It meets our remedial action of goals, hydraulically contain and expedite cleanup of the Navy Grumman plume. You have seen this slide before. It does include 24 extraction wells. They are shown here throughout kind of the core of the plume, the yellow part of the plume and also the purple shade of the plume. The wells in that yellow area, those are what we call mass flux wells. They really geared towards getting at the highest concentrations of the plume. The wells in the purple shade area are what we call hydraulic containment wells. Those are really meant to prevent further expansion of the plume, kind of contain the plume, prevent it from moving further south.

I am going to zoom in to the northern half and the southern half of that slide we just saw before. So right on the bottom of the slide here is Hempstead Turnpike, to get your bearings. So we are looking at the elements of

alternative 5B, north of Hempstead Turnpike. We have got those eight mass flux wells, like I said, in the central part of the plume, where the concentration is the highest. That will allow us to remove more mass and make cleanup more efficient and occur more quickly. We have central treatment located in the general vicinity of the former Navy and Grumman properties. Exact location has not been identified, but that will be determined during a more detailed remedial design. And we have central recharge occurring in the area of Bethpage State Park.

Now looking at the southern half of alternative 5B -- once again you get your bearings -- this is all the elements of the remedy below or south of Hempstead Turnpike. We have got 16 of the hydraulic containment wells. Like I said before, these are to prevent plume from spreading or continuing to arch to the south. We have an essential treatment plant located near Southern State Parkway, near the head waters of Massapequa Creek. To treat some water, that water will be

treated to the drinking water standards or better, before it is discharged in the Massapequa Creek. And we also have three wells located along the very distal end of the plume. Those wells will be located right next to a smaller treatment plant. So the water will be extracted from the wells, put into a small treatment plant, once again treat it to drinking water standards, and then it would be discharged to nearby recharge basins.

All right. With that I am just going to hand the microphone over to Steve Karpinski with the health department and he is going to talk about Department of Health's concurrence with this remedy.

MR. KARPINSKI: Thank you, Jason. While Jason is working on that, I will continue to -- obviously I am not -- that was really effective. So my name is Steve Karpinski. I work for the New York State Department of Health, Bureau of Environmental Disclosure Investigation, and I work hand in hand with Jason and everybody else who has been involved in the project. I am one of many

people from the Department of Health end of things that are involved in this project and involved in many projects throughout the state. Nassau County Department of Health has been involved right from the beginning, as with many people within the Department of Health. Bureau of Water Supply Protection people are here and have evaluated this remedy, as well as people from our toxicological group.

So what I do is I look at the same data that has been generated to evaluate whether people are coming exposed to the contaminants. It doesn't like me at all. All right. So I am just going to wing it then. We look at exposures, so how are we going to be exposed to these contaminants? We are either going to inhale them -- like when you are filling your car with gas, there is fumes associated with that, you could inhale them. We can have direct contact. If you are able to get down three or 400 feet below the ground surface and actually touch the contamination, it would be on your skin, and that is one way that you

could be exposed. The exposure concern that we are most concerned about is ingestion, like we have been talking about, what the public water suppliers have done to ensure that the contamination that is in the groundwater is not being delivered to anybody's home.

Bethpage Water District has done, as Martin has said, a tremendous job over the years. Right from the beginning, right back in the early '70s, when we knew this contamination was there, they shut down wells, and until they had proper treatment on those wells, they were not delivering any contaminated water, and they continue to do that all along, and to treat the water over and above what New York State calls for. So it really should be a comfort to everybody that is here. Yes, we have contamination in the ground, we know it's there. But it's been addressed, it's been treated, so that we don't have to worry about that as an exposure concern.

These were the exposure potentials that I was talking about, and in this particular case we have been evaluating whether people have

been exposed to ingestion. Again, from the early '80s up until present day, we know that the water district -- again, particularly Bethpage because they are the most significantly impacted -- has been delivering water that has met all the Department of Health as well as the federal drinking water standards that has been established. And as Jason mentioned, there is the public water supply contingency plan that has been in place and will continue to be in place to ensure that we monitor the groundwater upgrade of the public water supply wells, to find out if and when they are going to be impacted; and there is plans in place to have the Navy Grumman to put the treatment systems that are needed on wells that are going to be impacted. That is what we are finding out.

So again, this is my contact information. I guess the final thing I will say is that the New York State Department of Health has evaluated this proposed plan. We agree with the plan. We are happy to see that we are going to take major steps forward to take care

of the wells, the public water supply wells that have been impacted, and make sure there is no additional wells impacted down the road. Thank you.

MR. PELTON: Now we are just going to have Martin Brand just come up and provide a meeting recap. Then we will have Bill Fonda wrap up with the next steps.

MR. BRAND: Thank you very much. Well, you can see that our experience with slides is why we hire HDR and USGS to help us do the groundwater modeling and computer work. So just to recap, so we have a new plan. It's high in detail, high in science. You can read through it at your leisure this week or weekend, if you get on the web page and took a look at it. But really what it has done is taken a new look, as I said before, of a longterm problem. It's taking new science, new computer power and new eyes with the governor and Commissioner Seggos, and with my help and the help of Jason Pelton and Don Hessler, and my team and the USGS team, along with our partners in the Department of

Health. They are really coming up with a new approach because as you listened to Dan St. Germain describe sort of a no further action scenario, that's not acceptable anymore, just so further action. So we are trying different things, gone through different things. I am not going to take away some of the good work Navy Grumman has done. I will show you in a minute to summarize why we are here and why we came up with this new plan. Starting with the new plan, we talked about, had goals. Full hydraulic containment, we think the new plan will do that. That will prevent further expansion, will reduce the volume of contaminates. It will not create new harm and it will protect other water supplies and give us nice clean water to do what we need to do with it, what the community would like to see. We have heard from you all that you just did not want this to be put into service water. You want to put it back in the aquifer. So we changed the plan for that. We have heard from Grumman Bethpage State Park and others that

there is some beneficial uses that would be a good thing so we are patient in all that; and also some habitat restoration, Massapequa Creek and some of the other service water bodies. We also want to protect the longterm sustainability of Long Island aquifer as much as we possibly can, and again minimize other harms. So no salt water intrusion, no dry wetland.

So why are we here? So when we look at this slide here -- you saw Dan try to explain this and it takes you a little while to look at it. But essentially what it means is we do what we have been doing. Eventually those red lines at some point in time are just going to keep going. Plume is going to get bigger, going to keep going. It is going to pick up other communities, other water supplies, other water districts, who then will be having to do heroic work, like your water districts do all the time, in order to provide clean drinking water for the people. On the right is if we implement this plan. You can see everything stops. It stops moving. There is no red

lines, there is no escape; there is no more contamination heading south to other water districts, to Great South Bay or anything like that. So this is why we are here, because what the status quo is or what is going to happen right now if we are not taking this look is on the left. We don't want that to happen. We want something on the right, and then we keep optimizing the remedy and putting more contaminations out.

So takeaway point, full hydraulic containment is feasible based on our science, based on our hard look, based on the groundwater model. We do this. It's going to prevent further migration, it is going to protect water supplies. Not only will it help water supplies that are currently not impacted but it is going to reduce the burden. I have guys like Mike Boufis, he is looking at high level contamination coming at him, and he has to plan every day for this proposal to do this, and it will help him with that effort. And we are going to demand the responsible parties to implement the remedy. We don't want the state

tax papers to pay for this remedy. We want the polluters to pay for this remedy.

