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**New York State Department of Environmental Conservation**  
**Division of Environmental Remediation**  
Bureau of Eastern Remedial Action, Room 242  
50 Wolf Road, Albany, New York 12233-7010  
Phone: (518) 457-4349 • FAX: (518) 457-4198  
Website: www.dec.state.ny.us



November 3, 2000

RE: Northrop Grumman Site, Naval Weapons Industrial  
Research Plant (NWIRP)-Bethpage, Grumman Steel Los Site,  
Nassau County Sites No. 1-30-003A, B&C.

Distribution:

Enclosed please find a copy of the Northrop Grumman and Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage and the Grumman Steel Los Sites Operable Unit 2 Groundwater Remedy Proposed Remedial Action Plan (OU2 PRAP). Also enclosed are copies of the Feasibility Study Availability session for 7:00 on December 6<sup>th</sup> at the JFK Middle School in Bethpage and the PRAP public meeting for December 13<sup>th</sup> at the Bethpage High School.

If you have any questions, please contact me at (518)457-3395.

Sincerely,

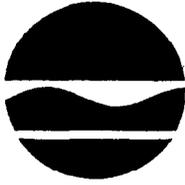
A handwritten signature in black ink, appearing to read 'Steven M. Scharf', written over a circular scribble.

Steven M. Scharf, P.E.  
Project Engineer  
Bureau of Eastern remedial Action  
Division of Environmental Remediation

(cofmanprap.wpd)

Enclosure

NEW YORK STATE  
DEPARTMENT OF



ENVIRONMENTAL  
CONSERVATION

Public Availability  
Session For the  
Northrop Grumman  
and the NWIRP Sites  
Operable Unit 2  
Feasibility Study

Date, Time and Location

**December 6, 2000**  
JFK Junior High School  
Broadway, Bethpage  
7:00 p.m.  
Mark Your Calenders

Main Document Repository

Bethpage Public Library  
Powell Avenue  
Bethpage, NY 11714

For More Information on the  
Northrop Grumman, NWIRP  
and Grumman Steel Los Sites:

NYSDEC Central Office  
50 Wolf Road Room 242  
Albany, NY 12233-7010  
Att: Steven M. Scharf, P.E.  
Project Engineer  
(518) 457-3395  
1-800-342-9296

NYSDOH  
547 River Street  
Troy, NY 12180  
Attn: William Gilday  
(518) 402-7880  
1-800-458-1158 Extension  
27880

Site No's. 1-30-003A, B&C      October 2000

## Public Notice For the Northrop Grumman & The Naval Weapons Industrial Reserve Plant Sites

Northrop Grumman and The Naval Weapons Industrial Reserve Plant (NWIRP) Inactive Hazardous Waste Sites, Operable Unit 2 (OU2) Groundwater Feasibility Study Availability Session.

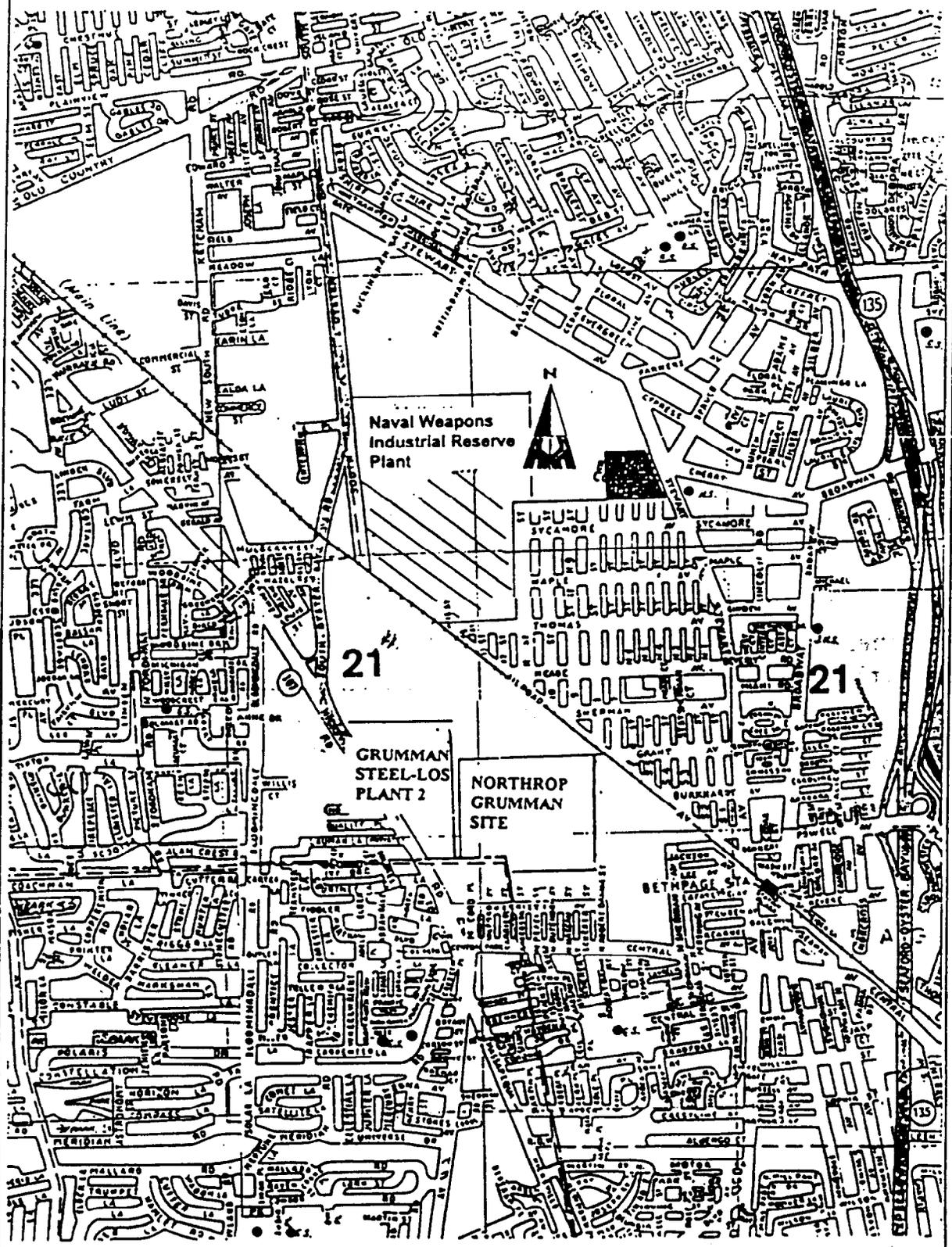
The New York State Department of Environmental Conservation (NYSDEC) is sending this fact sheet as an update on the Northrop Grumman (Grumman Aerospace), Naval Weapons Industrial Reserve Plant and the Grumman Steel Los Inactive Hazardous Waste Disposal Sites, located off Hicksville Road and South Oyster Bay Road, Bethpage, Nassau County (See figure 1). The NYSDEC and the New York State Department of Health (NYSDOH) announce the release of the Operable Unit 2 (OU2) Groundwater Feasibility Study (FS) for these sites. Also enclosed are notices from the Navy for a Remedial Advisory Board (RAB) public meeting on Wednesday October 25, 2000 (see enclosed Navy public notice for details) and for public review of documents regarding transfer of specific parcels of the Navy property to Nassau County.

### SITE HISTORY AND DESCRIPTION

The Northrop Grumman - Bethpage Facility, the Naval Weapons Industrial Reserve Plant - Bethpage (NWIRP) and the Grumman Steel Los Sites are inactive hazardous waste disposal sites, Site Nos. 1-30-003A, 1-30-003B and 1-30-003C, respectively, and are located in east-central Nassau County, Long Island. Northrop Grumman, formerly known as the Grumman Aerospace Facility, was 600-acres but through a program of investigation and remediation has been reduced in size. The NWIRP Site is approximately 105 acres in area and was also once part of the Grumman Aerospace facility. These sites are listed as Class 2 Sites (No. 1-30-003A&B) in the New York State Registry of Inactive Hazardous Waste Disposal Sites. Class 2 is assigned to sites where hazardous waste poses a significant threat to human health or the environment. The Grumman Steel Los Site, or the former Grumman Aerospace Plant 2 facility, now a Class 4 site, relates to this project as it was once part of the Northrop Grumman Site and was one of the sources of the groundwater contamination. A class 4 site is in the long term monitoring phase. The surrounding community is supplied with drinking water from the Bethpage Water District (BWD). Public water supplies are monitored on a regular basis to assure they meet New York State drinking water standards.

### INVESTIGATION SUMMARY: DESCRIPTION OF THE PROBLEM:

Northrop Grumman and the NWIRP have been in operation since the 1930s. These facilities are now in the process of completely shutting down. Over the last 30 years, Northrop Grumman has manufactured numerous aircraft for the Department of the Navy. This has resulted in the disposal of various hazardous wastes from industrial processes directly into the environment. On March 9, 1992 Northrop Grumman signed an Order on Consent with the State of New York to perform a remedial investigation and feasibility study (RI/FS). The State executed the Records of Decision (RODs) for the Northrop Grumman and NWIRP Sites in March and July 1995, respectively, for onsite Soils contamination. These RODs were known collectively as operable unit 1 (OU1). The RODs selected source control remedies for addressing the contamination in the unsaturated zones of site soils.



**Northrop Grumman**

Figure 1- Area Location Map

**DIVISION OF ENVIRONMENTAL REMEDIATION**

REVISED:  
DATE 03/21/00

DRAWING:



Town of Oyster Bay, Site No.s 1-30-003A, B and C

NEW YORK STATE  
DEPARTMENT OF



ENVIRONMENTAL  
CONSERVATION

**Public Meeting  
For the  
Northrop Grumman  
and the NWIRP Sites  
Operable Unit 2  
Proposed Remedial  
Action Plan**

**Date, Time and Location**

**December 13, 2000**

Bethpage High School  
Stewart Avenue  
7:00 p.m.

**Main Document Repository**

Bethpage Public Library  
Powell Avenue  
Bethpage, NY 11714

**For More Information on the  
Northrop Grumman, NWIRP  
and Grumman Steel Sites:**

NYSDEC Central Office  
50 Wolf Road Room 242  
Albany, NY 12233-7010  
Att: Steven M. Scharf, P.E.  
Project Engineer  
(518) 457-3395  
1-800-342-9296

NYSDOH  
547 River Street  
Troy, NY 12180  
Attn: William Gilday  
(518) 402-7880  
1-800-458-1158 Extension  
27880

Site No's. 1-30-003A & 1-30-003B November 2000

## Public Meeting Notice For the Northrop Grumman & The NWIRP Sites

Northrop Grumman and The Naval Weapons Industrial Reserve Plant (NWIRP) Inactive Hazardous Waste Sites, Operable Unit 2 (OU2) Proposed Remedial Action Plan.

The New York State Department of Environmental Conservation (NYSDEC) is sending this fact sheet as an update on the Northrop Grumman (Grumman Aerospace), Naval Weapons Industrial Reserve Plant (NWIRP) and the Grumman Steel Los Inactive Hazardous Waste Disposal Sites, located off Hicksville Road and South Oyster Bay Road, Bethpage Nassau County, New York (see map). The NYSDEC and the New York State Department of Health (NYSDOH) are pleased to announce the release of the Operable Unit 2 (OU2) Proposed Remedial Action Plan.

### SITE HISTORY AND DESCRIPTION

The Northrop Grumman - Bethpage Facility, the Naval Weapons Industrial Reserve Plant - Bethpage (NWIRP) and the Grumman Steel Los Sites are inactive hazardous waste disposal sites, Site Nos. 1-30-003-A, 1-30-003B and 1-30-003C, respectively, and are located in east-central Nassau County, Long Island. Northrop Grumman, formerly known as the Grumman Aerospace Facility, was 600-acres in size but through a program of investigation and remediation has been reduced in size. The NWIRP Site is approximately 105 acres in area and was also once part of the Grumman Aerospace facility. These sites are listed as Class 2 sites (No. 1-30-003A&B) in the New York State Registry of Inactive Hazardous Waste Disposal Sites. Class 2 is a listing assigned to sites where hazardous waste poses a significant threat to human health or the environment. The Grumman Steel Los Site, or the former Grumman Aerospace Plant 2 facility, relates to this project as it was once part of the Northrop Grumman Site and was one of the sources of the groundwater contamination. The surrounding community is supplied with drinking water from the Bethpage Water District (BWD). Public water supplies are monitored on a regular basis to assure they meet New York State drinking water standards.

### INVESTIGATION SUMMARY: DESCRIPTION OF THE PROBLEM:

Northrop Grumman and the NWIRP have been in operation since the 1930s. These facilities are now in the process of completely shutting down their manufacturing operations. Northrop Grumman has manufactured numerous aircraft for the Department of the Navy. This has resulted in the disposal of various hazardous wastes from industrial processes directly into the environment. On March 9, 1992 Northrop Grumman signed an Order on Consent with the State of New York to perform a remedial investigation and feasibility study (RI/FS). The State executed the Records of Decision (RODs) for the Northrop Grumman and NWIRP Sites in March and July 1995, respectively, for onsite Soils contamination. These RODs were known collectively as Operable Unit 1 (OU1). The RODs selected source control remedies for addressing the contamination in the unsaturated zones of site soils.

The groundwater contamination was deferred to OU2. The primary groundwater contaminants are chlorinated volatile organic compounds (VOCs) which were used and disposed of at the sites. These compounds include perchloroethene (PCE), trichloroethene (TCE), dichloroethenes (DCE), vinyl chloride and 1,1-dichloroethene (DCE).

arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, were detected in groundwater samples collected at the sites. However, only arsenic, cadmium, and chromium were detected at concentrations greater than the corresponding standards, and only in a small number of onsite monitoring wells, with chromium being the most prevalent.

### EXTENT OF GROUNDWATER CONTAMINATION

By current estimates, the groundwater plumes emanating from the three sites total 2,000 acres in area and are over 500 feet deep in several places. The highest concentrations of VOCs in groundwater were detected in on-site wells. The plume(s) emanating from the sites have impacted or threaten three public water supplies operated by the Bethpage Water District (BWD). Water from these wellfields is treated to remove VOCs prior to distribution to the community and water is monitored routinely. Nine (9) outpost or sentry wells were installed upgradient of the water supplies. These sentry wells have been sampled on a quarterly basis since March 1995. A groundwater computer model was used for developing and evaluating remedial alternatives for addressing the groundwater contamination. The study area that is encompassed in the model is 24.1 square miles. The model simulates groundwater flow throughout the entire thickness of the Upper Glacial and Magothy aquifers.

### INTERIM REMEDIAL MEASURES

Interim remedial measures (IRMs) are implemented at sites when a source of contamination or exposure pathway can be effectively addressed before completing the RI/FS. The following IRMs have already been implemented:

1. Protection of the Bethpage Water District Supply Wells Air Stripper systems that remove VOC contaminants have been installed at the three impacted or threatened public supply wellfields operated by the BWD. The systems at BWD plants 4 and 6 were funded by Grumman. The system at BWD Plant 5 was funded by the Navy as specified in the May 1995 Record of Decision for the NWIRP-Bethpage site.

2. Onsite Containment IRM: The groundwater IRM is containment of the plume below the sites. The groundwater IRM system went on-line full time in July, 1998. The IRM consists of four extraction wells, with the combined pumping rate of 3,375 gpm.

