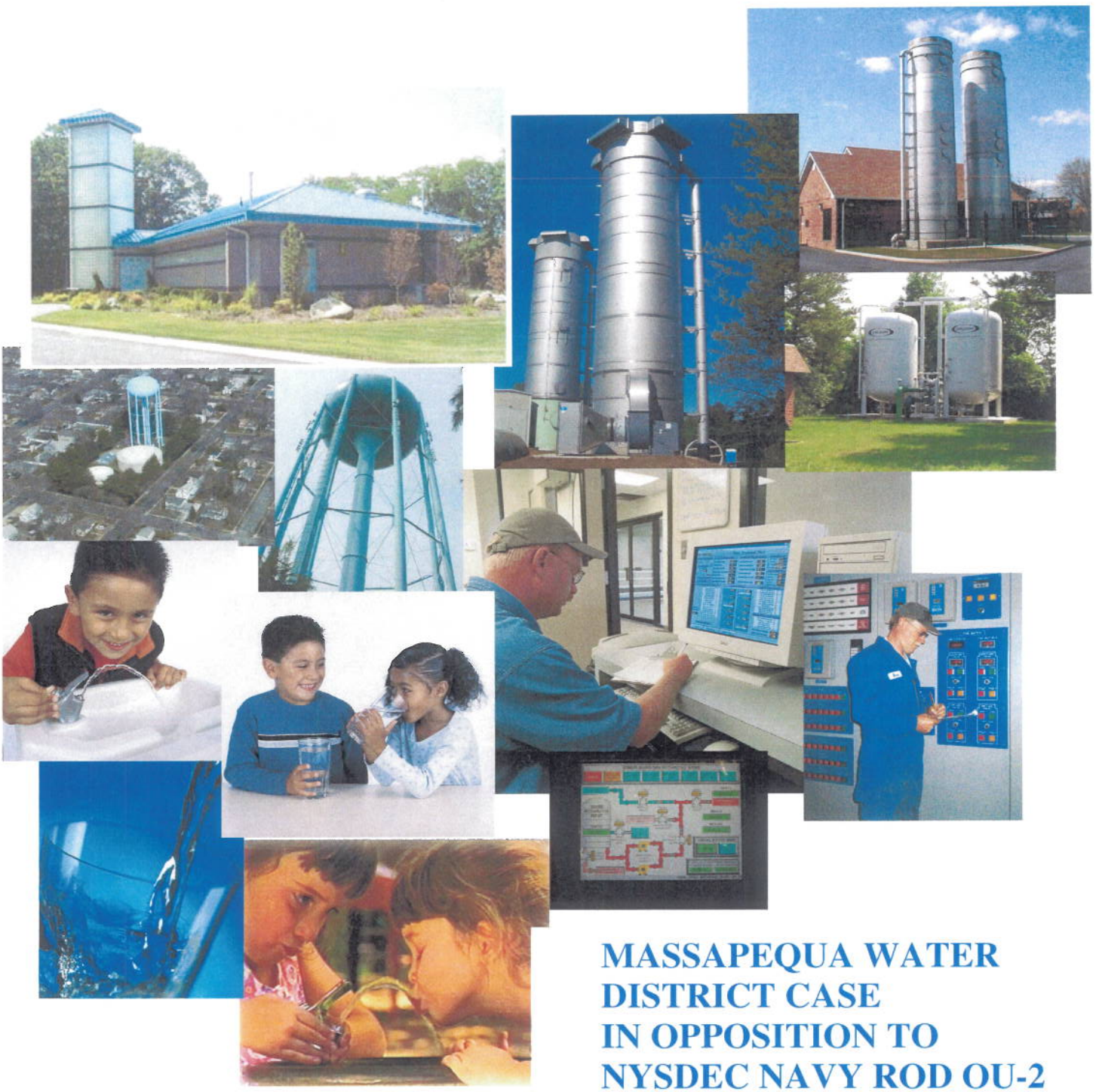

MASSAPEQUA WATER DISTRICT CASE IN OPPOSITION TO NYSDEC NAVY ROD OU-2

February 2011

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1.0 INTRODUCTION

The Massapequa Water District (MWD) continues to be concerned with the lack of cleanup and enforcement regarding the Grumman-Navy Plume. Over the past decade the District has placed the Nassau County Department of Health, New York State DEC and USEPA on notice of our concern that these highly contaminated plumes be remediated before they have the ability to impact our vital drinking water supply wells.

By September 2009 the District's frustrations with the regulatory agencies led MWD to commence a public campaign for support through newsletters and public information sessions at local civil associations. MWD also provided critical information through its newsletters and to local and regional media and newspapers. With the failure of regional newspapers and media (Newsday and News 12) to provide that public information on this issue, MWD continued to inform the public locally.