With that being said, we don't want to wait around until they decide, so we are going to use a little bit of your money to get this started and then we are going to seek cost recovery. So a couple of things before we get your questions, so one thing we hear -- we talked to a lot of people out in the hallways -- is how is this all going to work and when is it going to work and how much time does it take. So the public comment period goes through July 7th. It will take all your comments, evaluate those, factor those, make changes if we have to. We will put out a final plan. It will have all your comments summarized. In some cases they might be verbatim. If we get a unique comment, we will kind of summarize those. We will answer those to the best we can and explain why we make a change and why we did not make a change. We are going to formally select that remedy. We would like it to be the one we are proposing to you, but we are flexible. It's going to be

something that looks like that. We are going to formally select that using our authority from this day.

We are going to take that remedy, go to the responsible parties and say, "Implement the remedy." We will give them a certain time of think about it, talk about it. If they show interest, figure out how it might work and go from there. One way or the other this is not going to sit on a shelf. This is not going to be a plan that is going to sit on a shelf somewhere up in Albany. Whether it's Navy Grumman or whether it's the DEC, this plan is going to be implemented. As you already noted, we have already -- those eight wells, the fancy term "the mass flux wells," we are already drilling four of them. DEC went out there and jump started this work thanks to the help from the Town of Oyster Bay, Nassau County and the Town of Hempstead for access and for the permits. We already jump started that work. Those wells are in the ground being installed, ready to be hooked up to treatment facilities when they are done. So we have already jump

started the construction.

Now, there is some questions about how long it might take, whether it's five years or whatever, or 110 years. So we are going to have to do some remedial design work on this plan, fine-tune the remedy. These guys did a lot of great engineering work already. The plan is very detailed, if you read it. It has piping runs, it has all kinds of things. But there is certain things we have to do. For those of you that are in business or contracting know you have to have plans and specifications that you have to go out and get bids on. We want to spend your money wisely and we have to do that work.

That's going to be a very expedited process. That's not years. It's going to be very quick. Then we are going to get started. And this thing, we will do it in phases most likely. We do as much as we can. Immediately we are going to get out there to do those containment wells. So the very first thing that is going to happen, we will get down in that plume and get those wells in, get those

treatment plants built and stop the plume from moving. That will be done very quickly. You know, in a matter of once we get that design plans and specs for the bidding, we will be right out there in the field. As I said we are already drilling right now. We are actually going this week. So that work is going to start right away.

Now with the plan you have to put some figures in there to compare. So you look at the construction. You put something kind of reasonable that you think you can live with, so we put five years. We fully expect it to be done long before that. We expect to have things up and running long before that.

Now there is some estimates for full plume cleanup in that plan that you will see. So like the remainder figure we talked about 110, that is if we pumped and cleaned every single drop in that four-mile long, two-mile wide, 800-foot deep plume. Unfortunately it takes a long time to clean this stuff up, but almost immediately it's not going to be moving, not going to be going anywhere, and we are going to

be pulling contaminants out. And when we come back to you -- which we will routinely give you progress reports -- you are going to see rapid changes in that plume. I guarantee it. We are pumping 18 million gallons out, plus with Navy Grumman will have to continue to plump out, you are going to say, "Finally" -- some of you might be thinking -- "amazing changes in this plume." So when we come back to you, you know, in a couple of years and show you the next 3D vision of that plume, it's going to be different. And it's going to be going in the right direction. First of all, it's not going to be going in any direction. It's going to be staying where it is and getting smaller.

And that's the point. That's why we are here. We are going to make some progress. Been sitting on this for too long. Been putting up with the status quo for too long. We needed action. So complicated plan, complicated science, simple solution. Get out there and do something about it. So that is what we are going to do. Now Bill will take a few questions. I know some people want to

stand up and make a few remarks. So again, I will try to answer the questions the best we can, and thanks again for coming.

MR. FONDA: Once again, thank you for your cooperation during the presentation. I have about 35 cards so, as I said earlier, that's about three minutes per comment and two questions per questioner. I will call out the first three shortly. Again, we can let people make additional comments at this time. I am thinking we may not have that time, so if you could follow the limits that I suggested, I would appreciate that. After two speakers, I am going to call the next three speakers so we can save time in transitioning. We do have a court reporter who is recording the comments, so it will be an official part of the record. So occasionally I may look over at her to make sure she is able to keep up with the comments that are being made. Again, your comments are important and they are the official part of the record. So I will hold up a sign when it looks like you are hitting the

three-minute mark. Hopefully everybody can keep to that limit.

The first person I am going to call is Michael LiPetri, next is Assemblyman John Mikulon, and the next is the commissioner of the Bethpage Water District, John -- and the handwriting, I am sorry, I can't read it. And the assemblyman will lead us in the pledge, which I neglected to do at the start.

MR. LiPETRI: Thank you. If everyone can please stand and join me in the Pledge of Allegiance.

(Whereupon, the Pledge of Allegiance took place.)

MR. LiPETRI: Good evening everybody. I am New York State Assemblyman Michael LiPetri. I represent portions of South Farmingdale, Massapequa, Massapequa Park. First and foremost I want to applaud the DEC, DOH on creating a tremendous alternative. I see we have Supervisor Saladino here. I applaud your efforts in starting this study back when you were an assemblyman. It is great to see it come to fruition. I met with

Governor Cuomo and Commissioner Seggos up in Albany about this issue.

This plume has become a cancer to Long Island. Frankly, I am so happy to see what we have today. We have a full mass flux remediation, as well as containment as a representative of the south southern portion of Long Island. That is great to see that we are going to have a containment of this plume within the fourth coming time. One of my biggest critiques, I would say, is that time frame. Five years was way too long. Many of us have been waiting for 40 years, and the time has come and we must get this remediation up and running once and for all.

And Martin Brand is true and sincerely says that the comments you hear today, they will surely be taken into consideration. I had an issue over in West Islip where DEC just did that, and I thank you for that. So I appreciate it. I hope you hear these words that we must get this contained ASAP. I know I spoke with Governor Cuomo to put this at the forefront. It's fantastic and we have to get

this going. I know the Town of Oyster Bay, Nassau County, we will be working in tangent with each and every one of you on the state level. I look forward to seeing this cleaned up at the core. We must do that. We all must be here today and we must continue pressing forward and pressing to make sure this gets cleaned up. This is not the end of this.

We continue forward, we work continually with DEC, and I assure you I will be looking forward to working with DEC and DOH. But gentlemen, this a job well done. I read through the 400 page, the feasibility study. This report is highly detailed. You guys exhausted me and kept me up late at night, but it was well worth it. I just want to applaud you and say that I can speak for the residents of Farmingdale, Massapequa and Massapequa Park. And thank you, I appreciate it. Thank you everybody.

MR. FONDA: The next speaker is Assemblyman John Mikulon.

MR. MIKULON: Thank you. I am New York State Assemblyman John Mikulon and I

represent the Bethpage area. I must represent a lot of you here in this room, and I am not only -- I cannot only represent you but I am actually a resident of Bethpage. I grew up in the Bethpage Water District, bought a house with my wife. So I live right here and in the Bethpage Water District. Each every day I am committed to cleaning up the plume. And frankly I heard about this since I have been a child. This is something that should have been cleaned up back then. So I am going to be committed.