### OPERABLE UNIT 2 PROPOSED REMEDIAL ACTION PLAN (PRAP)

The Northrop Grumman OU 2 Groundwater Remedy PRAP is now available for the public to review. This PRAP contains eight remedial alternatives that were reviewed to address groundwater contamination from the Northrop Grumman, NWIRP and the Grumman Steel Los Sites. The proposed Alternative 3 includes: on-site plume containment, treatment and activated carbon air treatment, and discharge to on-site recharge basins; the off-site GM-38 area groundwater extraction and treatment system; the operation and maintenance of air strippers for BWD wellfields 4, 5 and 6; preparation of a wellhead treatment contingency plan for public water supply wells that are not currently affected but that may be affected by site-related VOCs in the future; a carbon polishing or equivalent treatment contingency for the BWD wellfields 4, 5 and 6; a vinyl chloride treatment contingency plan for the on-site containment IRM; long-term groundwater monitoring including comprehensive monitoring of plume attenuation; and long-term operation and maintenance of all operating treatment systems onsite and offsite.

**Repositories:** The public is encouraged to review the documents related to the site, *especially the Proposed Remedial Action Plan*, which are available to the public at the following locations:

**Bethpage Public Library**  
Powell Avenue  
Bethpage, NY 11714  
(516) 931-3907  
Hours: M-F 9:30-9:00  
Sat 9:30-5:00  
(Karen Gruskin or Lois Lovisolo-Reference Librarians)

**NYSDEC Region 1 Headquarters**  
SUNY Campus  
Loop Road Building 40  
Stony Brook, NY 11790-2356  
Attn: Mark Lowery, Citizen  
**Participation Specialist**

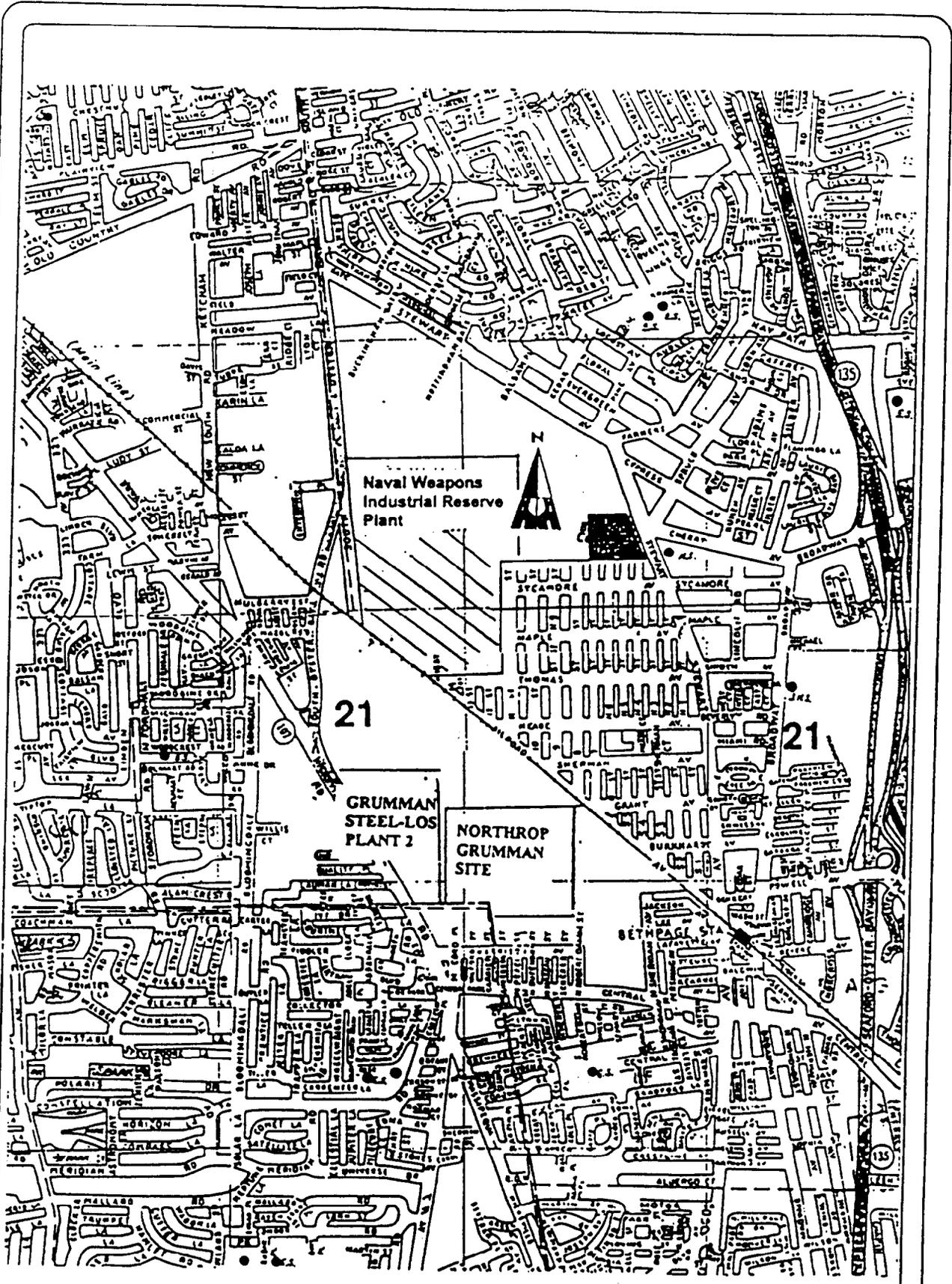
**NYSDEC Central Office**  
50 Wolf Road, Rm 242  
Albany, NY 12233-7010  
Attn: Steven M. Scharf, P.E.

**For More Information regarding this site please contact the following:**

**NYSDEC Concerns**  
Steven M. Scharf, P.E.  
NYSDEC  
50 Wolf Road, Rm. 242  
Albany, NY 12233-7010

**NYSDEC Concerns**  
Mark Lowery  
NYSDEC-SUNY Campus  
Loop Road Building 40  
Stony Brook, NY 11790-2356

**NYSDOH Concerns**  
William Gilday  
NYSDOH  
547 River Street  
Troy, NY 12180



**Northrop Grumman**

Figure 1- Area Location Map

**DIVISION OF ENVIRONMENTAL REMEDIATION**

REVISED:  
March 03/21/00

DRAWING:



**Northrop Grumman-Bethpage Facility- Site No. 1-30-003A  
Naval Weapons Industrial Reserve Plant- Site No. 1-30-003B**

**Town of Oyster Bay, Nassau County, New York**

**PROPOSED REMEDIAL ACTION PLAN**

**Operable Unit No. 2:  
Groundwater Remedy**

**OCTOBER 2000**



Prepared by:

Division of Environmental Remediation  
New York State Department of Environmental Conservation

# PROPOSED REMEDIAL ACTION PLAN

## Operable Unit No. 2: Groundwater

NORTHROP GRUMMAN - BETHPAGE FACILITY- Site No. 130003A  
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT - BETHPAGE  
Site No. 130003B

Town of Oyster Bay, Nassau County, New York  
June 2000

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### SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) is proposing a remedy to address the significant threat to human health and/or the environment created by the presence of hazardous waste at the Northrop Grumman Bethpage Plant and the Naval Weapons Industrial Reserve Plant-Bethpage (NWIRP), both Class 2 inactive hazardous waste disposal sites. As more fully described in Sections 3 and 4 of this document, plant wastes were disposed directly into either drainage sumps, dry wells and/or on the ground surface resulting in the disposal of a number of hazardous wastes, including the volatile organic compounds (VOCs) perchloroethene (PCE) and trichloroethene (TCE), the semi-volatile organic compound (SVOC) polychlorinated bi-phenyls (PCBs) and the inorganics chromium and cadmium at the site. Some of these contaminants have migrated from the points of disposal to surrounding areas, including the soils of the 3

sites and the groundwater beneath and down gradient of Northrop Grumman, NWIRP and the Grumman-Steel Los Plant 2 facilities. Contaminated groundwater originating from the Grumman-Steel Los Plant 2 Site, formerly part of the Northrop Grumman site, now a Class 4 site, would be addressed by the Northrop Grumman Site remedy.

These disposal activities have resulted in the following significant threats to the public health and/or the environment:

- a significant threat to public health associated with contaminated soils, groundwater and drinking water;
- a significant threat to the environment associated with contaminated soils and groundwater;

In order to eliminate or mitigate the significant threats to the public health and/or the environment that the hazardous wastes disposed at Northrop Grumman, NWIRP and Grumman-Steel Los Plant 2 may have caused, the following remedy is proposed:

- continued operation of the on-site containment groundwater extraction and treatment system Interim Remedial Measure at Northrop Grumman's southern property line;

- mass contaminant removal through offsite groundwater extraction and treatment in an area near the GM 38 monitoring well;

- a carbon polishing contingency for Bethpage Water District Public Wellfields 4, 5 and 6;

- long term operation and maintenance of all operating systems;

- long term monitoring of the groundwater including a comprehensive monitoring of plume attenuation;

- and public water supply wellhead treatment contingency plans.

During the course of the investigation certain actions, known as Interim Remedial Measures (IRMs), were undertaken at the Northrop Grumman Site in response to the threats identified above. An IRM is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. Groundwater IRMs undertaken at this site include the Onsite Groundwater Containment System at Northrop Grumman's southern property line and the Bethpage Water District (BWD) Wellfields 4, 5 and 6 wellhead treatment systems. These IRMs are described in more detail in Section 4.

The proposed remedy, discussed in detail in Section 7 of this document, is intended to attain the remediation goals selected for these sites in Section 6 of this Proposed Remedial

Action Plan (PRAP), in conformity with applicable standards, criteria, and guidance (SCGs).

This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The NYSDEC has issued this PRAP as a component of the citizen participation plan developed pursuant to the New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in greater detail in the Remedial Investigation (RI), Feasibility Study (FS) and other relevant reports and documents, available at the document repositories.

To better understand the sites and the investigations conducted, the public is encouraged to review the project documents at the following repositories:

Main Document Repository:

1. Bethpage Public Library  
Powell Avenue  
Bethpage, New York 11714  
(516) 931-3907  
Hours: M-F 9:30am-9:00pm  
Saturday: 9:30am-5pm  
9:30am -1pm during July and August  
Sunday: 12:00pm-5pm  
Closed Sundays, May 1 to Sept 30  
Karen Gruskin or Lois Lovisolo,  
Reference Librarians
2. NYSDEC Region 1 Office  
Building 40 Loop Road  
SUNY Stony Brook

Stony Brook, New York 11790  
(631) 444-0294  
Hours: 8:30 - 4:45 (M-F)  
Attn: Mark Lowery

3. NYSDEC -Division of Environmental Remediation- Bureau of Eastern Remedial Action  
50 Wolf Road  
Albany, New York 12233-7010  
(518) 457-3395  
Hours: 8:00 - 4:15 (M-F)  
Project Manager: Steven Scharf, P.E.

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from October 23 to December 22, 2000 to provide an opportunity for public participation in the remedy selection process for this site. A public meeting is scheduled for December 13, 2000 at the Bethpage High School, Cherry Avenue, Bethpage beginning at 7:00.

At the meeting, the results of the RI/FS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which you can submit verbal or written comments on the PRAP.

The NYSDEC may modify the preferred alternative or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision. The Record of Decision is the NYSDEC's final selection of the remedy for this site. Written comments

may be sent to Mr. Steven Scharf, project manager, at the above address for the NYSDEC Albany office through {add date comment period closes}.

## **SECTION 2: SITE LOCATION AND DESCRIPTION**

The Northrop Grumman and NWIRP inactive hazardous waste disposal sites are located in east-central Nassau County, Long Island (see Figures 1 and 2).

The entire Northrop Grumman site was initially more than 600 acres in area, but has been reduced in size through previous remedial activities and confirmatory sampling events. The portions of the former Northrop Grumman site that remain listed in the New York State Registry of Inactive Hazardous Waste Disposal Sites includes the southern recharge basins, the NWIRP and the Grumman-Steel Los Plant 2 site (formerly the Grumman Plant 2 facility). The southern recharge basins and the Grumman-Steel Los Plant 2 facility currently total about 35 acres in size. The NWIRP site is approximately 105 acres in size. There are numerous groundwater industrial supply wells and recharge basins at these sites.

The RUCO Polymer site, site No. 1-30-004, (see figure 4) is located to the northwest of the Northrop Grumman Site and west-northwest of the NWIRP. There are other industrial and commercial facilities in the area along with several residential communities. There are several municipal supply wells within a two-mile radius of the sites.

## **SECTION 3: SITE HISTORY**

### **3.1: Operational/Disposal History** **Northrop Grumman Site No. 1-30-003A**

The Grumman Aerospace Corporation was established in the early 1930s at the present site in Bethpage. Several naval aircraft were developed and manufactured at the site. Other activities at the site included the manufacturing of naval amphibious craft and the manufacturing of various satellites, etc. for the National Aeronautics and Space Administration (NASA).

From 1943-1949, Grumman disposed of chromic acid wastes directly on the ground or in open seepage basins. In 1949, a chromic acid treatment system was put on-line at Plant 2. In addition to the chromic acid treatment system located at Plant 2, systems for treating phenols, oils, and other organic compounds, and for recovering silver were also used at Plant 2. Since the early 1950s, some of the wastes generated by Grumman were taken to the NWIRP property for treatment or storage before being taken off site by private haulers. These wastes included common organic solvents consisting of chlorinated hydrocarbons. There were several locations on the Grumman site where wastes were stored, treated, or disposed. of. . . . Trichloroethene (TCE) was stored in an above ground tank along the northeastern corner of Plant 2. A release of TCE from this tank (or the associated piping system) occurred and was discovered during the Grumman Remedial Investigation.

#### **NWIRP Site No. 1-30-003B:**

The NWIRP was established in 1933. The NWIRP is known as a government owned, contractor operated (GOCO) facility. Since its inception, the primary mission for the facility has been the research, prototyping,

testing, design engineering, fabrication, and primary assembly of military aircraft.

The facilities at the NWIRP include four plants (No. 3, 5, and 20, used for assembly and prototype testing; and No. 10, which contains a group of quality control laboratories), two warehouse complexes, a salvage storage area, water recharge basins, an industrial wastewater treatment plant, and several smaller support buildings.

The following is a discussion of the waste handling practices at the three identified disposal areas at the NWIRP facility (see Figure 3 or area locations):

#### **Area 1 - Former Drum Marshaling Area**

From the early 1950's to 1978, drums containing liquid wastes were stored on a cinder covered area over a cesspool leach field. This leach field may have been used to discharge process wastewater. In 1978, the drum storage area was moved a few yards to the south to a 100- by 100-foot concrete pad. This pad did not have a cover or berms around it. In 1982, the drum storage area was moved to Area 3.

Various solvents were stored at Area 1. Cadmium and cyanide wastes were also stored in this area from the early 1950's through 1974. Approximately 200 to 300 drums were stored at these locations at any given time. Reportedly, all drums of waste which were stored at these areas were taken offsite by a private contractor for treatment and disposal.

#### **Area 2 - Recharge Basin Area**

Prior to 1984, some Plant 3 production-line rinse waters were discharged in the three on-site recharge basins. These waters were

directly exposed to chemicals used in the industrial processes (rinsing of manufactured parts). Only non-contact cooling water has been discharged into these basins since 1984. The source of this non-contact cooling water has been on-site production wells.

On at least one occasion (1956), hexavalent chromium was detected in the water in the recharge basins at concentrations in excess of allowable limits. This matter was discovered and handled by the Nassau County Department of Health.

Adjacent to and west of the recharge basins are the former sludge drying beds. Sludge from the Plant 2 Industrial Waste Treatment Plant (part of the Grumman Site as described above) was dewatered in these beds before being disposed of off-site.

#### **Area 3 - Salvage Storage Area**

The NWIRP salvage storage area is located to the west of Area 2. This area has been used for the storage of fixtures, tools, and metallic wastes such as aluminum and titanium scraps, since the early-1950's.

Located within the salvage storage area was a 100- by 100 foot area that was used for the storage of drummed waste. This 100 by 100-foot area was reportedly covered with coal ash cinders. Halogenated and non-halogenated waste solvents were stored in this area from the early-1950's through 1969. The exact location of this drum storage area is not known. Since 1982, drums have been stored in a covered area with a concrete pad and berms.