In our fall 2009 newsletter we clearly provided the status of our plight invoking U.S. Senator Charles Schumer to intercede. Early meetings with the Senator's staff, although productive, did not force either the EPA of NYSDOH to intercede. Once local civic associations sent petitions and e-mails directly to the Senator's office, he convened a meeting at MWD on September 27, 2010. Members of the EPA, USGS, Navy, Grumman, NYSDEC, NYSDOH, NCDH and local water suppliers discussed this 25 year old contamination issue at the meeting. The Senator committed these agencies to stop the plume from infiltrating MWD and to clean up the source and plume (see Senator Schumer press release attached at the end of Section 1).

1.1 - Background

The Northrop Grumman facility is situated on 635 acres in the Town of Oyster Bay, Bethpage, New York. Approximately 105 of the 635 acres were occupied by the Naval Weapons Industrial Reserve Plant (NWIRP), a Government Owned Contractor Operated (GOCO) facility. The Northrop Grumman Corporation was established in the early 1930s. Activities conducted at the facility included engineering, administrative, research and development, and testing operations, as well as manufacturing operations for the Navy and NASA. The facility also had an active airfield. Both Northrop Grumman and the NWIRP had maintained numerous industrial groundwater supply wells and recharge basins. Former manufacturing and other operations have been phased out, and Northrop Grumman has sold most of the facility, though Northrop Grumman maintains a permanent presence with approximately 1,500 technical staff.

Volatile organic compounds (VOCs) (*primarily trichloroethylene, tetrachlorethylene, dichloroethylene and vinyl chloride*) and chromium contamination at the Northrop Grumman facility entered the groundwater through various source areas. These include recharge basins, sumps, dry wells, spill areas and former hazardous waste storage areas at

both the Grumman facility and the adjacent Hooker/RUCO EPA Superfund site. In 1976, water pumped from some of the on-site Grumman production wells was found to contain volatile organic compounds. Subsequently, Grumman ultimately installed an air stripper on the non-contact cooling water supply wells.

In 1986, the Nassau County Health Department, in conjunction with the United States Geological Survey, began an investigation of the groundwater resources in the vicinity of the Grumman plant. During this study, a groundwater plume estimated to be over 2000 acres in area and over 700 feet deep in places has been identified beneath, and south of, these facilities. This plume is emanating from this facility, and is commingled with a plume from the upgradient and adjacent Hooker/RUCO site.

Northrop Grumman has implemented an on-site groundwater remediation and monitoring system which is known as OU-1. OU-1 includes three groundwater extraction wells (ONCT-1, 2 and 3) which remove contaminated groundwater from the site and pump it through an air stripping treatment system for the removal of VOCs. Following treatment, the groundwater is recharged back to the ground through recharge basins located along the southern boundary of the site. This process has allowed the on-site contaminated groundwater to be treated, and upon recharge, has created a partial hydraulic barrier which minimizes some of the off-site migration of the contamination.

Since 1986 off-site groundwater contamination has adversely impacted several public drinking water supply wells and now threatens many others. The impacted water supply wells include facilities operated by the Bethpage Water District. Public supply wells operated by South Farmingdale Water District, AQUA of New York and Massapequa Water District are threatened by the contamination. This threat is imminent for all of the aforementioned water purveyors. Grumman and the Navy have financed the installation wellhead treatment systems for the impacted Bethpage Water District public water supply wells. The South Farmingdale Water District and AQUA of NY are presently in negotiations with the Navy and Grumman to provide wellhead treatment for those wells that are known to become impacted soon. A Public Water Supply Protection Program was memorialized in the Operable Unit 2 Groundwater Record of Decision for this facility, by the NYSDEC during 2001.

A second operable unit, OU-2, is the off-site remediation and monitoring component of the contamination plume. OU-2 includes a network of monitoring wells which are used to monitor the off-site contamination plume. The contaminants present in the monitoring wells indicate there is a significant contaminant plume flowing in a southeasterly direction that is not being treated by the on-site OU-1 Groundwater Remediation System. Unfortunately there is a lack of monitoring wells. As such, the groundwater plume is poorly delineated. The feature of this DEC solution is to allow that contaminated plume to "breakaway" from the Grumman site and impact wells to the south including MWD.