I must say I actually work with Martin on behalf of a resident of Bethpage. They were testing the water and it was going to affect his business. I called him up, we looked into this situation; they were able to move the testing site a few feet over. It doesn't affect his business and, actually, we are receiving better results. So together we are going to get this done. We are going to remediate. And the only thing that I have to say is, you know, I want to make sure I am going to be committed that this cannot be put

on the back burner. You know, we need to keep working towards this because so many times this has been at the forefront and then it died down. We can't let that happen and we have to hold the Navy and Grumman responsible. Thank you.

MR. FONDA: Next speaker is John Goomatoz, followed by Mike Boufis, Town of Oyster Bay Supervisor Joe Saladino and Stan Carey.

MR. GOOMATOZ: I am Michael, the superintendent of Bethpage Water. I want to thank everyone for coming tonight and showing your support for this plan. I want to thank the DEC, the health department, of course USGS. This is a huge milestone for the residents of Bethpage in this community. As you all know, we have been fighting this battle and we have been on the frontline since the mid-'70s. We will comment on this plan as we do every time.

The biggest question I got up for the first two hours is, "What is Mike going to say?" I mean we are going to comment. We want

to make sure that the residents of Bethpage are taken care of, our community is taken care of. We agree it's long overdue. We agree we don't want to see south Farmingdale, Massapequa water go through what Bethpage goes through. So we are all for stopping the plume. We are going to hold Martin and the DEC to the fire. And we do. I have argued with most of the regulators in here. Nothing personal, it's business. The bottom line is you come in our town, you have to deal with us. And that is where we sit right now. Thank you very much and I look forward to an expedited cleanup.

MR. SULLIVAN: Good evening. My name is John Sullivan. I am a commissioner of Bethpage and I am here tonight with two other commissioners, Teri Black and John Goomatoz. We ask the residents of Bethpage for a lot. We ask them for increased taxes, increased rates, and basically we ask you to come out tonight and stand with us. This is a monumental change in the way we are mediating this plume. It may not happen over night. A lot of us probably won't be here, but the

best part of the plan is it's for the next generation. We hope this cleanup comes out and works out for us. We have traveled a long road and it's come to an end. Thank you very much.

MR. FONDA: There is a slight change in order. Commissioner Teri Black from the Bethpage Water District.

MS. BLACK: Good evening everybody. I am Teri Black, Bethpage Water Commissioner. I am a lifelong Bethpage resident, third generation, and I have been involved in this situation my whole life. I would also like to add to what my fellow Commissioner John Sullivan had said. We have been at this for a very, very long time, and I do applaud and I thank the governor, the DEC and all of our elected officials who will work very hard with us.

Every journey starts with a single step and that step is tonight. We really need the support. We need to actually let our voices be heard to the DEC that this is the plan for Bethpage and as everyone is a sentiment

tonight, we cannot let up. We need to continue with this, and we thank you and we thank the DEC.

MR. FONDA: Next speaker is town supervisor.

MR. SALADINO: I have some prepared remarks because this is too important and I want to make sure we get this right. Pleased that we started with the Pledge of Allegiance because we are all proud Americas. But it illustrates an important point, that Bethpage is filled with proud Americans. We understand our commitment to America and the armed service, to our veterans who we thank for being here, including veterans of the United States Navy. We support the United States Navy. We support our country. We pay our federal taxes. And I want to make the point very clear, illustrate that to the United States Navy and to Grumman that they have a responsibility back to us.

So I am proud -- most of you know me. I am Joe Saladino. I am the new supervisor of the Town of Oyster Bay for these two years, but

I am proud to stand with you tonight. After decades of testing and modeling and calling for the complete remediation, we are here tonight to finally start seeing the progress of designing and building the full remediation of the Grumman Navy plume take shape.

As supervisor of the Town of Oyster Bay, Americas third largest township, I have the responsibility of looking out for the well being of all 300,000 of our residents of this town and especially the residents of Bethpage. The good people of this community have lived with this environmental crisis for far too long. The customers of our water district and especially Bethpage Water District have been burdened with the cost associated with this plume and have dealt with the anxiety of wondering if our water is safe. That's a problem to have that anxiety. But our water district has worked very hard to ensure that it's safe at the tap.

We live in America, the greatest nation in the world, and clean, safe and affordable drinking water should be seen as a right and

not a privilege. So it's only right to thank those who have been helping us all along the way, including Superintendent Mike Boufis and the dedicated commissioners of the Bethpage Water District, John Sullivan, John Goomatoz and Theresa Black. They have worked tirelessly to protect water at the tap and deal with the enormous expenses associated with delivering this life-sustaining resource.

It's also proper to thank the superintendents and commissioners of the surrounding water districts, who have been engaged, helpful and steadfast partners in finding this solution. We thank Governor Cuomo and the new leadership of the New York State Department of Environmental Conservation, including Commissioner Seggos and Deputy Commissioner Martin Brand who has come here over and over again to Long Island to deal with this. And we thank you for believing in us as we have brought up this issue for more than a decade.

We began to call for the complete remediation of the hotspots here in Bethpage

and halting the migrating of the plume going back to 2004, when I was first elected to the New York State Assembly. Representing parts of Bethpage and community south, we made it our priority to bring attention to the hardships faced by Bethpage and the concerns of others for far too long. As a member of the New York State Assembly Environmental Conservation Committee, I have relentlessly advocated for this environmental cleanup which at first fell on death ears.

When Governor Cuomo took office I found a partner who was willing to listen. His decision to change the leadership at the DEC was monumental and our community thanks you from the bottom of our hearts. As many of you are aware, chemical contaminations have been leeching from the site at which Grumman and the Navy built war machines to keep America free. Those operations date back to 1939. As a legacy byproduct of these operations, the dangerous chemicals, you have heard it all tonight, DCE, TCE, 1,4-dioxane have been entering and contaminating our aquifer system.

At first the contamination got to the upper glacial aquifer and then to the Magothy aquifer, from which Long Island derives all of our drinking water. These contaminants continue to permeate through the lenses for years and the plume grew and grew and grew. In the 70 years since the defense industry began to operate on this site, the plume, as per the latest report, two point one miles wide and over four miles long, reached depths of some 800 and even 900 feet, the same height as a New York City skyscraper.

The plume has already impacted 11 public water supply wells with at least 16 uncontaminated wells in its lethal path. Today is the culmination of the collaboration that quite frankly I undertook with our water districts with our experts, as well as thousands of residents who signed petitions, and we thank you all for signing those petitions and staying in support all along. We set out to prove that there was scientific data to support that this immense plume could indeed be contained and the contaminants fully

removed.

To do just that, I as your state assemblyman drafted and passed the legislation in Albany to scientifically define the methods of parameters for remediating this plume, especially through the hotspot treatments here in Bethpage, as well as the hydraulic containment. In 2017 that report was released confirming the feasibility that the technology will work to clean it up once and for all and do it right. Passage of this legislation and the resulting report are acknowledged on page one of the DEC's report and amended record of decision as the reason we are here today.

On page one it states the remodeling options of this report was completed and provided to the New York State legislature in accordance with A9492 Saladino, and that was the number of the bill that was passed into law and signed, and it was signed into law December 2014, after many years of struggling in Albany to get that passed.