#### **Grumman-Steel Los Plant 2, Site No. 1-30-003C (Groundwater Contamination):**

In 1994, the Grumman Aerospace Corporation was purchased by the Northrop Corporation and became known as the Northrop Grumman Corporation. In December 1996, Northrop Grumman sold Plant 2 and the surrounding land to the Steel Los III Corporation (Steel Los). Steel Los refurbished the Plant 2 complex and now leases the former Plant 2 as commercial real estate.

The Plant 2 facility, listed as site No. 1-30-003C on the New York State Registry of Inactive Hazardous Waste Sites, was originally part of Site 1-30-003A, the Northrop Grumman Site. Now known as the Grumman Steel Los site, this site was addressed by the Operable Unit One (OU1) soils remedy for the Northrop Grumman Site. The OU1 ROD deferred groundwater contamination issues to this OU2 groundwater remedy. The Grumman Steel Los Site is now a class 4 site, and long term monitoring would be required.

#### **OXY Hooker Ruco, Site No. 1-30-004 (Not the Subject of this PRAP):**

The RUCO Polymer site (see figure 4) was originally the Rubber Corporation of America. The Hooker Chemical Corporation (now the Occidental Chemical Corporation, also known as OCC or OXY) purchased the Rubber Corporation of America (RUCO) in 1965. The RUCO plant was sold to the employees in 1982. The site is now operated by a privately held corporation under the name RUCO Chemical Corporation (Ruco Site). OXY has retained the environmental liability for the past disposal practices.

Between 1956 and 1975, industrial process wastewater and storm water runoff from the facility was discharged to six (6) on-site recharge basins or sumps. This wastewater

contained chlorinated hydrocarbons including PCE, TCE and vinyl chloride monomer (VCM), as well as other organic and inorganic wastes. These waste waters have contributed to the contamination of the Bethpage regional aquifer upgradient and beneath the Northrop Grumman, NWIRP and Grumman-Steel Los facilities. The OXY Hooker Ruco Site is listed on the National Priorities List (NPL) of the United States Environmental Protection Agency (USEPA). A separate remedial program is being carried out for the Ruco site under the oversight of the USEPA. Therefore, the Ruco site is not a direct focus of this PRAP except inasmuch as it may affect the selection of groundwater remedies (see for example Item D in Section 7.1).

### 3.2: Remedial History

#### Northrop Grumman and Grumman Steel Los Plant 2:

Grumman was reportedly notified in December 1947 that a sample collected from Well No. 3 of the Central Park Water District (predecessor of the Bethpage Water District) contained chromium at a concentration of 1.4 parts per million (ppm). As a result, the District's well No.'s 1, 2 and 3, located on Jackson Avenue near the train station, were permanently closed. Eventually Grumman Aerospace reimbursed the District for these wells. Grumman installed a chromic acid treatment system for its Plant 2 waste waters. This system went on-line in 1949.

Odor and taste problems were discovered in water pumped from some of Grumman's on-site production wells in 1973. Several investigations into the source(s) of this problem were conducted from 1973 through the early 1980's. It was ultimately determined that these problems were due to chlorinated hydrocarbons in the groundwater.

The Northrop Grumman site was added to the New York State Department of Environmental Conservation's Registry of Inactive Hazardous Waste Disposal Sites in New York State (Registry) in 1983. At the time, the NWIRP-Bethpage site was considered part of the Northrop Grumman site. The site was initially listed as a Class 2a site because there was insufficient data to assign it a classification set forth in the Environmental Conservation Law (ECL).

Based on a subsequent review of existing data, the Grumman site was reclassified to a Class 2 site by the NYSDEC in December 1987. A Class 2 site is a site which poses a significant threat to human health and/or the environment, and for which action is required.

Northrop Grumman conducted a remedial investigation (RI) on site between October 1989 and September 1994. As a result of this investigation, two source areas were identified. The NYSDEC also divided the remedial programs at the Northrop Grumman Site and the NWIRP site into two operable units; site soils and the regional groundwater. An operable unit is designated to represent a portion of the site remedy which for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from contamination at a site.

The purpose of the Feasibility Studies on the Northrop Grumman and NWIRP sites was to develop and evaluate remedial alternatives for remediating the soils contamination defined during the RI(s). A Record of Decision (ROD) for operable unit one (OU1) for the Northrop Grumman site was issued in March 1995 and for the NWIRP site was executed on July 5, 1995.

A soil vapor extraction system was installed adjacent to a former storage tank that was used to store trichloroethene (TCE) at Plant 2. This system was shut down for a short period of time and was used to remediate a small area of contamination (perchloroethene or PCE) at Plant 15. The Plant 15 source area has been adequately remediated. The adequacy of the Plant 2 remediation will be determined after confirmatory sampling.

In addition to the hazardous waste remediation program, the parts and parcels of the former Grumman Aerospace facility have been regulated under the Resource, Conservation and Recovery Act, (RCRA), or active facility permitting program. Under the RCRA program, other remedial measures (sometimes called corrective actions), have been implemented by the NYSDECs RCRA program (also discussed in section 4), and under the USEPA's underground injection control (UIC) program.

Contaminated soil and dry well sediments, at known or potential source areas (such as various Northrop Grumman and NWIRP facilities) have been or are being addressed under OU 1 and/or appropriate RCRA and UIC closure programs.

Certain specific areas of the former Plant 2, or Steel Los property, have elevated levels of chromium and cadmium. The Steel Los Corporation opted to remove only the hazardous waste levels of contamination and then restrict access to the remainder of the soils with contamination above NYSDEC soil cleanup objectives. These areas are well below ground surface and have been deed restricted. The Steel Los property has been reclassified to a class 4; which means the remedial actions are in place and proper long

term operation, maintenance and monitoring is required.

#### NWIRP

An Initial Assessment Study was conducted at the NWIRP-Bethpage site in 1986. Based upon the results of this study, it was concluded that three areas at the site posed a threat to human health or the environment. A description of the Northrop Grumman and NWIRP sites is presented in Section 3.1. In March 1993, NYSDEC listed the NWIRP as a separate Class 2 Registry Site, distinct from the Northrop Grumman Site. The NWIRP site was excluded from the 1990 Northrop Grumman RI/FS Order on Consent and therefore, a separate investigation was required.

An RI/FS was conducted at the site from August 1991 through July 1995. The purpose of the RI was to determine the nature and extent of the contamination that was found during the Initial Assessment Study. The NWIRP ROD called for addressing soils contamination at the three areas of concern. The NWIRP remedies called for the excavation and removal of specific areas of PCB and solvent contamination and the reduction of soils to be excavated by the implementation a soil vapor extraction system in conjunction with a shallow groundwater air sparging system.

#### OXY Hooker RUCO

The RUCO Site is broken into three operable units. OU 1 addresses site soils and adjacent groundwater, OU 2 addresses soils associated with a particular recharge basin and OU 3 is the offsite migration of groundwater contaminated with VOCs including vinyl chloride and tentatively identified compounds, or TICs, that generally fall into the category of semi-volatile organic compounds, (SVOCs).

The USEPA is recently released a PRAP for the offsite groundwater contamination in the near future. The OU 1 and OU 2 RODs have already been issued.

### 3.3: Enforcement History

#### Grumman

Grumman entered into a Consent Order with the NYSDEC on October 25, 1990 in which Grumman agreed to conduct a RI/FS at the Northrop Grumman site.

#### NWIRP

The United States Navy has undertaken their environmental studies pursuant to the Navy's Installation Restoration Program. The State of New York provided oversight of the work conducted by the Navy pursuant to a Memorandum of Understanding between the State and the Department of Defense.

#### Resource Conservation and Recovery Act

The purpose of this PRAP is to set forth the groundwater remedial program for the Northrop Grumman and NWIRP Sites as set forth in 6 NYCRR Part 375, "Inactive Hazardous Waste Disposal Sites." These two sites are also regulated under 6 NYCRR Part 373, commonly known as the Resource, Conservation and Recovery Act, (RCRA) program. This is the permitting and ultimately the closure process for active facilities that store, generate, and treat hazardous wastes over a certain quantity as defined under this regulation. The RCRA program as promulgated under NYSDEC regulations is authorized by the USEPA to issue RCRA permits.

## SECTION 4: SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate alternatives to address the

significant threat to human health and the environment posed by the presence of hazardous waste, the Northrop Grumman Corporation and the Navy have conducted two area-wide remedial investigation and feasibility studies (RI/FS's) and a smaller focused RI/FS on the Navy property.

The RCRA program is addressing the contaminated soils beneath the building.

In addition, both Grumman and the Navy are working towards completing the remediation of large capacity underground fuel oil tanks that historically leaked. All the tanks have been removed and residual contaminants in these areas are being remediated under the NYSDEC Division of Environmental Remediation Underground Storage Tanks (UST) program.

### 4.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any soil and groundwater contamination resulting from previous activities at the Site.

The RI was conducted in two phases. The first phase was conducted between February, 1991 and October, 1991 and the second phase between August 1992 and September 1993. For the Northrop Grumman property, a report entitled "Remedial Investigation Report, Grumman Aerospace Corporation, Bethpage, New York, May 1994," has been prepared. For the NWIRP, two reports entitled "Final Remedial Investigation Report NWIRP, May 1992," and "Phase 2 Remedial Investigation Report, NWIRP, October 1993," describe the field activities and findings of the RIs in detail.

The first two FSs were for soils remedies covered under OU 1 RODs with the Navy and Northrop Grumman. The Focused RI/FS, being conducted by Northrop Grumman, is still ongoing for the two remaining PCB contaminated dry wells at the NWIRP. An additional FS, which is the subject of this PRAP, was prepared for offsite groundwater issues.

The following investigatory techniques were used in order to achieve the goals for the RIs:

- Soil gas surveys were conducted in various locations throughout the site in order to locate potential areas which could be sources of groundwater contamination.
- Soil samples were collected in various locations throughout the site to confirm the results of the soil gas surveys and to identify source areas that could not initially be located using the soil gas survey technique.
- Groundwater samples were collected from monitoring wells that were installed as part of the two Remedial Investigations and by other organizations (such as the United States Geological Survey).

To determine whether the groundwater is contaminated at levels of concern, the RI analytical data were compared to environmental Standards, Criteria, and Guidance values (SCGs). Groundwater, drinking water and surface water SCGs identified for the Northrop Grumman and NWIRP Sites are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part 5 of New York State Sanitary Code.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, the groundwater requires remediation. The RI results are summarized below. More complete information can be found in the RI Report on file in the document repositories.

Chemical concentrations are reported in parts per billion (ppb) or parts per million (ppm). For comparison purposes, where applicable, SCGs are provided for each medium.

#### 4.1.1: Site Geology and Hydrogeology

The sites are underlain by five geologic/hydrogeologic formations (descending from ground surface):

- Pleistocene deposits (Upper Glacial Aquifer) consisting of various sands and gravels intermixed with discontinuous low permeability clay lenses, approximately 100 feet thick
- Magothy Formation (Magothy Aquifer) consisting of various sands and gravels varying in thickness interlaced with low permeability confining layers,
- Raritan Clay Formation
- Lloyd Sand Formation (Lloyd Aquifer)
- Bedrock

The Upper Glacial, Magothy and Lloyd aquifers are all important formations for the purposes of this PRAP. Groundwater from the Upper Glacial aquifer in this area eventually makes it's way to the Magothy and Lloyd aquifers, a sole source of drinking water

for residents of Long Island. The Magothy Aquifer is the aquifer that is utilized the most as a source of drinking water.

#### 4.1.2: Regional Groundwater Study

The investigation of onsite and offsite groundwater contamination associated with the Northrop Grumman and NWIRP Sites is referred to as the regional groundwater study. The information gathered was used to screen alternatives in the Operable Unit 2 (OU 2) Groundwater Feasibility Study. The groundwater plume is estimated to extend over an area of approximately 2,000 acres and to a depth of approximately 500 feet. Due to the magnitude of this contamination and the multiple sources of the contamination, a regional remedy for addressing the groundwater contamination was required. The process of developing a regional remedy began in October 1994 and originally included Northrop Grumman, the NWIRP and the RUCO Sites. Subsequently, in September 1998, the involved Agencies determined that the RUCO Site would be most appropriately addressed separately under the USEPAs RI/FS program for that site.

#### 4.1.3: Nature of Contamination

As described in the RI report, numerous soil, soil gas, groundwater and sediment samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed their SCGs are inorganics (metals), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs).

A summary of the groundwater analytical data generated during the RIs is presented in Table 1. Summaries of the soils analytical data are

presented in the RODs for onsite soils that are referenced in Section 3.2. It is recognized that residual soil contaminants such as chromium and cadmium beneath the Plant 2 property could serve as a source of groundwater contamination in the future. Although this PRAP addresses groundwater contaminants, this relationship between soils and groundwater is recognized throughout the PRAP.

The sites are located in an area of deep aquifer recharge. Precipitation that percolates through the soil and enters the aquifer system travels vertically down through the aquifers thus replenishing the water that is pumped for potable uses. Pollutants in the unsaturated soils and upper reaches of the aquifer system also migrate downward with infiltrating water.

The primary groundwater contaminants are chlorinated VOCs which were either used and disposed of at the sites or are breakdown products of these chemicals. These compounds are:

- perchloroethene (PCE)
- trichloroethene (TCE)
- dichloroethenes (DCE)
- vinyl chloride
- 1,1,1-trichloroethane

Inorganic analytes (metals), specifically arsenic, cadmium and chromium were detected in groundwater samples that were collected at the sites. The arsenic, cadmium, and chromium were detected at concentrations greater than the corresponding standards, though only in a small number of on-site monitoring wells.

#### 4.1.4: Extent of Contamination

### Groundwater

By current estimates, the groundwater plumes emanating from the two sites total 2,000 acres in area and are over 500 feet deep in places. An estimate of the areal extent of the plume is presented on Figure 5.

#### On-Site Groundwater Plume

The highest concentrations of VOCs in groundwater were detected in samples collected from on-site wells. The most contaminated on-site well was the intermediate depth well of the HN-24 well cluster (see Figure 6), located on the southwest corner of the Navy property, in which TCE was detected at a concentration of 58,000 ppb (the drinking water standard is 5 ppb). An attempt to isolate the source of this contamination was unsuccessful. Concentrations greater than 1,000 ppb have been detected in some of Grumman's and the Navy's production wells. Consistently high concentrations of VOCs have been detected in Grumman production well GP-1 for some time, and a treatment system has been installed to treat the water that is pumped from that well (see Section 4.2).

#### Off-Site Groundwater Plume

To date, the plume(s) emanating from the sites have impacted or threaten three public water supplies operated by the Bethpage Water District (see Figure 5). There are treatment systems in place at each of the three impacted or threatened water supplies (see section 4.2). The water that is distributed to the community is tested on a monthly basis to ensure that the drinking water standards promulgated by the NYSDOH are met.

Because of the proximity of the contaminants to the Bethpage Water District (BWD) well fields, nine (9) outpost or sentry wells were installed upgradient of the water supplies.

These wells have been sampled on a quarterly basis since March 1995. The purpose of this quarterly sampling is to provide the BWD with the data they need to make sure that the existing treatment systems are adequate to treat the level of contaminants that may impact their public supply wells. The data are also used to make decisions about the need for groundwater remediation.

Based upon a review of the sentry well data, there is an area surrounding monitoring well cluster GM 38 that contains high concentrations, in excess of 1,000 ppb, of site-related contamination. The outpost wells will continue to be monitored to determine the groundwater concentrations of these site-related contaminants.

### Soil

The Northrop Grumman and NWIRP OUI RODs dealt with soil contamination outside the areas of the site buildings at the Northrop Grumman and NWIRP sites. Contaminated soils beneath the site buildings are being addressed by the RCRA program, or active facilities permitting program. This is being accomplished by sampling, excavation and offsite disposal of contaminated soils.