Today we provide testimony following the second report, which built on the first one and

describes the specifications needed to decide this infrastructure effectively. We applaud the work of the DEC and are very grateful to finally be at a place that some thought we would never arrive, a place where now we are picking up momentum. While we embrace your findings of the options given, no further action is not an option. We will have some technical aspects that our experts will be addressing directly with the DEC and we have our attorneys and engineers from the Town of Oyster Bay here this evening and they have been working with me throughout this process. First and foremost the timetable. Five years ago is a very long time. And we applaud the DEC to pick up the speed on that and we have had conversations and a commitment tonight to all of us, that you will do just that. We understand that there are many loops to jump and we and the town will be working with you every step of the way.

It's very truly possible to get this done, and we know that the DEC will make that happen. This is the largest remediation project of this

kind anywhere in the nation, and it will take an enormous effort from the state and local levels to get through the process and the site access, but we will work together, as we must, to create the highest levels of collaboration, cooperation and communication. Our administration and the Town of Oyster Bay has done just that, by working with the DEC, the water district and everyone involved, to provide locations for the installation and the remediation infrastructure, while ensuring the reduction of impact on our residents' quality of life.

I would like to thank my other colleagues and government, including Legislator Rose Walker and Legislator Laura Schaefer -- both of them are with us this evening -- as well as our assembly members Michael LiPetri, John Mikulon, whom you have heard from, Assemblyman Montesano and everyone in local government and state government, so that we continue to get this done quickly. Our site must ensure that the responsible parties, not homeowners, pay for all of the past and the future costs associated

with remediation for Bethpage and especially Bethpage, as well as south Farmingdale and all the others affected, as well as those communities in its path. And most importantly we must continue to work together to provide for the health, safety and welfare of our residents.

Bethpage played a critical role in the history of our nation and of the world. It was the effort of the people in this community, Grumman workers, the Navy servicemen and woman and all of the Rosie the Riveters who helped to win the worlds greatest war and also put an American on the moon. Well, once again we are at that momentous time in history, the history of Bethpage, and we must act now and put those remediations in place to protect every resident in Bethpage. With the 75th anniversary of D-Day and the 50th anniversary of landing on the moon, efforts that came from the sweat and tears of the residents of this town and the residents of the Bethpage community. 2019 must go down in history as the birth year for the long overdue relief that Bethpage and our

surrounding communities deserve.

Our residents were there for America when Lady Liberty needed us the most, and now we call on you and the United States Navy and Grumman to come to our aide to protect Rosie the Riveter and this generation, as well as future generations, by winning the war on pollution and making the Grumman Navy plume finally, and once in for all, for all a thing of the past. I am Supervisor Joe Saladino and we are committed to continue the process and see that it gets done for you.

MR. FONDA: Next speaker is Stan Carey.

MR. CAREY: So I am Stan Carey, the superintendent of the Massapequa Water District. That truly is a tough act to follow. Back in 2011, about eight years ago, on a rainy night -- it may have been June, I think -- many of us were here and we spoke in opposition of the selected remedy -- I believe it was for the OU-3 portion -- and all the reasons we gave were the fluent models, the increasing contamination levels, just to name a few. We saw what the

struggles that the Bethpage Water District was going through. We certainly did not want to see that in Massapequa.

So fast forward to today, we have a whole new staff and DEC who we are very thankful for; Martin, Jason and Don, the hard work of HDR and the USGS, and we have a new plan, alternative 5B, which the Massapequa Water District fully supports. That alternative will certainly prevent impacts to our public supply wells and keep our water pure in Massapequa. So we would just like to thank everyone for their hard work and we, too, will submit official written comments to the plan. But again, thank you and please do your best to implement this in less then five years. Thank you.

MR. FONDA: Next speaker is Nassau County Legislator Rose Walker.

MS. WALKER: Thank you. And I am speaking on behalf of myself and Legislator Laura Schaefer who is right on the side there. But thank you so much for the presentation tonight. Legislator Schaefer and I are committed and have been

continuously through this process. Hicksville is my hometown. I border the Bethpage community and certainly Bethpage is my other hometown. My only wish is that you could have been involved 30 years ago and this would be done by now, so I thank you. The water district here is absolutely amazing. They make sure our residents stay safe and they continue to do that, and we will continue to work with them. God bless. Thank you.

MR. FONDA: Thank you. We now have reached the public section of our commenters. The first person is John Joseph Budnick.

MR. BUDNICK: I am retired. I used to be a Nassau County Assistant District Attorney. I used to be special assistant to the county board. I used to be a lot of different things, now I am retired. I am saying these things because I think they need to be said to be followed up on the presentations. Number one is your discharging to southerly discharge basins. I am not sure it might be more hydrically

correct and effective to discharge to northern drainage patients because that way the purified water could triple through the system in order to try and expedite the making of the entire horrible plumes into something that is usable by everybody on our county.

The other thing is I am worried about the issue of the health questions that a number of people in the Bethpage area, that attended a number of these hearings, have asked me about. I have spoken to New York State Department of Health and been assured that there will be health examinations and health investigations for the people in or around the Bethpage Community Park, people near the air stripping stations that we have now and potentially will be having in the future. They all need to be monitored to make sure there is no health [inaudible] near any of them. There needs to be continuing concern and continuing follow-up to make sure that everything goes as our supervisor and the folks from the DEC have said.

Mr. St. Germain here from something called HDR, who I believe is an independent contractor and independent person, has reviewed all of these, and I believe you stand behind all of them, and I hope that that continues and this is not just left fallow. It's been left fallow. I have gone back in the historical records of the newspapers here in Bethpage and Nassau County and noted that these complaints about water supply here in the Bethpage area go back to the 1940s. We can't allow any fallow time. Into the future we have to stand behind our town supervisor, the DEC, our county legislators.

There is also another particular question, very technical question. I see that we are going to discharge some of the purified waters into the Bethpage Park, and someone needs to contact the New York State Park system immediately and make sure that their counsel doesn't indicate that there is a problem with that, causing an alienation of state park land. Thank you all very much for putting up with me. Have a nice evening. God bless.

MR. BRAND: Thank you for your comments. We certainly did look at infiltration and whether we should put some of it there. Most of the water, very large percentage of water, would go on the northern part of recharge basin at Bethpage State, and just to assure you, I have been fully in conversations with New York State Parks about what infrastructure needs they might have and what might work for them and actually create some recreational opportunities as well. So we have been talking with them as well.

MR. FONDA: The next speaker is Robert Toman, and Gina McGovern right after that. And if Gina could walk her way up too.

MR. TOMAN: Good evening, my name is Bob Toman. I am a resident in North Seaford. I live a little north of the median edge of the plume. My concern was 18 million gallons a day to pump out and return about 85 percent of it seemed like a lot of gallons a day to come out. So my basic concern was the potential for undermining the support of the ground above it. Of course that was before I

was introduced to hydraulic confinement and I am not sure I fully understand it yet, and hopefully my concerns are unfounded. But I think that it's an item that at least should be looked into or considered. Thank you.

MR. BRAND: So thank you for the comment. We certainly mentioned a couple of spots where we looked at what the potential consequences of this pumping regime would be. Like I said, we want to make sure we are protecting wetlands and dewater any wells. We did not create a salt water intrusion situation. Ground movement, I think given the depth of the plume and the proximity of the geology and all of that, is not really a concern, but thanks for the comments. We will definitely indulge that.

MS. McGOVERN: Good evening. My name is Gina McGovern. I moved to a house in the north numbered streets directly south and east of the Navy Grumman property 25, almost 26 years ego. And approximately 20 years ago I started attending meetings and meetings and meetings and meetings and more meetings. We

have attended meetings with the DEC. We have attended meetings with the Navy. We have attended meetings with -- well, no. Grumman basically pretended we did not exist. We attended meetings with everyone. So I came into this just a little bit skeptical as you could imagine, as I imagine many people in this room did.

This seems like a wonderful plan and I certainly hope it works, and I certainly hope we are going to jump on it. My question really is about time and money. My father always said the hand that writes the checks writes the rules. If we are asking the Navy and Grumman to pay for it, do they get a say in how this works?

MR. BRAND: So how it works is we put this plan out there and we ask them to implement it. If they want to implement it, they have to sign a legal agreement saying they are going to do that, they are committed to that, and then we put a scope of work. But DEC is not going to approve a scope of work less than what we are proposing. I can

guarantee that.

MS. McGOVERN: That is question number one. So the second question I guess is about getting them to the table and getting them to the table fast. People do things for fear, love or money. Obviously Grumman stopped loving Bethpage a while ago. As for money, they rather not dig in their cushions and pull out the money that they need. But that is really all that's going to cost them, that they pointed fingers for 20 something years over there isn't excusable. And I certainly obviously support the Navy. I am married to a veteran. But they have done essentially the same thing. It's been an awful lot of tapdancing we have heard over the years. My question is, how are you going to get them to the table? What is the carrot; what is the stick, and how fast will it happen? You say things like quickly. Please quantify for us.

MR. BRAND: Well, we did come to the table by doing good science, good engineering work, we have defensible product. We generated information in the case of new

information that indicates that the correct remedies they are pursuing are no longer protective within the larger goals of the project and we get them to come to the table. And we have significant enforcement authority and our state superfund law, that once we go through this process -- and that's why this is really important that public comment periods are maintained and we have these comment periods with full transparency on what project we are proposing here. So we need all those legal marks because there is a state law -- there is a state finance law that requires us to ask the responsible party to pay for this. It's protection for you all so we don't just spend state superfund money right away and the state taxpayer dollars.

I have to ask them to do this work and they have to say no before I can submit state resources. The comment period ends July 7th, the plan right now. So very shortly thereafter we will come out with a formal remedy and then that discussion and that demand will make the responsible parties.

MS. McGOVERN: I understand you mean shortly. Are we talking three months, two months, six months? Can we get some kind of a time frame? Our comment ends July 7th and shortly?

MR. BRAND: Late summer.

MR. FONDA: Next three speakers are Susie Spinoto, Sandra D'Arcangelo and Edward Olmsted.

MS. SPINOTO: Susan Spinoto, 7th Street, south side. I grew up in Bethpage on and off. Back in 1990s I learned about the plume because there was a spill in Farmingdale. I went from the frying pan into the fire when I moved back home to Bethpage. When we moved here in 2004 I believe it was, there was a ton of meetings, what we were going to do with the Grumman site. They said they were going to put low income housing, which I knew they could not do, but we played the game and they came back and said, "Guess what, we are not going to do the low income housing because we can't put those houses on the poisonous land," which I already knew because

of Farmingdale.

So since I moved here, my girlfriend's dogs have been having cancer, had to be put down. Tons of people I know, I have gone to wakes because they got cancer. I always said no, not me, not my family, not my friends, but not anymore, because in October, I got diagnosed with breast cancer and so did my niece. I had my surgery, double mastectomy, my niece is going on July 8th, the day after we are allowed to put our information in. She is 40, I turned 60. No trip, no party. I was in two doctor offices on my 60th birthday. She is having a much harder time than I am. So I pray for all our pink sisters and brothers and I hope that you guys can ask, I am begging you to please tell us -- I know some of these questions were answered, but how long are we going to have to wait before you fix this? I know the water is supposed to be good, but there is too many people. I had a cluster in my breast and there is clusters in Bethpage with cancer.

Also, when you clean the contaminants,

200,000 contaminants are being taken out of the water. Where are you actually dumping the chemicals; are you putting it in Greenwood Lake where we go during the summer; are you putting in the ocean so we can't swim there? What are you going to do with all of those contaminants that you are taking the poison out and putting them someplace? They can't just be here. One last thing I never would have been able to talk like this back in 1990s when I found out about the chemicals and the plume and the poisons. I never would have been able to talk about this when I moved here in 2004, when I was going to the meetings and dreaming about the wonderful things we were going to put on Grumman's land. But since October I got a set and I say what I say because it's got to get taken care of. I don't want my kids dying and I don't want to put my dogs down. So now that we know that Long Island's water is one of the worst waters, yes, Bethpage it might have been best tasting, but it was worse and it's bad for us. It wasn't and it's not best tasting anymore either. So something has got to happen. Thank

you.

MR. BRAND: So thank you for your comments. First of all the water -- as we mentioned before since I think the early detections in 1975, all the water provided in the distribution system in Bethpage and it is tested, treated and approved. The Department of Health, the state level on the local level review all those results, and I can assure you that Bethpage Water District, as well as the other surrounding districts, provide you with water that meets all applicable standards that are out there, and that's been the case for a long time. It's contaminated before it comes into the treatment plant, but once it leaves that treatment plant, it meets all applicable standards.

In terms of the contaminants that you talked about discharge, it was about 24 contaminants in the plume that we have identified. The 200,000 number was the number of data points and samples and information points that we used in the model. But there was about 24 contaminants. When this system is

built and constructed, there will be some number of treatment plants. I think right now the plan is five. And it's going to treat that 18 million gallons of the water per day. Again, all that water will be treated down to the most stringent levels. So that water comes out of those treatment plants. It is going to be clean water, safe for all normal uses and purposes, and it is going to be discharged right back into the aquifer for the most part, or use for irrigation purposes or habitat enhancements in Massapequa Creek. So it's going to be all right here.

At this point we kind of skipped over John Goomatoz from the Bethpage Water District. I would like to see if John wants to come up and say a few words.

MR. GOOMATOZ: I am going to make this quick. I am here to ask certain people to rise and stand, the people every day that guide your water. South Farmingdale, Massapequa superintendents, our water district Bethpage, all our workers stand right now so you guys can be recognized. I

am going to tell you a short story. I know Bethpage water is known to be the contaminant, but in 1976 it wasn't Bethpage water that was contaminated, it was Grumman. Sal Greco 60-year fireman was our supervisor. In 1976 when Grumman was contaminated and people were drinking out of the water fountain. Sal Greco, he was the guy that got us in 1976 to realize that there was an issue in Bethpage that started back in 1932. Sal, I ask you to stand up.

I want to thank the DEC, the governor, all the officials here. But I have one thing to say, today is June 10th, June 10th. This is a new day in history for us 40 years. Although people have helped us and want to say they helped us, we will see who the real people that help us are starting tomorrow. We lived in this, our Bethpage residents, Massapequa residents and south Farmingdale residents lived this 24/7. I want the other people to come here and support us and say we are Bethpage guys, and that's it.