### Sediments

Sediments in some of the onsite recharge basins contained elevated levels of inorganics. All sediments that were removed from the recharge basins were characterized and sent offsite for disposal. The closure of the onsite storm drains was through the USEPA underground injection control (UIC) program.

#### 4.1.5: Development of a Computer Groundwater Model

A groundwater computer model was developed as a tool for developing and

evaluating remedial alternatives for addressing the groundwater contamination. The study area that is encompassed in the model is 24.1 square miles in area (see Figure 8). The model was constructed in order to simulate groundwater flow throughout the entire thickness of the Upper Glacial and Magothy aquifers. A detailed description of the model is presented in the Northrop Grumman Groundwater Feasibility Study Report, Appendix B, dated January, 2000. Copies of this report are on file at the document repositories listed on Page 2 of this document.

#### **4.2: 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 completion of the RI/FS. Two groundwater IRMs have been implemented over the past seven years that have been incorporated into this proposed plan.

##### **1. Protection of the Bethpage Water District Public Supply Wells**

Treatment systems have been installed at the three currently operated and impacted or threatened public supply wellfields operated by the BWD (see also section 4.1.2). The treatment systems at BWD Plants 4 and 6 were funded by Grumman. The treatment system at BWD Plant 5 was funded by the U.S. Navy as specified in the May 1995 ROD for the NWIRP-Bethpage site.

##### **2. On-Site Containment IRM**

The On-Site Containment (ONCT) IRM was installed by Northrop Grumman. It was realized during the early stages of the Feasibility Study that one of the components of the final remedy for addressing the groundwater contamination was the containment of the portions of the plume(s)

that are still beneath the sites (i.e. - prevent further migration of contaminants off site to the extent practicable). Pumping at the onsite production wells had helped contain much of the contamination onsite. However, as Northrop Grumman and the Navy began closing down their Bethpage operations, many of the on-site production wells were slated to be removed from service. Therefore, it was decided to implement a specific groundwater containment remedy as an Interim Remedial Measure (IRM) in advance of making a decision regarding the final groundwater remedy. This system went on-line in November 1997.

As designed, the ONCT IRM system consists of four extraction wells; one of which was pre-existing (GP-1), and three others that were installed in 1996-97 (see Figure 7). The bulk of the contaminant removal is predicted to occur in wells ONCT-1 and GP-1, with lesser amounts of contaminants extracted from wells ONCT-2 and ONCT-3. The combined pumping rate for wells GP-1, ONCT-1, ONCT-2, and ONCT-3 is 3,375 gallons per minute.

The groundwater that is pumped from these wells is treated to remove VOC contaminants prior to being recharged back into the aquifer via on-site recharge basins. This combination of pumping, treating and recharge are the factors by which the on-site plumes will be contained ("hydraulic containment"). Eventually, most of the Northrop Grumman production (GP) wells that added additional pumping will be closed and only the ONCT system, consisting of GP-1 and ONCT extraction wells 1, 2 and 3 will be left in place. The closure of most of the production wells was incorporated into the design of the containment system.

#### 4.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section 5 of the RI report entitled, "Contaminant Fate and Transport."

An exposure pathway is the manner by which an individual may come in contact with a contaminant. The five elements of an exposure pathway are; 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Human exposure pathways, relative to this operable unit, known to presently exist or that have historically existed at the site include:

- direct contact with (dermal absorption), ingestion of, and inhalation of contaminated onsite soils; and
- direct contact with (dermal absorption), ingestion of, and inhalation associated with contaminated groundwater through residential or commercial use.

Contaminated soil, dry well sediments, and groundwater at known or potential source areas (such as various Northrop Grumman and NWIRP facilities) have been or are being addressed under OU 1 and/or appropriate RCA and UIC closure programs.

Human exposures could occur by ingesting or coming into direct contact with untreated, contaminated groundwater pumped from a water supply well. Additionally, inhalation of VOCs could occur if contaminated water is used for cooking, cleaning or bathing. Several BWD public water supply wells were impacted by contamination from the Site. Water from the affected municipal wells is either no longer used or treated to remove the contaminants prior to distribution to the community. Routine monitoring of the treated water supplies has demonstrated the effectiveness of these treatment systems in mitigating exposures to groundwater contaminants.

There are no known private drinking water wells in use within the contaminated aquifer area. This was verified by a survey conducted by the Nassau County Department of Health (NCDH). The nearest down gradient private well, a non-contact cooling water well at a hospital, was tested in 1998 and found to be free of site-related contaminants.

In summary, while human exposures to contaminated groundwater may have occurred in the past, there are no known exposures that are presently occurring due to the implementation of the IRMs.

#### 4.4: Summary of Environmental Exposure Pathways

There are no surface water bodies or other environmentally sensitive areas within a two-mile radius of the sites. Therefore, it was concluded that there is a negligible risk to wildlife in the area from the disposal of hazardous wastes at the sites.

## SECTION 5: 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 NYSDEC and the Northrop Grumman Corporation entered into a Consent Order on October 25, 1990. The Department of the Navy entered into a Memorandum of Understanding (MOU) with the NYSDEC in 1993. The Order obligated Northrop Grumman to implement an RI/FS. The MOU brought the NYSDEC into the Department of the Navy's Installation Restoration (IR) program. Upon issuance of the Record of Decision for Operable Unit 2 (OU2) the NYSDEC will approach the Northrop Grumman Corporation and the Department of the Navy to implement the selected remedy under an Order on Consent and a Federal Facility Site Remediation Agreement respectively.

## SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria and Guidance (SCGs) and be protective of human health and the environment. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Eliminate, to the extent practicable, site-related contaminants from the affected public water supplies and to prevent, to the extent practicable, the future contamination of public water supplies through the implementation of the offsite groundwater remediation.
- Eliminate, to the extent practicable, exposures to contaminated groundwater.
- Eliminate, to the extent practicable, off-site migration of contaminated groundwater and, where practicable, to restore the groundwater to pre-disposal conditions.
- Eliminate, to the extent practicable, the offsite migration of soils contamination entering the groundwater.
- Eliminate, to the extent practicable, exceedances of applicable environmental quality standards related to releases of contaminants to the waters of the state.

## SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Northrop Grumman and the NWIRP sites were identified, screened and evaluated in the Operable Unit 2 (OU2) Report entitled

“Groundwater Feasibility Study, Northrop Grumman, Bethpage.”

The on-site containment IRM and the wellhead treatment IRM for the BWD Wells are presumptive remedy strategies for this site. All of the remedial alternatives contained in the OU2 Groundwater PRAP include the continued operation, maintenance and monitoring (OM&M) of these two IRMs.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to put the remedy in place, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

#### 7.1: Description of Remedial Alternatives

The potential remedies are intended to address the contaminated groundwater at the site.

For Alternatives 1 thru 8, the following Items A through F, are included in Some or All of the Remedial Alternatives:

##### A. On-Site Plume Containment (ONCT), Treatment, and Discharge to On-Site Recharge Basins via the On-going IRM:

Under this component of each alternative, the existing on-site groundwater IRM would continue operating. The pumping rate from the groundwater IRM treatment system (See Figure 9) would continue at the approximate rate of 3,375 gallons per minute. The water would be recharged into the recharge basins located adjacent to Plant 5 and to the Southern Recharge Basins. Costs for this option do not include the already completed design and

construction but do include operation and maintenance.

##### B. Long Term, Operation and Maintenance of VOC Removal Systems At Three Off-Site Bethpage Public Water Supply Well Fields:

A long-term agreement is being renegotiated between the BWD and Northrop Grumman to pay for the operation and maintenance of the treatment systems at BWD well fields 4, and 6. This agreement would be required to be effective for at least 30 years or until the treatment at the public supply wells is no longer necessary. The Department of the Navy entered into a cash out agreement with the BWD for the installation, permanent operation and maintenance of a treatment system at BWD wellfield 5.

##### C. Long-Term Groundwater Monitoring including Comprehensive Monitoring of Plume Attenuation, Public Supply Wellhead Treatment contingency and Long-Term Operation and Maintenance of All Operating Treatment Systems On-site.

A long-term monitoring program would be designed and implemented for this component of each alternative. This includes the installation of at least twenty new monitoring wells. Site specific vertical profile borings and monitoring wells would be added on the Grumman Steel Los Plant 2 and the NWIRP source areas to ensure that site related contamination does not pass below the ONCT system. The goals for this monitoring program would be to monitor the groundwater plume(s) both on-site and off-site and monitor the effectiveness of the groundwater remedy or remedies. Comprehensive monitoring of plume attenuation would also be used with respect to the fate and transport of site contamination. This component would also

contain operation and maintenance provisions for all treatment systems.

The goals for the long term monitoring program would be to:

- monitor the groundwater plume(s) both on-site and off-site; and
- monitor the effectiveness of the groundwater remedy.

Samples would be collected on a quarterly, semi-annual or annual basis from a monitoring well network (approximately 20 - 40 wells). The specific sampling locations and the specific analyses would be based upon periodic reviews under the ongoing long term operation, maintenance and monitoring (OM&M) program. In addition, water level data would be collected on a regular basis. These results would be evaluated by means of periodic updating of the computer groundwater model that has been developed (see Section 4.1.3) for this site.

All the alternatives would contain a wellhead treatment contingency. Outpost monitoring would indicate if VOC concentrations in the groundwater would potentially threaten a public supply well. A wellhead treatment system would be designed and installed if outpost monitoring well data, as determined by the NYSDEC and State and County Health Departments, indicate that treatment of a public supply well is necessary to protect public health from exposure to site related contamination.

The ongoing ONCT system would require a long term operation and maintenance plan to be submitted to the Department for review, acceptance and periodic updates. The public supply wellhead treatment systems currently

in place would also require an operation and maintenance plan both of which would be for the minimum of the thirty year CERCLA time frame or until the treatment systems are no longer required; whichever is longer.

#### D. Vinyl Chloride Contingency Plan

The feasibility study does not include specific treatment for vinyl chloride. The Ruco site is upgradient of the Northrop Grumman Site and historically upgradient of the NWIRP Site due to large scale pumping by Northrop Grumman. The Ruco site discharged vinyl chloride, other chlorinated solvents and other organic compounds directly into the aquifer through on-site recharge basins. Currently the USEPA is moving towards a remedy for the Ruco site vinyl chloride plume. However if no remedial measures are taken with respect to vinyl chloride, based on the current concentrations and time of travel, it has been estimated that vinyl chloride could reach the Northrop Grumman/NWIRP ONCT system in as early as 10 years. The existing ONCT system was not designed to treat vinyl chloride, a VOC that requires unique methods of treatment to meet stringent air discharge limits. Thus, the NYSDEC directed Northrop Grumman to develop a contingency treatment plan in the event that treatment for vinyl chloride becomes necessary.

#### E. Offsite GM 38 Area Remedy:

This offsite groundwater extraction and treatment remedy would be located in the monitoring well GM38 area. This remedial technology would address elevated concentrations of total volatile organic compounds (TVOCs) in groundwater because deep groundwater at the GM-38 well area has been identified as an off-site "hotspot". This process option would be operated as a mass removal option to prevent further degradation of the aquifer. The modeling data from the

OU 2 Groundwater FS indicates 7,000 pounds of the contaminant mass could be removed at this location

Capital Cost: \$ 4,390,000  
Annual O&M Cost: \$ 220,000  
Present Worth: \$ 6,673,000

**F. Carbon Polishing Contingency For The Bethpage Water District Well fields 4, 5 and 6 and Future Potentially Impacted Supply Wellfields:**

Carbon polishing is a treatment process option that is proposed as a contingency for inclusion in all but the no further action alternative. This contingency option is not discussed in the OU 2 FS. Activated carbon adsorption is a process that effectively removes low levels of VOC contaminants from water. Air stripping units, such as those presently in use at the affected well fields, are capable of removing VOC contaminants from highly contaminated water. If concentrations of site-related VOCs in finished water demonstrate a consistent upward trend, then carbon polishing, or other requisite technology, would be implemented when the concentration reaches one half the concentration of the respective MCL.

The activated carbon systems, when used in combination with the air stripping units, can remove trace residual of contaminants from the water prior to distribution to the community. For this reason, this secondary water treatment process is commonly referred to as "carbon polishing." These combined VOC removal systems are very effective and have been used at other contaminated water supply well fields on Long Island to further reduce public exposure to VOC contaminants in drinking water.

The estimated costs for carbon polishing for a thirty year period are:

Capital Cost: S 475,000  
O&M Cost: S 22,500  
Present Worth: S 985,000

**Alternative 1: No Further Action, A, B, C and D above:** This alternative is the baseline alternative to which the other alternatives will be compared. Under this alternative, no additional remedial actions would be incorporated into the existing on-site groundwater IRM which has been installed and is now operating. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment than that already provided. Under this alternative, no additional remedial actions would be taken and the existing on-site groundwater IRM which has been installed and is now operating would continue to be operated over the next 30 years.

In order to maintain hydraulic containment of the groundwater plume(s), production well GP-1 has been included in the ONCT pump and treatment system design. The GP 1 water would be treated at the IRM treatment system located to the north of Plant 2 and discharged to recharge basins to the west of Plant 2. The ONCT wells are treated by a separate air stripper. The water would be recharged into the recharge basins located adjacent to Plant 1 in the Southern Recharge Basins.

Capital Cost: S 3,670,000  
O&M Cost: S 1,480,000  
Present Worth: S26,700,000

**Alternative 2: A, B, C, D and F above, and HN-24 Area Treatment:**

Alternative 2 would add treatment of the HN-24 area on the Navy Plant 3 property. Treatment at the HN-24 area would consist of the use of reactive iron powder injected into

the impacted groundwater through a series of injection wells. After injection the reactive iron powder would become immobilized within the soil pore space and begin to react with the contaminants of concern (COCs).

Capital Cost: \$ 4,900,000  
 O&M Cost: \$ 1,514,000  
 Present Worth: \$ 28,200,000

**Alternative 3: A, B, C, D, E and F above:**

Alternative 3 contains the addition of groundwater extraction and treatment system at the GM-38 area. The purpose of the GM-38 groundwater extraction and treatment system would be to accelerate off-site contaminant mass removal and to restore the off-site portion of the impacted aquifer in the vicinity of BWD Supply Well fields 4, 5 and 6 to remedial action objectives (RAOs) in a shorter time frame than under Alternative 2. The GM-38 area is located approximately 4,500 feet southeast of the Northrop Grumman south recharge basin area, and is defined by the inferred 1 ppm TVOC contour line drawn around Well GM-38D2.

Capital Cost: \$ 8,060,000  
 O&M Cost: \$ 1,660,700  
 Present Worth: \$ 33,600,000

**Alternative 4: A, B, C, D, E and F above, with HN-24 Area Treatment:**

Alternative 4 is the combination of Alternatives 2 and 3. Alternative 4, is undertaken in an attempt to accelerate on-site contaminant mass removal, and restore groundwater quality in these localized areas to RAOs in a shorter time frame than under Alternative 1.

Capital Cost: \$ 9,290,000  
 O&M Cost: \$ 1,048,000  
 Present Worth: \$ 35,000,000

**Alternative 5: A, B, C, D and F above, and Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers:**

Alternative 5 would add six new off-site groundwater extraction wells to achieve containment of the full extent of the off-site portion of the TVOC plume. Alternative 5 would provide mass removal from the entire aquifer by the installation of a groundwater extraction and treatment system at the farthest downgradient edge of the plume, to contain the full extent (off-site as well as on-site portions) of the plume. The off-site wells would be installed south of the Northrop Grumman facility and north of Hempstead Turnpike (see Figure 7).