MS. D'ARCANGELO: Good evening. My name

is Sandra D'Arcangelo and I am with the restoration advisory board for the Navy Bethpage site. As we all know, our only drinking water source comes from the aquifer beneath our feet. So my question is why isn't some of this very expensive treated drinking water standard water being aimed back to our drinking water supply, especially since we do blending of water, and other areas in the country would be using that water immediately as their drinking water?

MR. BRAND: Well, that's a great question. We have looked at that actually, and frankly it's because we want to get municipalities and water districts out of the business of remediating legacy pollution sites.

MS. D'ARCANGELO: But it would be remediated already.

MR. BRAND: I understand, but we don't want this municipalities and all of that, first of all, to incur the cost. First of all we have to constantly -- as you know today, there is a number of people in this

room that still think they are drinking water that is not treated and still contaminated. And we thought it would better to use that water for aquifer restoration, habitat enhancement, irrigation and recharge rather than try to put it back into the distribution system because we just want to give everyone here that certainty, that they are not drinking water from the Navy Grumman plume. You guys have done that for long enough. We want to get you out of that plume, out of that situation. And you know, we have been having discussions with Mike Lewis and his commissioners about how we can help you continue your campaign, your efforts so far, define new alternate water supplies that are outside the plume, that support that for sure. We want to help that effort. So I think we just -- we did not even want to go down that road. From an engineering standpoint it might make sense, but I think just from a standpoint of frankly people that live here, getting up in the morning would be certain and be happy that they are out of the

plume and the plume is no longer impacting them. Even though we know we are treating the water and everybody is getting clean drinking water, we just want to be out of the plume, out of that business.

MR. OLMSTED: My name is Ed Olmsted. I am also restoration advisory board member. I would like to know why you are treating 15 percent of the water and putting it in Massapequa Creek where it's all connected and going to end up in the Great South Bay; why spend the money doing that?

MR. BRAND: Well, so we consulted. So when we did our analysis to determine the potential harmful consequences of pumping that much water in the aquifer, we also looked at some of the service water bodies around to see if there was some need or some habitat enhancement. They indicated Massapequa Creek is impaired, certainly for large portions of its reach, and it also has flow issues and some other water quality issues. So one of our recommendations now is to put some of that treated water into

Massapequa Creek, help the flow, help the overall water quality, increase aquatic habitat, which could not only enhance Massapequa Creek itself, but also the South Bay as well. So that's where we came up with that.

MR. FONDA: Next speakers are Richard Schary, Lisa Schary.

MR. SCHARY: Hello all, Richard Schary and I am president defense of Massapequa Preserve. There are about 500 members and we support the plan and there are some portions that I want to warn some people about. The reason the creek is impaired is because the six million dollars the county spent five years ago to put a new system in hasn't had a pump. Their pump was hit on Sunrise Highway. They can't get a spare part and have been waiting five years for a new pump. If the pump was fixed, the creek would be a lot better. I am just warning you of that.

Massapequa Preserve has always been a very exciting spot. We have had unfortunately a series of two incidents there having worked

with police for 20 years, the police and I are very satisfied that Massapequa Preserve in the last 20 years has not had, except for those two incidents, a serious crime. I just want to say that the height of the preserve, itself, is good for everybody to get into. And I want to show you one more thing. The creek that the water flows into, you have to watch out because there is studies that show that there is pollution and some are Bethpage containment areas, and that pollution may be radioactive. And this committee has to watch for radioactive pollution and could not possibly show up in radioactive creek and contaminate the water.

Otherwise, we support the preserve. However, when you fill up the preserve with the water, please make sure you don't add 17 million gallons a day. That would equal over one point seven trillion gallons over 200 years, which is what you had been proposing. So please make sure you don't overflow the preserve because Sunrise Highway already floods right now in heavy storms, and the next heavy storm it will flood and the homeowners who live

on Lake Shore Drive are going to go crazy trying to figure out where the water came from and have to look out their windows and see it rising towards their houses. Thank you.

MS. SCHARY: Hello. I just want to say a short statement. First of all, I want to thank all of you for coming tonight. My husband and I have been involved with the environment over, I would say, two decades at least, and I am a glamma, and I want you to know something. We were involved with liberty. We worked very hard with our local representatives. Many of them are here tonight. We worked with the community, with the DEC. We worked with the government. I am also a military grad. My father gave 25 years to the strategic air command. So I know that they can be forced into doing the right thing, and you see what they got in Farmingdale and other things, we know a lot of communities are suffering. There are clusters, there are problems that we can't prove right now, but if we don't do something, then we can't stop it from

affecting our future. I want everyone to be able to enjoy the preserve and all of our Massapequa Creek.

We have a documentary that we did. We show how it started, and we want you to know that you can all make a difference and you can make this happen. We deserve it. You pay enough in taxes. We have elected the best people in the world to represent us, and we want our DEC to work with our local residents, and I want them to be notified, if you are going to get a well in your neighborhood, you should know about it. If you are trying to sell your home, what does it look like if they pull up with the trucks and they start digging in front of your house? The value of your home is affected by anything that happens of this nature. So we have got to put all of you in charge. You are all the eyes and ears of this project. And this is just the beginning, you have got a long hall to go. But we are here to tell you that it can happen. Make it happen. Thank you.

MR. FONDA: After this speaker I have

ten more cards and about 20 more minutes to get through them. So if the remainder speakers can be as brief as possible.

MS. ESPOSITO: Good evening. My name is Adrionne Esposito. I am the executive director of citizens campaign for the environment. First off I would like to really wholeheartedly thank the DEC for this cleanup plan. Finally we have a plan that prioritizes public health over the Navy's budget. There is a concept that the Navy has yet to wrap their mind around. So this a very critical plan. With that in mind, I do want to make couple of comments. The first is that we appreciate that 85 percent of the water will be recharged into the ground and 15 percent will be used to help the Massapequa Creek. I remember the Navy's plan where 100 percent of the water was going to go into the Massapequa Creek which was just simply a bizarre and thoughtless plan.

Also, one of the things we are concerned about is even with a new plan given to the old God doesn't give us enough confidence that it

will be implemented correctly. And I know that a previous speaker spoke about this, but I think one of the things you could do in this plan is put in this plan how you will hold the Navy accountable. Will there be benchmarks of success? Will there be goals that you want the Navy to reach, and at what timetables will you be able to do that? After all, how would we know if you are holding the Navy to success or not? I think it would be good also for the public to understand what are the timelines, what are the goals, and what are the expectations of the Navy and Grumman, so that not only you, but the public can hold them accountable to achieving this cleanup and achieving this success as well.

And the reason that is important is I don't know about you, you are very beautiful. But I am going to be very old in 110 years from now. So the more we can front load this, the better off we are. So, for instance, I think also it would be a reasonable expectation for you to put in the plan because you already stated this, that you can implement the

cleanup, putting the wells in two point five years and not five years. At this point every year counts. So if we could shorten that timeline within the plan, that helps us also.

Last two things I want to mention is also radium. The groundwater cleanup plant dismisses or does not discuss the issue of radium. I want to tell you why we believe that's a big flaw in this. That's because we took the time to look at what is the average radium levels here in Nassau County and also across Long Island. So we looked at three consecutive years of drinking water reports that are provided by the water districts across Nassau and Suffolk County. In Nassau alone we looked at the year 2014, 2015 and 2016 50 water reports spanning 30 water supplies, and what we found is the average for radium 226 and 228 is 1.99 picocuries per liter. That is the Nassau County average.

In the plume they have reached as high as six and seven and eight picocuries per liter and dismissed it as background levels. The data shows that not to be true, that it is way

above background levels. So we also agree with some of the other comments I have heard at the last hearing, which is that radium 226 and 228 should not be readily dismissed and it should be looked at further and, if warranted, included in as a contaminant of concern and in the plan.

Last thing quickly, also the PCB remediation and the soil, I understand this is a groundwater remediation plan, however to leave PCBs in soil, doing the soil cleanup, we think could be a problem. So I did not see anything in the plan. As you know, the soil is going to be remediated 30 feet down, but however, the contamination of the PCBs goes into the groundwater, which is 50 feet down. So as we know, PCBs do move very slowly and they bond very well with the soil, but even EPA documents that PCBs do move -- I will bet slowly -- but they do move in groundwater. So what we don't want to do is leave another problem for tomorrow that we could have resolved today. So we would like to see something in the plan, but at least monitoring

the PCBs and see if there is a need to remediate them as well as part of this process. But overall, I do want to say again we are so appreciative of finally having a plan and we are really thankful for your work and all your efforts. Thank you so much.

MR. FONDA: Again, I am going to try to get everybody in as possible. Bill Pavone, Michael Camisa and Ashley Flores.

MR. PAVONE: My name is Bill Pavone. I am a new kid on the block, being that I only lived in north Seaford for 23 years and I have been directly affected by the water contamination for last four or five years. We thank both the elective officials for making this happen. Without them this would still be just paperware. We thank the New York State Department of Environmental Conservation, Department of Health, who worked tirelessly over the last several years to make this happen. Now what I ask all of you to do, everyone in this audience, make your words known. Your comments matter more than mine, more than these guys, the

residents of Bethpage, Plainview, Massapequa, Seaford, Levittown, Town of Hempstead, Town of Oyster Bay all matter. We need your help to make this happen. Thank you.

MR. BRAND: First of all, the plan doesn't dismiss radium. We have been investigating radium for the last couple of years as well. We continue to investigate any and all information we get about the use of radium nuclides that may be in Grumman, and these are some new allegations that we are looking into. I will say that, you know, that list of contaminants in the plan is not a stagnant list. You all have heard issues about emergent contaminants. Certainly if radium -- as we do our design and look at the groundwork characteristics -- if radium is an issue, we will accommodate for that in the plan. So if there is radium that needs to be treated, we will treat for radium. So it's not going to be dismissed. We take broad scans. We don't just sample for the contaminant concerns. We look for several hundred compounds when we take samples. So

we will certainly factor any and all contaminants that we find in the plume and then factor that in our plans for treatment.

MS. CAMISA: Hi. My name is Matthew Camisa. I have been a resident of Massapequa Park my entire life. I live there and I grew up in Massapequa Park. My personal interest is really the quality of the land. The cost of the cleanup for the next 110 years estimates as being 584,665,000. I just wanted to know if the recovery and the recuperation of the preserve's creek has been studied or investigated. I just want to make sure that the environment, although it has been a huge concern for all of us, that it is actually being -- the awareness of it is coming --

MR. BRAND: I am not sure the costs associated with the treatment of the water and any discharge in Massapequa Creek are included in those numbers you quoted. I don't know what else evaluation we did for Massapequa Creek, other than look at the habitat. We thought it was important enough

and we talked about the important natural resources. It's important for the community so we wanted to build that into the plan. If you have any other particular concerns, you know, let us know. We will make sure that it's evaluated when we do the design for that particular area.

MS. FLORES: My name is Ashley Flores. I am a resident in Bethpage. As a community member I think that it would be very important to incorporate within the plan some sort of formalized community advisory board or something of the sort that could allow for ongoing evaluation that not only holds these plan organizers accountable throughout the years that this plan is going to take, as well as just keeping the public educated as to what is going on throughout the whole process.

MR. FONDA: The next three speakers are Ann Kenna, Deborah Dombek and Warren Bavlowe.

MS. KENNA: Good evening. My name is Ann Kenna and I am a lifelong resident, third generation of Bethpage. I want to thank the

DEC for everything they are doing here. It's greatly appreciated. It's been a long time coming. I also want to thank the water district for constantly working to keep our water safe. My comments tonight are something a little different. It's directed at the negative press that has been coming about because of this plume. This morning a headline in Newsday once again confronted me. The words "Bethpage Plume" in very large letters stared at me from the newspaper. I state empathically Bethpage and its residents are not responsible for this devastation. I am for those in a position to do this, address this. Respect Bethpage. Identify the responsible parties at every term. Tag them with the correct monogram. It's the Navy Grumman plume. I urge our local press, especially Newsday to respect Bethpage and its residents. Keep in mind, consider how their negative headlines impact our communities. Thank you.

MS. DOMBEK: Hello, I am Deborah Dombek. I live at 57 Berkshire Road which is

northwest of the Bethpage Community Park and my question is where do people go in the community to get tested or evaluated to see who has been damaged by this water? I have a report here from April from my doctor, and I have got many heavy metal contaminants. I got aluminum, arsenic, barium, cadmium, cesium, lead, mercury, tin. The highest levels are the cesium and thallium, which may be related to some sort of radiation which someone mentioned to look into. They also mentioned here that their dogs were getting cancer. Many people in my neighborhood have told me of cancer, especially women who worked in the Grumman plant. And like I said, even the dog, I spend $300 a month for last year and the vets have given up on her. They don't know what this is with this skin. So my question is where do we go when we think we have been damaged by this? You know, you are saying about the next generation, what about the people living here now that are suffering? In the back there is a table that says health consultation report,

but when you find out this is something they did already and they already made the determination, so where do we go now to find out what to do when we feel we have been wronged with these chemicals in our water?

MR. BRAND: What we look at is what potentially people are getting exposed to. We know what's coming out of the water pipes. We know what Bethpage is putting into your homes. That water does not contain the heavy metals that you are talking about. Those are things that the water district has to monitor on a regular basis and we would know if those were minerals that were getting into the water. So it's extremely unlikely that the water that you are drinking is the source of the contaminants that your doctor is saying are in your body. In terms of what you can do to get tested or evaluated, again there is procedures that the Department of Health can take, but we are going to first want to know whether people are being exposed. And again, we know with relative assurance that people are not being exposed to contaminants that

you mentioned in addition to the contaminates that we know are in the groundwater. So it is a tough question to answer right off the bat. Again, we have to look at what the facts are. We have to look at what the data tells us about what people can possibly be getting into their body at this point in time.

MR. BAVLOWE: I am Warren Bavlowe. I grew up in Bethpage on Wilson Lane, which was about three blocks away from a well that was being dug when I was in college. And for the seven or eight years that I still lived there that well was pumping and they were working on it and we would ask them what was going on and they were closed mouth about it. I grew up there in the plume. I have cancer now and I am in remission, but who knows where that is going to go. Two, the cost must be born by Grumman and the US Navy, not us. Three, using Massapequa Creek, which I have fished in, as a sewer, is not acceptable. It will spread the plume to the south shore, and pumping water into areas north of it sounds a

lot like fracking, and you know the talk about fracking. And our governor said we are not going to be doing it here in New York. Number four, our real estate values have dropped and will continue to fall for years. Some Bethpage homeowners have been advised to pave over their backyard to protect their children. And five, this is a reelection issue as much as health and financial issue. If this is not resolved in a reasonable amount time, we will not reelect you. Thank you.