Under Alternative 5, the six new off-site extraction wells (OFCT-1, OFCT-2, OFCT-3, OFCT-4, OFCT-5, and OFCT-6) would be installed. Each off-site well would require an individual treatment system to remove VOCs from the pumped groundwater. Construction of one central treatment facility, in lieu of six individual systems, would be impractical due to the dense residential development in the area, the substantial distances between proposed off-site extraction well locations, and the large quantity of water to be discharged. It is estimated that the total quantity of water to be pumped from the proposed off-site extraction wells would be 3,635 gpm (equal to 5.2 million gallons per day, or MGD).

Where necessary, monitoring wells will be installed to supplement the existing monitoring well network. The number, location, and depth of wells to be installed will be evaluated during the remedial design phase of the project.

Capital Cost: \$ 21,390,000  
 O&M Cost: \$ 2,700,000

Present Worth: \$ 62,800,000

**Alternative 6: A, B, C, D and F above, Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers, and HN-24 Area Treatment:**

Alternative 6 contains the elements of Alternative 5 as described above, with the addition of treatment at the HN-24 area, as described above in Alternative 3.

Alternative 6 would provide mass removal from the aquifer through groundwater extraction and treatment at the farthest downgradient edge of the plume, to contain the full extent (both off-site as well as on-site portions) of the plume. Furthermore, Alternative 6 would provide localized groundwater treatment of the HN-24 areas.

Capital Cost: \$ 22,620,000  
O&M Cost: \$ 2,700,000  
Present Worth: \$ 64,100,000

**Alternative 7: A, B, C, D, E and F above, Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers:**

Alternative 7 contains the elements of Alternative 5 as described above, with the addition of treatment at the GM-38 area, as described in Item E and Alternative 3. Under Alternative 7, Well ONCT-6 would be relocated approximately 500 feet to the northwest and at this location serves the dual purpose of being a local extraction well for the GM-38 area and also being part of the off-site containment well system.

Alternative 7 would provide mass removal from the aquifer through groundwater extraction and treatment. Alternative 7 would also provide groundwater pumping at the farthest down gradient edge of the plume to contain the off-site as well as on-site portions

of the plume. In addition, Alternative 7 would provide treatment of the GM-38 area.

Capital Cost: \$ 21,860,000  
O&M Cost: \$ 2,700,000  
Present Worth: \$ 63,300,000

**Alternative 8: A, B, C, D, E and F above, Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers and HN-24 Area Treatment:**

Alternative 8 is the combination of Alternatives 6 and 7. This alternative includes all of the remedial process options discussed above.

Capital Cost: \$ 23,090,000  
O&M Cost: \$ 2,706,000  
Present Worth: \$ 64,700,000

## 7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Feasibility Study.

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

### **1. Compliance with New York State Standards, Criteria, and Guidance (SCGs).** Compliance with SCGs addresses whether or not a remedy will meet applicable environmental

laws, regulations, standards, and guidance.

The most significant SCGs for this PRAP are the New York State Water Quality Regulations: Part 5 Drinking Water Standards Title 10, New York Codes Rules and Regulations (10 NYCRR) and NYSDEC Groundwater Standards (6 NYCRR Part 700). Air Quality Regulations (6 NYCRR Part 200 series) are relevant to the air discharges from each groundwater treatment system.

Alternatives 1, 2, 3 and 4 would be compliant with SCGs for the portion of the groundwater plume addressed by each alternative. Alternatives 5, 6, 7 and 8 would be compliant with SCGs for the entire groundwater plume. The groundwater treatment systems would be designed to be compliant with the NYSDEC Part 200 Air Quality Regulations.

The applicable SCGs for the drinking water are the State's maximum contaminant levels, or MCLs, as specified in Part 5 of the NYS Sanitary Code. These standards are currently being met for treated water at each of the affected public supply well fields in the area. The GM-38 area offsite remedy was added to the feasibility study in order to evaluate the reduction of future contaminant loading to the BWD well fields and any public wellfields downgradient. The carbon polishing contingency would prevent exposures to site related contaminants from the water supply.

The air treatment systems for the IRM wells were not designed to treat vinyl chloride and may need to be modified if the vinyl chloride concentrations in the air discharge exceeds state air discharge guidelines. The raw and treated groundwater at the ONCT system, as well as the effluent air stream, would need to

be monitored for vinyl chloride. If necessary, a vinyl chloride treatment component would be incorporated into existing treatment system.

The 5 ppb groundwater standard for principle organic contaminants would not be met with respect to full plume interception for alternatives 1 through 4, although natural attenuation should reduce site related contaminant concentrations to below 5 ppb over time.

## **2. 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 contaminant-specific SCGs are currently being met with respect to treated water at the municipal water supplies (specifically the BWD). This is being accomplished via VOC-removal treatment systems that are operating at the wellheads. The addition of carbon polishing contingency would ensure that the treatment is meeting drinking water standards.

The plume(s) would be contained along the southern boundary of the Grumman site under each alternative based upon the computer modeling work that was conducted as part of the Feasibility Study. By containing the portion of the plume(s) that are on-site, the future contaminant load to the downgradient public water supplies would be reduced.

It is anticipated that the extraction and treatment programs for the ONCT system that are incorporated into each of the eight remedial alternatives under consideration here would need to be operated for 30 years or more. At that point there would be residual contamination remaining in the aquifers. The

amount of remaining contamination, however, would be incrementally less as additional remedies are implemented under the various alternatives.

While there are presently no known exposures to site-related VOCs via the BWD public water supply, the risk of exposure remains in the event that current engineering controls fail. For this reason, additional groundwater remedies that decrease mass loading of contaminant to public water supply wells would offer an additional margin of protection and would reduce, the potential impacts if existing or planned control systems fail in the future.

As contaminant mass loading decreases, the relative importance of reliance upon the wellhead controls also diminishes.

Deep groundwater at the GM-38 well area has been identified as an off-site "hotspot" because concentrations of TVOCs exceed 1,000 ppb (equal to 1 ppm) at that location. The main objective of the GM-38 well area remedy would be additional protection of human health by reducing the future elevated mass contaminant load to the downgradient public water supplies. The remedy would also enhance the long-term natural process of aquifer restoration.

There could be incremental potentials for exposure to VOCs in air posed to downwind populations due to emissions from each additional groundwater treatment plant installed under the eight alternatives. Air pollution and monitoring controls would be implemented as necessary to ensure that the air emissions from these treatment facilities are within the criteria set by the regulatory agencies. Additional engineering controls

could be used to further reduce the potential of exposure.

There is a potential for exposure to VOCs in air if the vinyl chloride plume(s) is captured in the ONCT extraction wells. The treatment systems for these wells were not designed to treat vinyl chloride and could result in air effluent concentrations of vinyl chloride that exceed state air discharge guidelines. This potential exposure pathway would be minimized by implementing the vinyl chloride contingency plan.

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

**3. Short-term 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.

There could be short-term impacts to the community if Alternatives 2 through 4 were implemented. The impacts could be dust emissions, VOC emissions and noise during construction activities. Engineering controls would be employed to minimize these impacts.

No short-term impacts to the community or the environment would be expected to occur as the result of implementing Alternative 1. The HN24 area remedy short term impacts would be negligible as the Navy property is now vacant.

The GM38 area remedy would have slightly higher short term impacts. This groundwater extraction and treatment system would be located closer to residential areas. Potential impacts would be addressed under the site specific community health and safety plan through emission control technologies.

For Alternatives 5 through 8, the short term impacts would be much greater than alternatives 1 through 4. The offsite containment (OFCT) system would, in most if not all the locations, be placed on or near residential properties, streets and neighborhoods. In addition, it is envisioned that each OFCT location would require its own treatment system.

**4. 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 controls intended to limit the risk, and 3) the reliability of these controls.

The sources of the groundwater contamination are being addressed as operable units for the Northrop Grumman-Bethpage Facility, NWIRP-Bethpage, and the RUCO Inactive Hazardous Waste Disposal Sites. The long-term effectiveness of each of the source area remedial actions was addressed in the RODs previously issued for these sites.

The time required to remediate the aquifer system is a function of the quantity and location of groundwater that is pumped and treated. It is projected that it would take

more than 30 years to remediate the aquifer system onsite for each of the eight Alternatives. However, the ONCT system would prevent any further migration of onsite contamination into the Bethpage regional aquifer.

The OFCT Containment extraction and treatment system that is incorporated into Alternatives 5 through 8 would likely be operated for 30 years or longer. Based on the groundwater modeling, after 30 years of operation, residual contamination would likely exist onsite at concentrations slightly greater than the current drinking water standards.

The GM 38 area remedy is a hot spot remedy that was evaluated in the FS for 15 years. The long term effectiveness for this remedy would be to reduce the contamination loading to the BWD public supply wells on a permanent basis. Performance results from the ONCT IRM already demonstrate that TVOC concentrations in groundwater immediately down gradient from the ONCT system are diminishing. The GM 38 area remedy would enhance this permanent restoration of the natural resource.

The carbon polishing contingency option would enhance the long term effectiveness of the public supply wellhead treatment currently in place to address the Northrop Grumman/Navy contamination. These controls are considered to be reliable and would add to the long term effectiveness and permanence of the remedy.

**5. 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.

Reduction of toxicity, mobility, and volume for the onsite groundwater contamination would be realized by the ONCT groundwater extraction and treatment system for all eight alternatives. These reductions would be achieved as a result of the extraction (reduction of mobility and volume) and treatment (reduction of toxicity) components which are incorporated into the ONCT system.

The greatest reductions in toxicity, mobility and volume would be realized under Alternatives 5 through 8 with the OFCT system. Alternative 8 has the highest reduction in mobility with the HN 24 area treatment, GM 38 area remedy and the ONCT and OFCT systems. Alternative 1 has the least reduction in toxicity, mobility and volume because it targets the on-site contamination only via the ONCT system.

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

The HN 24 remedy of alternatives 2, 4, 6 and 8 would be fairly easy to implement technically and administratively. There are several vendors who could supply the treatment technologies which are incorporated into these alternatives. Alternatives 2, 3 and 4 are readily implementable with respect to

the GM38 area remedy that would be located near an existing Nassau County recharge basin in an open space area. However, easements would have to be obtained from the municipal and private parties that own the property. Alternative 1 is already in place and therefore is the most easily implementable.

Alternatives 5, 6, 7 and 8 would be substantially more difficult to implement administratively with respect to the OFCT system. Private property would have to be purchased or accessed and potentially, zoning changes would be required in order to construct the off-site extraction wells and treatment plants. The permit-related tasks would be difficult to implement. In addition construction of one central treatment facility, in lieu of six individual systems, would be impractical due to the dense residential development in the area, the substantial distances between proposed off-site extraction well locations, and the large quantity of water to be discharged.

**7. Cost.** Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the PRAP have been received.

## 8. Community Acceptance.

Concerns of the community regarding the RI/FS reports and the PRAP are evaluated. A "Responsiveness Summary" will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

Members of the community at large in the BWD have already expressed some of their concerns about Site contamination during the Remedial Advisory Board (RAB) meetings sponsored by the Department of the Navy and about the presence of Northrop Grumman/Navy contamination in the BWD drinking water supply. The inclusion of the GM38 area remedy and the carbon polishing contingency option in this PRAP are intended to address community and public health concerns.

### SECTION 8: SUMMARY OF THE PROPOSED REMEDY

Based upon the results of the RI/FS, the evaluation presented in section 7 and the reasons presented below, the NYSDEC is proposing Alternative 3, as described in detail in this PRAP. The selected remedy, Alternative 3, consists of the ongoing ONCT IRM, the off-site GM-38 area groundwater extraction and treatment system, the operation and maintenance of air strippers for BWD well fields 4, 5 and 6, an activated carbon polishing contingency, preparation of a wellhead treatment contingency plan for public supply wells not currently affected but that may become affected by site-related VOCs in the future and a vinyl chloride

treatment contingency plan, long-term groundwater monitoring including monitored natural attenuation and long-term operation and maintenance of all operating treatment systems onsite and off-site.

The Alternative 3 selection is based on the evaluation of each of the eight alternatives developed for this site. It was determined that Alternative 3 would meet standards, criteria and guidance for the containment portion of the groundwater plume remedy, prevent exposure to site related contaminants in the groundwater, actively restore a natural resource (sole source aquifer), and prevent further deterioration of down gradient groundwater conditions. Alternative 3 was also chosen based on the fact that it is not economically or technically feasible to contain and treat all the contaminated groundwater that has migrated from the Northrop Grumman and NWIRP sites to groundwater quality standards.

The probability of impacts to additional public water supply wells is low. These wells would be protected by a long term monitoring program that includes sampling of wells upgradient of the public water supply wells and by a contingency to provide wellhead treatment, if necessary. The preference to permanently and significantly reduce the toxicity, mobility or volume of VOCs in groundwater is satisfied by this remedy since it would reduce the mass of VOCs in the groundwater by recovering, treating and discharging groundwater contaminated by the Northrop Grumman and NWIRP sites plume(s). The remedial goal for attainment of the 5 ppb groundwater standard would be met in the treated aquifer segment, to the extent practicable.

Part of the remedy may address contamination that has not been conclusively attributable to Northrop Grumman and/or the NWIRP. In the same manner, not all of the contamination attributable to Northrop Grumman and the NWIRP would be addressed by the selected groundwater remedy. Therefore, the wellhead treatment contingency plan and the carbon polishing contingency plan for public drinking water supply wells would address the potential future exposure to site-related VOCs.

As more data becomes available, other PRPs may be identified; for example, the RUCO Site. The USEPA is concluding the RI/FS process to select a groundwater remedy for the RUCO Site that would address the additional VOC loading, including vinyl chloride, to the Bethpage regional aquifer.

The estimated present worth cost to implement the remedy proposed in this PRAP is \$33,600,000. The cost to construct the remedy is estimated to be \$8,060,000 and the estimated average annual operation and maintenance cost for 30 years is \$1,660,700.

The elements of the proposed remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS would be resolved.

Since the remedy results in untreated hazardous waste remaining at the site, a long term monitoring program, including comprehensive monitoring of plume attenuation would be

instituted. This monitoring would verify the effectiveness of the ONCT groundwater extraction and treatment system, monitor the levels of select inorganics and volatile organic compound contaminants in the groundwater upgradient of the ONCT system, monitor the effectiveness of the offsite component of this remedy and the wellhead treatment systems, and track the offsite plume beyond the BWD municipal wells. This would allow the effectiveness of this remedy to be monitored and would be a component of the operation, maintenance and monitoring (OM&M) program for the site.

2. Continued operation of the Onsite Containment (ONCT) IRM groundwater extraction system to address the onsite TVOC groundwater contamination emanating from the former and current onsite source areas. This system must be sufficient to intercept the width and depth of the entire TVOC plume migrating from the Northrop Grumman Site.
3. A limited predesign investigation to determine the optimum location for the GM38 area groundwater extraction well(s). This predesign investigation would derive the data necessary to determine the screen zone of the extraction well(s). In addition, the number of extraction wells would be substantiated and the potential need to cluster these wells would be determined.
4. a. The installation of at least one groundwater extraction well, or comparable remedial technology, at

the approximate location of the GM38 area, depicted on Figure 7 and as detailed in the Northrop Grumman OU2 FS, or a comparable remedial technology with all necessary piping to install the wells and properly run the discharge to the groundwater treatment systems.

b. Utilize an existing storm water collection and groundwater recharge system for discharge of treated groundwater. If one is not available, then a suitable method of system discharge and groundwater recharge would be developed.

5. The installation of the necessary air stripping systems or comparable remedial technology designed to remove VOCs from all the extracted groundwater to meet the State Pollutant Discharge Elimination System (SPDES) discharge limitations.
6. The installation of air emission controls, if required, to comply with the NYSDEC and any other applicable air regulations.
7. The long-term operation, maintenance and monitoring (OM&M) of the ONCT and GM-38 area extraction well(s). Monitoring would include the installation and use of upgradient and downgradient groundwater shallow, intermediate, deep and very deep monitoring wells. Testing would be done, at a minimum, on a quarterly basis unless otherwise approved by the NYSDEC, to verify the system performance. Additionally, monitoring of groundwater elevations

would be done, initially on a quarterly basis (unless otherwise approved by the NYSDEC) to determine the groundwater capture zone in different seasons, and annually thereafter.

8. The installation and/or quarterly monitoring for VOCs of outpost monitoring wells installed with respect to potentially affected public and private supply wells, including BWD well fields 4, 5 and 6. The remedial design would evaluate and determine the best locations for any additional outpost wells required for this program.
9. A wellhead treatment contingency plan for the design, construction, operation and maintenance of wellhead treatment systems, if necessary. It is not envisioned that site contamination would affect any additional public supply wells within the next 30 years. However, if the evaluation of the long term monitoring indicates that a public supply well has been or is in imminent danger of being affected with Northrop Grumman/NWIRP and/or co-mingled Site related contaminants, treatment at the public supply well(s) would be necessary. A treatment system to produce potable water would be designed and constructed. Alternatively, if Northrop Grumman/NWIRP reaches a cash settlement with an affected Water District, then each settling District would be responsible for its respective monitoring and implementation of, as necessary, wellhead treatment. Operation and maintenance of all public supply well treatment systems

- would be assumed to operate, at a minimum, for the required Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 30 year time frame.
10. Any detection of 1 ppb or more of Northrop Grumman/NWIRP Site related contamination in the outpost or long term monitoring wells upgradient of a public supply well would "trigger" Northrop Grumman or the Department of the Navy to evaluate the rate of movement of the Northrop Grumman/NWIRP contaminants towards the public supply wells. If VOC concentrations in the outpost well(s) come close to or exceed the respective standards, a minimum of one and a maximum of three confirmatory samples would be collected within 30 days and the results evaluated by the NYSDEC and the State and County Health Departments. If the NYSDEC's and the Health Departments' evaluation indicates that treatment is necessary, the design phase of the water treatment system(s) would begin.
  11. Activated Carbon polishing would be a contingency treatment option added, if necessary, to the existing VOC removal systems at BWD Wellfields 4, 5 and 6 to ensure compliance with 10 NYCRR Part 5 Drinking Water Standards. The contingency would also be used at other impacted municipal supply wellfields in the future as necessary.
  12. The BWD public supply wells and any other supply wells determined to be at risk based on the long term OM&M, would be sampled on a monthly basis for total volatile organic compounds.
  13. A performance evaluation conducted at least once a year to determine whether the remedial goals have been or can be achieved, and whether the monitoring should continue.
  14. The provision of public water to residential or commercial structures that have private drinking water wells determined to be affected or potentially affected by the offsite migration of the Northrop Grumman and NWIRP groundwater plume(s).
  15. A plan to properly close all monitoring wells associated with the Northrop Grumman and NWIRP at such time that the wells are no longer necessary.

**Table 1  
Nature and Extent of Contamination**

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs	SCGs (ppb)
Groundwater (On-Site Monitoring and production Wells)	Volatile Organic Compounds (VOCs)	Perchloroethene	ND-3,600	39/121	5
		Trichloroethene	ND-58,000	55/121	5
		1,1-Dichloroethene	0.38-620	11/121	5
		1,2-Dichloroethene	ND-3,850	21/121	5
		Vinyl Chloride	ND-6,4000	11/121	2
		1,1-Dichloroethane	ND-880	8/121	5
		1,1,1-Trichloroethane	ND-10,000	21/121	5
Groundwater (On-Site Monitoring and production Wells)	Inorganic Analytes (Metals)	arsenic	ND(1)-68	7/82	25
		barium	ND(2)-164	0/82	1,000
		cadmium	ND(1)-130	3/82	10
		chromium	ND(1)-160	4/82	50
		lead	ND(1)-7.2	0/82	25
		mercury	ND(0.2)-1.2	0/82	2
		selenium	ND(1)-4	0/82	10
		silver	ND(1)-6	0/82	50
Groundwater Outpost Monitoring Wells for the BWD September 1997		Perchloroethene	ND(0.5)-10	1/9	5
		Trichloroethene	ND(1)-1,300	5/9	5
		1,1-Dichloroethene	ND(0.5)-5.1	1/9	5
		1,2-Dichloroethene	ND(0.5)-1	0/9	5
		Vinyl Chloride	ND(0.5)-1	0/9	2
		1,1-Dichloroethane	ND(0.5)-12	1/9	5
		1,1,1-Trichloroethane	ND(.5)-7	1/9	5

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs/Background	SCG/ Bkgd. (ppb)
Groundwater Long Term Monitoring Data 1997-Present		Trichloroethene	ND-15,000	25/106	5
		Tetrachloroethene	ND-44	11/106	5
		1,1-Dichloroethene	ND-39	3/106	5
		1,2-Dichloroethene	ND-6	3/106	5
		Vinyl Chloride	ND-2,000	3/106	2
		1,1-Dichloroethane	ND-10	3/106	5

**Table 2  
Remedial Alternative Costs**

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
1. Alternative 1:	\$3,670,000	\$1,480,000	\$26,600,000
2. Alternative 2:	\$5,375,000	\$1,506,000	\$28,830,000
3. Alternative 3:	\$8,535,000	\$1,722,500	\$32,945,000
4. Alternative 4:	\$9,765,000	\$1,748,000	\$34,172,000
5. Alternative 5:	\$21,865,000	\$3,002,500	\$63,670,000
6. Alternative 6:	\$23,095,000	\$3,102,500	\$65,086,000
7. Alternative 7:	\$26,255,000	\$3,222,500	\$69,010,000
8. Alternative 8:	\$27,485,000	\$3,322,500	\$69,198,000

## GLOSSARY OF TERMS

- ARAR:** Applicable or relevant and appropriate requirement.
- BWD:** Bethpage Water District.
- Capital Cost:** Refers to the up front cost of constructing a remedial alternative.
- CERCLA:** Comprehensive Environmental Response, and Comprehensive Liability Act (USEPA).
- Chromium:** An inorganic element used in various manufacturing processes.
- DCE:** Dichloroethene.
- ECL:** Environmental Conservation Law.
- FS:** Feasibility study.
- GM:** Refers to monitoring wells installed for Northrop Grumman by Geraghty and Miller.
- Groundwater**
- Contours:** Equipotential lines of groundwater elevation above mean sea level.
- Glacial:** Refers the Glacial or shallow aquifer associated with Long Island.
- GOCO:** Government owned, contractor operated facility.
- HN:** Refers to monitoring wells installed for the Navy by Halliburton NUS.
- IRM:** Initial Remedial Measure.
- Magothy:** Refers to the section of the Long Island aquifer below the Glacial and above the Lloyd.
- MPS:** The Main Plant Site, or the former Fairchild Republic Aircraft manufacturing facility.
- MCLs:** Maximum contaminant levels.
- MGD:** Million gallons per day, refers to daily rate of pumping groundwater.
- MNA:** Monitored natural attenuation.
- NASA:** National Aeronautics and Space Administration
- ND:** Non-detect or below the detection limit of the analytical equipment.

NWIRP: Naval weapons Industrial Reserve Plant.

NYCRR: New York State Codes, Rules and Regulations.

NYSDEC: New York State Department of Environmental Conservation.

NYSDOH: New York State Department of Health.

OFCT: Offsite containment system.

ONCT: Onsite containment system.

O,M&M: Refers to operation, maintenance and monitoring, of remedial alternatives.

OU: Operable unit. Refers to portion of the remedial program that have been divided into sections.

PCB: Poly-chlorinated Bi-phenyl.

PCE: (Perchloroethylene or tetrachloroethylene) A chlorinated, aliphatic organic solvent

Plume: Contaminant dispersion in the groundwater.

POTW: Publicly owned treatment works or sewage treatment plant

PPB: Part per billion. For water samples also termed micrograms per liter (ug/l) and for soil samples termed micrograms per kilogram (ug/kg).

PPM: Part per million. For water samples also termed milligrams per liter (mg/l) and for soil samples termed milligrams per kilogram (mg/kg).

PPMV: Part per million volume, used for air samples.

PRAP: Proposed Remedial Action Plan. This is a document listing the remedy(s) proposed to mitigate the threat of hazardous waste disposal to human health and the environment.

PRP: Potential Responsible Party.

RAOs: Remedial Action Objectives, or the goals established to remedy a site based on findings of the RI (CERCLA).

RCRA: Resource Conservation and Recovery Act.

RI/FS: Remedial Investigation an Feasibility Study.

ROD: Record of Decision.

RUCO: Rubber Corporation of America.

SCGs: Standards, Criteria and guidance.

SVOCs: Semi-volatile organic compounds. Semivolatile Compounds- compounds amenable to analysis by extraction of the sample with an organic solvent. Used synonymously with Base/Neutral/Acid (BNA) compounds. Also, organic compounds with boiling points above 150 degrees Celsius.

TAGM: Technical Assistance and Guidance Memorandum. These guidance documents are used by the NYSDEC.

TCA: (Trichloroethane) A chlorinated aliphatic organic solvent.

TCLP: Toxicity Characteristic Leaching Procedure, is one test used to determine if hazardous waste is present.

TCE: (Trichloroethylene) A chlorinated, aliphatic organic solvent.

TVOC: Total volatile organic compounds.

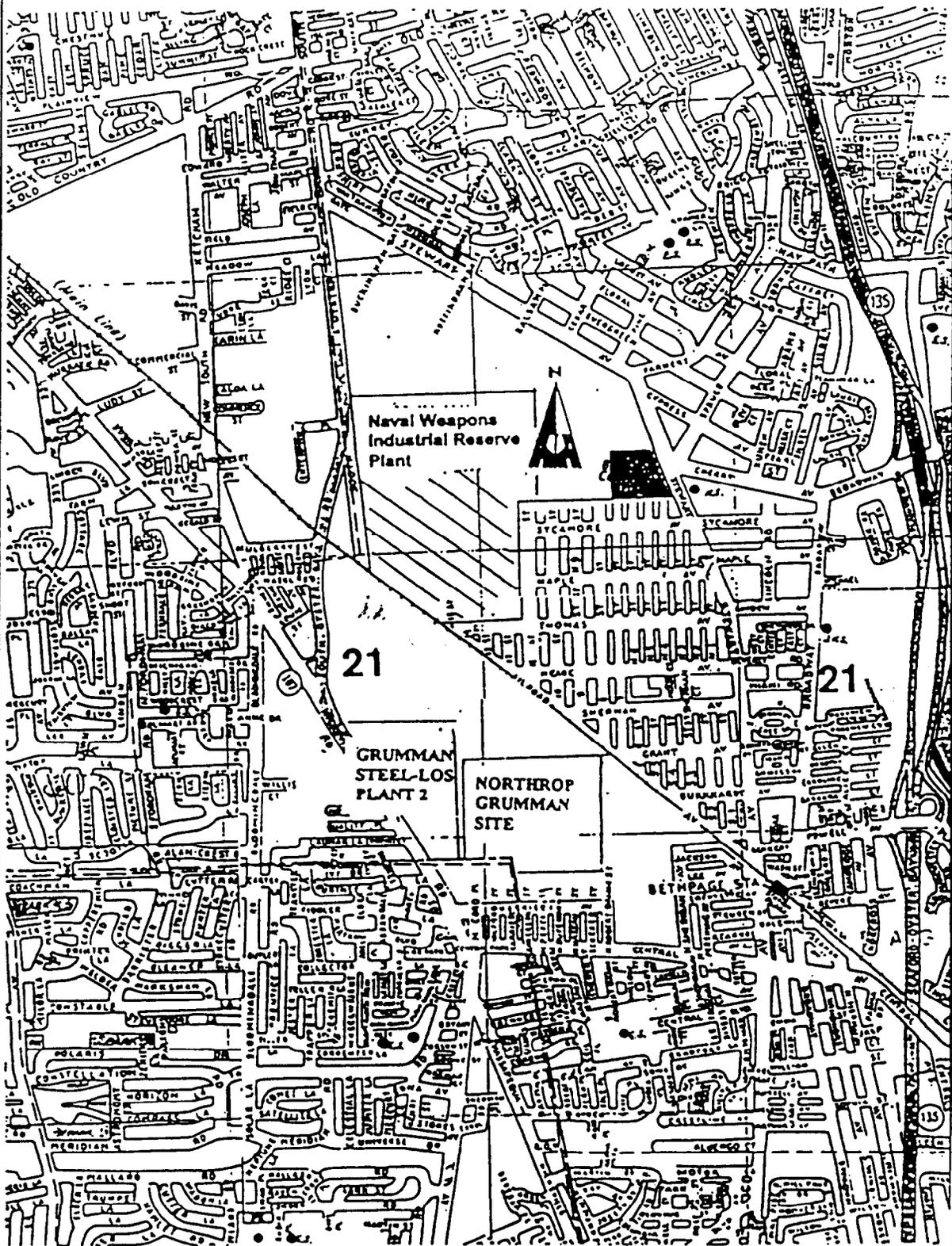
ug/l: Micrograms per liter. See also PPB.

UIC: Underground Injection Control Program.

UST: Underground Storage Tank.

VCM: Vinyl chloride monomer.

VOC: Volatile organic compound. Amenable to identification by gas chromatography analysis. Also, an organic compound that is readily vaporizable at a relatively low temperature.