MR. BRAND: So I will try to answer a couple of the questions that I have information about. One is the Massapequa Creek discharge. That water will be fully treated to all applicable drinking water standards. It would be water that is perfectly acceptable to drink and cleaner than the water that is already in Massapequa Creek. So it would not be putting sewer water in and it would not contribute to any additional contamination.

MR. FONDA: The last four speakers are

Maryann Herbert, Mark Romaine, Lila Factor and Susan Hayes.

MR. ROMAINE: My parents bought their house in Massapequa Park in 1955. I grew up in Massapequa Preserve. On the stream areas that I fished in and used to catch tadpoles there are dried up. The pond they used to skate on is dried up as well. A lot of people here mentioned that the future is most important here, and I absolutely agree. However, it is also really important to manage our fresh water resources. The main thing about Long Island is that are the largest sole source aquifer in the country. The concern that I have here is that one of the reasons we got here is because of overstressing and overpumping aquifer. The plan you are putting in place is to overstress it even further. I thought this woman here -- I don't know if she is a hydrologist -- but I thought her question of why wouldn't you be adding this to public supply wells, it is not a point of getting away from the plume. You are treating it

100 percent, there is nothing added to the supply wells. As a matter of fact, if you think about it this way, my real concern here is that every time you pump a well in an aquifer, you create something called a cone of depression, meaning that all the water in every direction around that pump is being pulled down. If we think about dioxane, if you do a simple web search, you will find it's not just a local problem, it's a national problem. There are so many different ways it could be introduced to the groundwater. And emergent contaminants have become a very great deal because every few years they are finding new ones. The concern here is that 15, 25 years from now, there might be other contaminants that have now be identified that have pulled further down into the aquifer because of the fact that we are continuing to pump.

The issue here is that nitrogen as I believe Mr. Saladino had mentioned, nitrogen occurs in the upper aquifer. If you pump aquifer a lot, you are going to draw more

nitrogen now into that aquifer. So the biggest concern also is you mention about how it absorbs in place. If we are pumping 900 feet down, that same rule of the cone of depression applies 900 feet down. You can absolutely drastically affect the functions of the aquifer overall.

The last thing I would say is that one of the solutions you might want to consider is I agree, as I said, with what this woman had to say about it. But also 50 percent of the water on Long Island is just a runoff. Previous generations can be concerned about our generations and realize that recharge matter. Take a look at the sumps where you live. Are there trees growing? Are they being maintained by our county? No, they are not. So to me, if I am looking at a situation where you are going to be pumping out six billion gallons of water annually over that amount, and it's going to be 100 percent pristine. It makes no sense to do anything other than to supply it to these people so that this way their own water services won't be pumping out as much as they

currently are. If you think about it, 17 billion gallons a day. The most water ever pumped out by Massapequa Water District a day was about 18 million gallons. So there is no reason why Plainview, Farmingdale, Bethpage couldn't use this water. And as a result, you would be retaining a lot more of this water for future generation, for future use. Thank you.

MS. HAYES: My name is Susan Hayes and I am a Massapequa resident. I find it encouraging that the New York State DEC partnered with the USGS to hire professional hydrogeologists to provide an objective science of study to actualize the situation. So what role will the USGS and HDR play throughout this project and will expanded assessment occur to continually be on top of the potential change in the footprint of the plume? Because it's extremely important considering the relevance of the mapping that you showed us this evening. And lastly I agree with the woman who stated this should no longer be called the Bethpage Plume. It should be Navy Grumman Plume. And my

reasoning for that is I just came from Massapequa and I belong to a book club. I am active in my community and I have a lot of friends. I went to a meeting one night after coming to a meeting in Massapequa where there were a handful of people, and I said, "Guys, do you believe what is happening with that Bethpage Plume?" They said, "What? It's in Bethpage." I am like all right. It's absolutely not. It's like headed our way. It's in Massapequa, it's in Seaford. It's not the Bethpage Plume. This is our water and it's a result of Navy and Grumman and it has nothing to do with the town. So labeling it a town because it's located there is a misconception because people -- I know there are a lot of intelligent people out there, but it doesn't mean you are aware. So it is mislabeling and I was wondering if maybe we could work on that a little because maybe this room would be packed and everyone would realize the seriousness of the situation.

MR. BRAND: I learned that lesson I think the first day I came down. So you will

notice every single piece of paper that we put out here today and every single slide calls it the Navy Grumman Plume. There is no mention of the Bethpage Plume anywhere in the documents. We are sensitive to that. Yes, our partnership with HDR and USGS has been nothing sort of fantastic. These guys work very hard with us. Our relationship with HDR is we have contracts with them and we certainly love to work with them and want to keep working with them in the future. So we will see how that works out moving forward. USGS we work with in a number of different ways on Long Island. We cooperate with them on the larger Long Island groundwater study that you have all heard about. They do different monitoring programs and certainly do fantastic scientific research in the area water quality as well as in other areas. So we support them financially in some ways and we certainly would love to keep working with them moving forward on this project and could not agree more.

MS. FACTOR: Hi. My name is Lila

Factor. I live in Massapequa Park. I am also an environmental attorney. I work for Napoli Shkolnik which is a law firm which is suing other [inaudible] on behalf of the residents of Bethpage. I have a lot of comments that I will make. You have looked in this study and all the previous studies that a lot of groundwater levels and the impacts on water districts and supply wells. But other than the testing of a few properties right near the south fence of the Navy site many years ago, no one has ever offered testing on private properties to look at what is in the soil, what is in the air that is coming up from the plumes through the soil vapor into the homes. So that is one missing link. If you are going to spend more than half a billion dollars to address the contamination, perhaps you should offer something that every person here really wants to know, how is this impacting my property, my home?

Second thing is we have heard comments from a lot of people here about the illnesses

they have suffered and their neighbors have suffered. Well except for a very limited survey that was done about ten years ago by New York State Health Department in a 20-block area right near the site, there has been no study, no monitoring, no analysis of the health impacts of these very toxic chemicals on the people in this community. Now I know that the New York State Health Department has just come out with a plan. Not many people know about it because apparently it has just been sent to about 300 people so far, but I have been able to follow the link today and look at this plan. It mostly talks about the fact and looks at the drinking water and says that, "Yes, the drinking water would be a problem, but it's not because it's filtered."

However, in the meantime, I know and you know, and I think all of you here know, a lot of people who live right on top of this plume and have become seriously ill with cancer and other illnesses that are linked to these chemicals. So while the plan addresses the groundwater, there has got to be a study of

plan for funds monitoring and compensation offered to the people who have already been made sick.

MR. FONDA: Thanks. We have now reached the end of your meeting. We did have a 9:30 time for ending this meeting. I want to thank you all for being respectful throughout the meeting. Remember the comment period goes to the 7th of next month. They will go to Jason Pelton, and that information is in the back. Thank you for your cooperation.

(Time noted: 9:40 p.m.)

C E R T I F I C A T E

I, CHRISTINA FERRARO, a shorthand reporter and Notary Public within and for the State of New York, do hereby certify:

That the within statement is a true and accurate record of the stenographic notes taken by me.

I further certify that I am not related to any of the parties to this action by blood or marriage, and that I am in no way interested in the outcome of this matter.

CHRISTINA FERRARO

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