# Northrop Grumman

Figure 1- Area Location Map

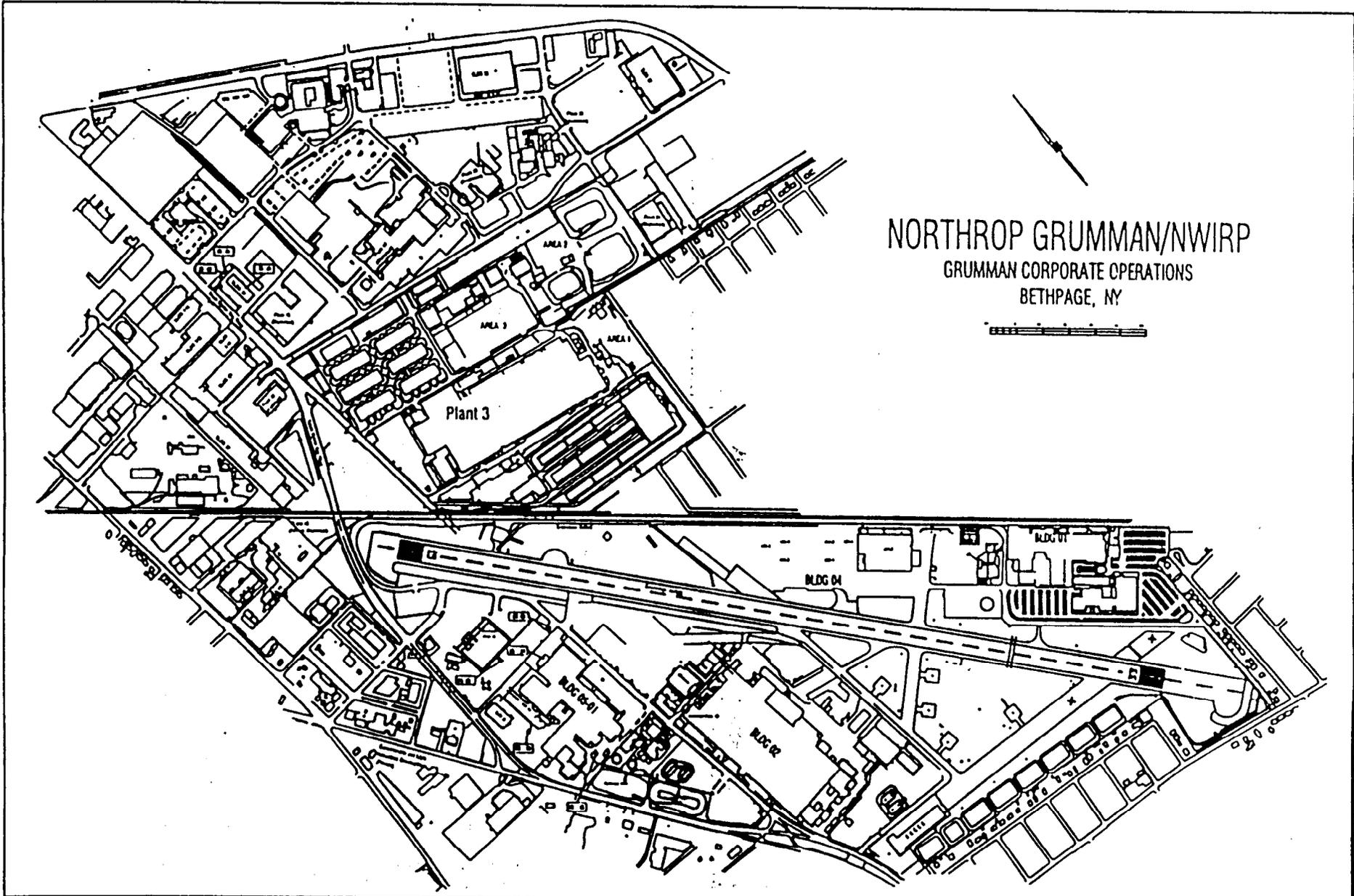
DIVISION OF ENVIRONMENTAL REMEDIATION

REVISED:  
DATE 03/21/00

DRAWING



Town of Oyster Bay, Site No.s 1-30-003A, B and C



NORTHROP GRUMMAN/NWIRP  
 GRUMMAN CORPORATE OPERATIONS  
 BETHPAGE, NY

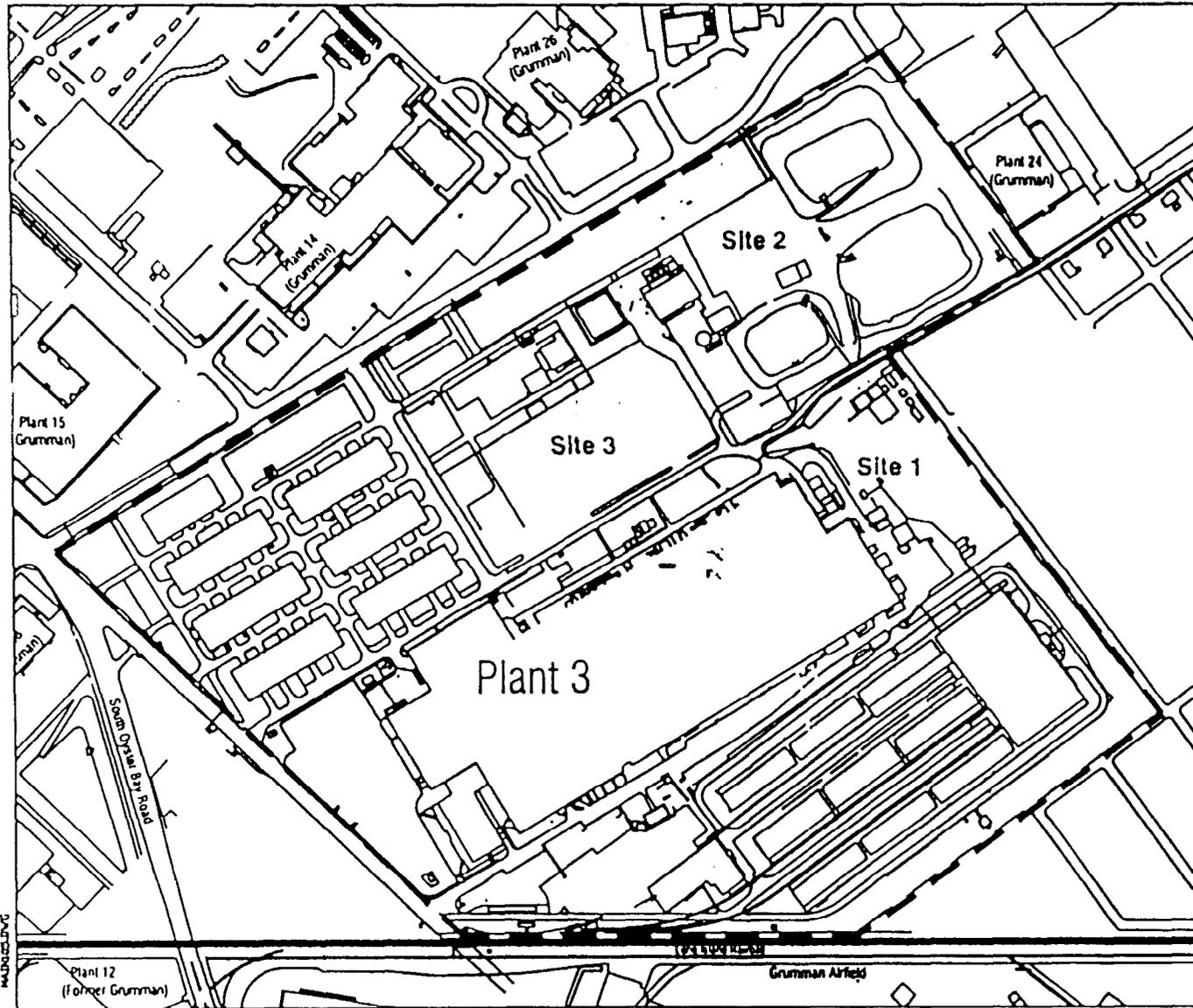


NORTHROP GRUMMAN/NWIRP SITE  
 BETHPAGE, NASSAU COUNTY, NEW YORK

GENERAL SITE LOCATION

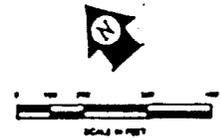
FIGURE 2

# Figure 3



### Legend

 Navy 105 Acre Parcel Boundary

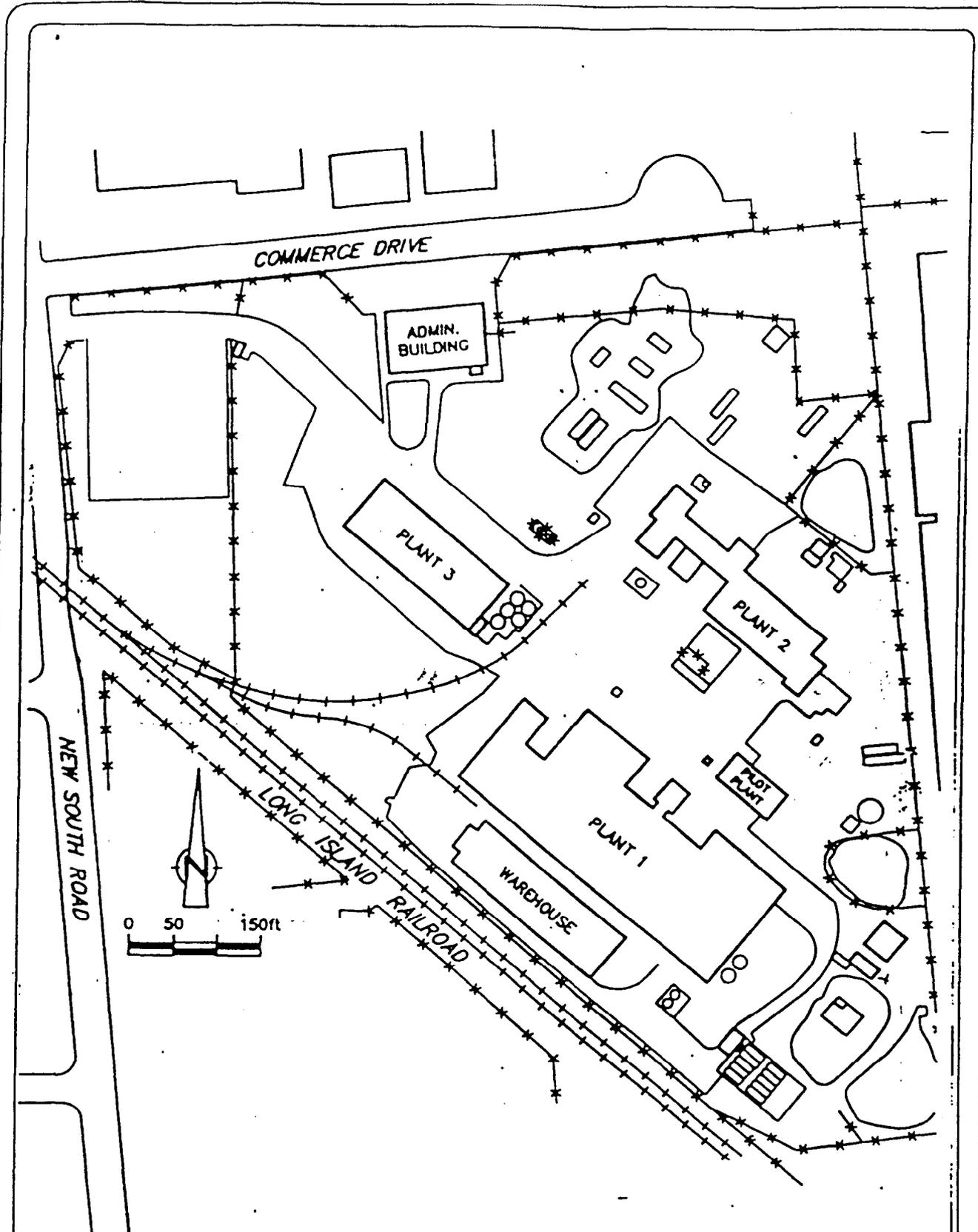


April, 2000 From TetraTech NWS Base Map  
Modified by: Steven M. Scharf, P. E.

Naval Weapons  
Industrial Reserve  
Plant  
NWIRP Bethpage  
(NWIRP.DWG)

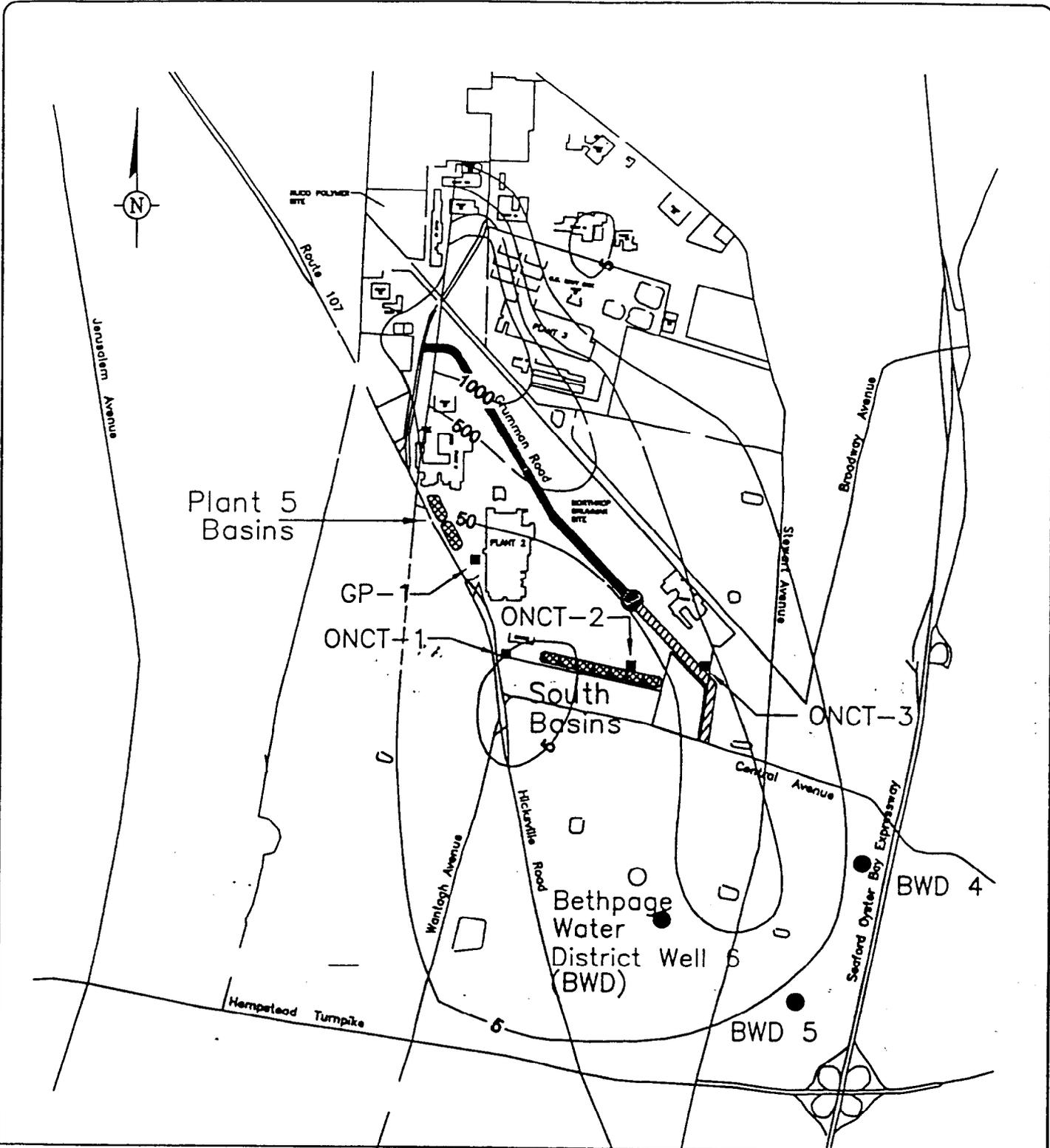


For Estimating Purposes Only, Not To Scale



OXY Hooker Ruco Site  
 Figure 4  
 DIVISION OF ENVIRONMENTAL REMEDIATION  
 REVISED: \_\_\_\_\_  
 DATE: 04/25/00  
 DRAWING: \_\_\_\_\_





**LEGEND:**

- ONCT-1 ■ WELL LOCATION AND DESIGNATION
- APPROXIMATE WESTERN EXTENT OF TVOC PLUME
- 5 — LINE OF EQUAL TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION IN PARTS PER BILLION
- REPRESENTS MODIFIED WESTERN EXTENT OF TVOC PLUME AS REQUESTED BY NYSDEC BASED UPON HISTORIC DISCHARGE OF NON-CONTACT COOLING WATER TO PLANT 12 BASINS

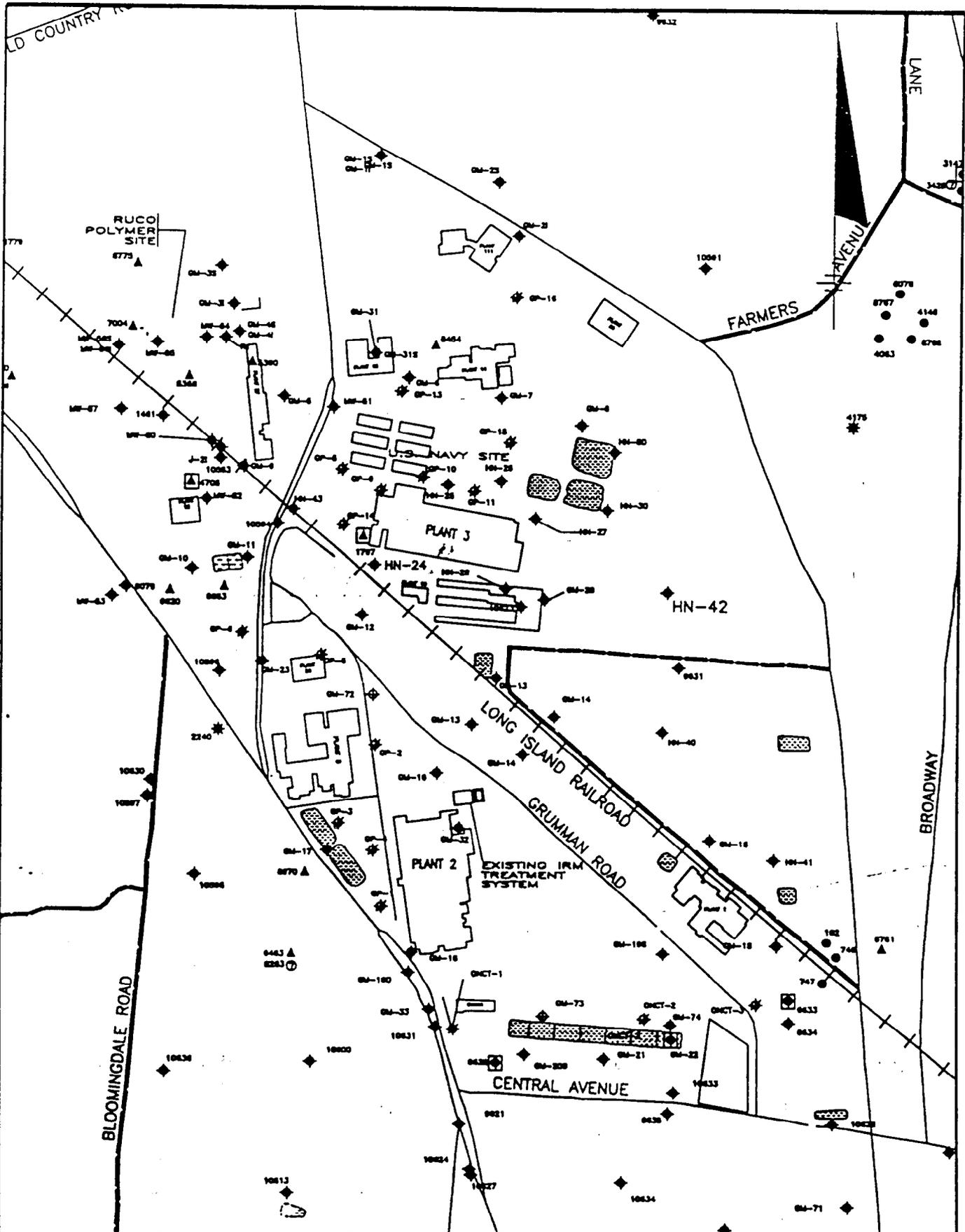
0 2000 FT

Modified by:  
 Steven M. Scharf, P.E.  
 From Original Map prepared  
 Arcadis Geroghty and Miller

INITIAL CONTOURED CONCENTRATIONS  
 OF TOTAL VOLATILE ORGANIC COMPOUNDS  
 IN MODEL LAYER 4

Figure 5

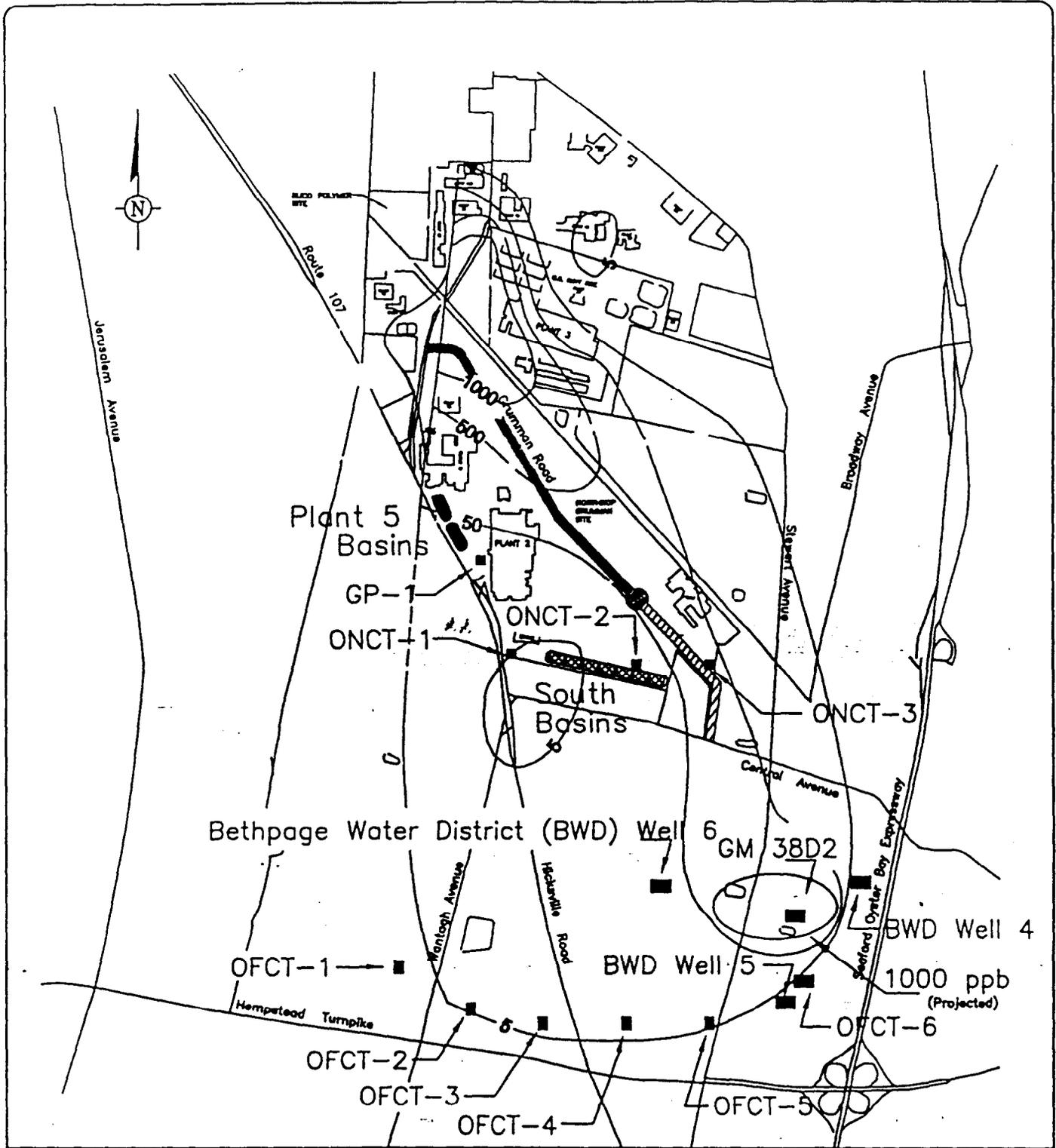




NORTHROP GRUMMAN/ NAVAL WEAPONS INDUSTRIAL RESERVE PLANT  
 BETHPAGE, NEW YORK

FIGURE 6

SITE MONITORING WELL LOCATIONS



**LEGEND:**

- OFCT-1 ■ WELL LOCATION AND DESIGNATION
- APPROXIMATE WESTERN EXTENT OF TVOC PLUME
- 5 LINE OF EQUAL TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION IN PARTS PER BILLION
- REPRESENTS MODIFIED WESTERN EXTENT OF TVOC PLUME AS REQUESTED BY NYSDEC BASED UPON HISTORIC DISCHARGE OF NON-CONTACT COOLING WATER TO PLANT 12 BASINS

figure7.dwg

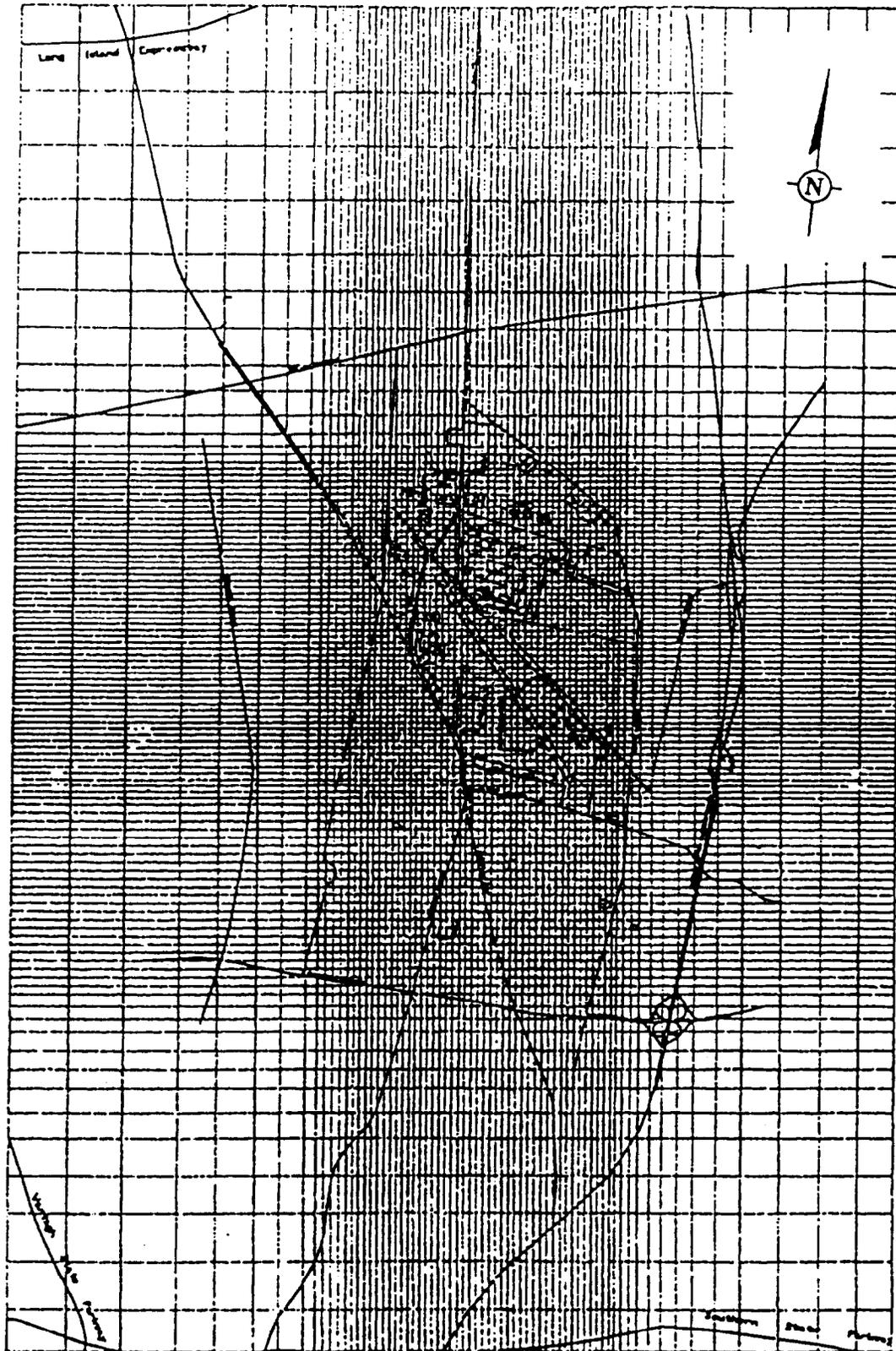
0 2000 FT

Modified by:  
 Steven M. Scharf, P.E.  
 From Original Map prepared  
 Arcadis Geraghty and Miller

NORTHROP GRUMMAN FEASIBILITY STUDY  
 VARIOUS EXTRACTION WELL LOCATIONS

Figure 7





0  4000 FT

Groundwater Model Grid  
Figure 8

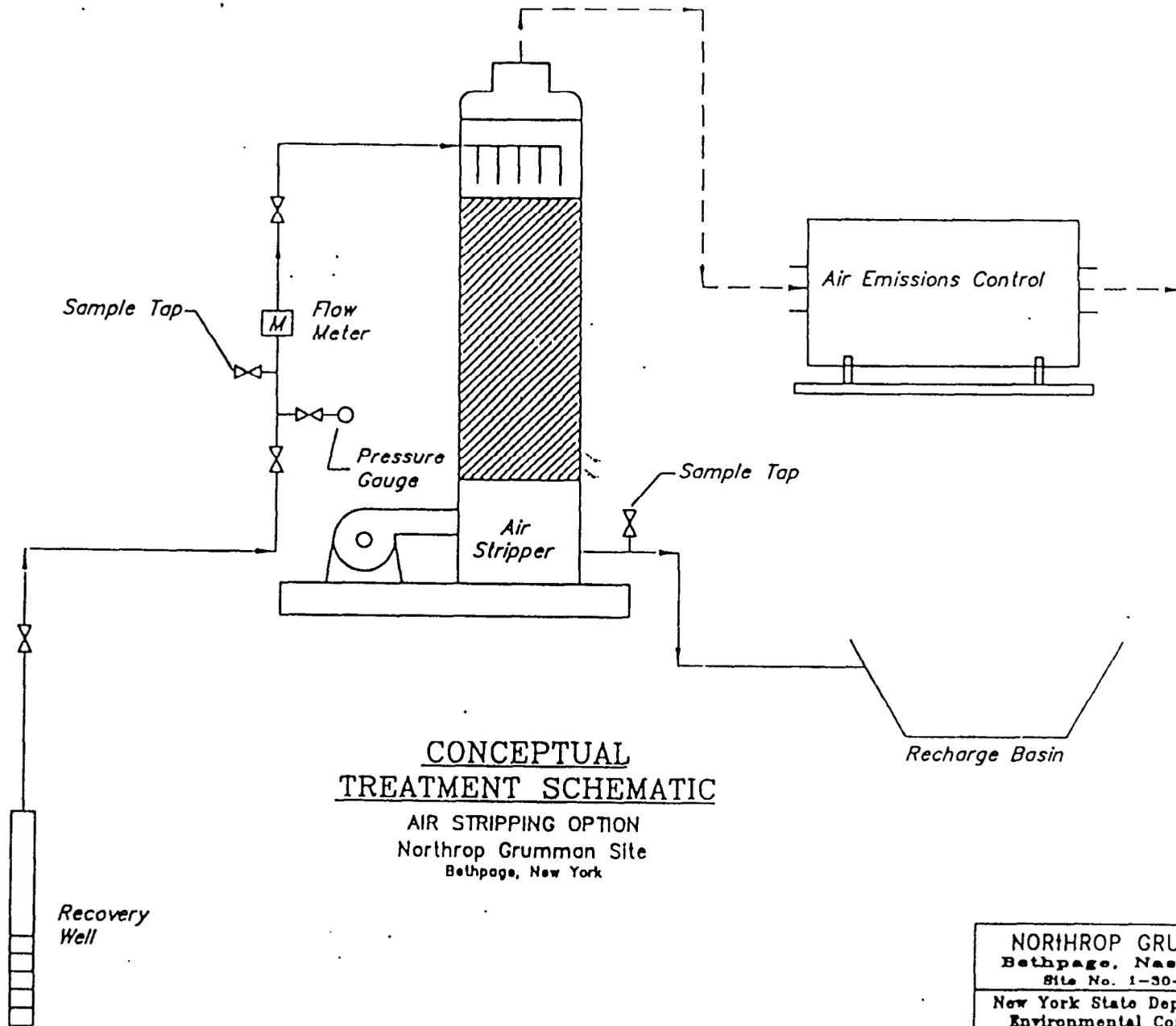
DIVISION OF ENVIRONMENTAL REMEDIATION

REVISED:  
DATE: 06/22/00

SCALE: 1"=100'



Northrop Grumman Site



**CONCEPTUAL  
TREATMENT SCHEMATIC**

AIR STRIPPING OPTION  
Northrop Grumman Site  
Bethpage, New York

NORTHROP GRUMMAN SITE	
Bethpage, Nassau County	
Site No. 1-30-003A, B, C	
New York State Department of Environmental Conservation	
FILE: Stripper.dwg	DRAWING: <i>Page 1 of 1</i>
GROUNDWATER REMEDIATION SCHEMATIC VIEW	