A third operable unit, OU-3, was added to this contamination site following the discovery of the heavy contamination. Operable Unit 3 (OU 3), an area immediately off-site which was used for sludge drying and fire control training, is an 18-acrea area that now is part

of the Bethpage Community Park. This park area was reportedly used by Grumman as a wastewater discharge recharge area, sludge drying bed area, and fire training facility, where waste oil and jet fuel were ignited and extinguished. Preliminary data indicates that the OU 3 area could have been a historic source of six chlorinated volatile organic compounds. As part of the off-site investigation into the contamination plume emanating from the park, vertical profile borings (VPBs) were installed and deep extensive off site contamination of the basil Magothy formation was documented.

Currently remedial work at the facility is being conducted pursuant to several authorities: the New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation is handling groundwater issues through Administrative Orders. NYSDEC Spills Program has addressed a fuel spill. NYSDEC Bureau of Solid Waste and RCRA Corrective Action are handling the soils contamination and RCRA concerns through a NYCRR Part 373 Permit, and the NYS Department of Health Underground Injection Compliance (UIC) Program is dealing with the dry wells in conjunction with RCRA.

1.2 - NYSDEC Navy ROD OU-2

During March of 2001 the NYSDEC issued a Record of Decision (ROD) on Operable Unit 2 (OU-2) Groundwater Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites Nassau County for Site Numbers 1-30-003A & B. The 2001 NYSDEC ROD strictly addressed present conditions and failed to address future supply well impacts and threats. Meaningful clean-up of the offsite contamination was not selected as a remedy. The NYSDEC concluded the wellhead treatment for the impacted Bethpage Water District supply wells along with future consideration of additional wellhead treatment to address impacts to additional supply wells was the selected public water supply protection alternative. Unfortunately the selected alternative failed to properly assess the long term impacts based on realistic costs, future impacts and public health protection. Further discussion is provided in Section 2.0.

1.3 – Massapequa Water District Position

Most recent groundwater investigation reveals that the full extent and magnitude of the Northrop Grumman has not been fully determined. This is further evidenced by the fact that the Bethpage Water District must perform a significant upgrade of several of its wellhead treatment systems based on dramatically increasing groundwater contamination levels.

Based on the known elements of the groundwater contamination, the large plume continues to move unmitigated in the south-southeast direction and deep into the Long Island sole-source aquifer system. This massive contamination will impact public supply wells operated by the South Farmingdale Water District and AQUA of New York. The

Massapequa Water District is further south and will be adversely impacted by the contamination if proper action is not taken to perform full delineation and remediation of the plume.

Time is of the essence. For every day that passes, the plume move closer to our vital drinking water wells. Therefore we strongly urge our elected officials to compel federal and state regulatory agencies to perform their regulatory duties that are specific to health issues, by remediating the groundwater contamination as opposed to the state's position of requiring wellhead treatment by the local water supply agencies.

Based on the magnitude and upgradient location of the Grumman plume, the following actions must be expeditiously implemented:

1. Full horizontal and vertical delineation of the plume must be performed.
2. Outpost early warning detection wells must be installed at strategic locations and depths upgradient of all Massapequa Water District supply wells.
3. Upon successful comprehensive plume delineation, updated groundwater modeling must be performed using the latest proven software application.
4. Remediation and / or a hydraulic barrier must be implemented to prevent the plume from migrating further south toward the Massapequa Water District. Items 1 through 3 must be completed in order to properly assess and implement this action.
5. Assess the current Technical Advisory Committee (TAC) that has been established to monitor investigation and remediation activities associated with the Grumman plume. Determine and implement improvements to provide proper plume investigation and remediation oversight by the TAC.

1.4 - NYSDEC Boundary Conditions

At the time of the issuance of the 2001 ROD, the groundwater plume was estimated to extend over an area of more than 2,000 acres and to a depth of approximately 700 feet. During 1993 the southern edge of the plume was delineated to be just north of Hempstead Turnpike. The 2001 ROD acknowledged that groundwater data from the Navy vertical profile borings migrated southward beyond Hempstead Turnpike. As of 2007 the plume has migrated approximately 1 mile south of Hempstead Turnpike. Due to the lack of adequate delineation, the location of the leading edge of the plume is not known. Based on the best estimates developed by the Massapequa Water District, the plume could impact the Northwest Well Field within 4 years.

Aside from the inadequate delineation of the leading edge of the plume, the NYSDEC visa vi the 2001 ROD place a boundary condition on the approach to remediate the plume and protect vital drinking water supply wells. This boundary was based on the use of permanent wellhead treatment as the remedy without assessing full costs, total impacts and health effects. From a technical perspective the 2001 ROD acknowledged that hydraulic containment of the plume was feasible but was erroneously ruled out based on skewed cost impacts.

1.4.1 – Cost

The remedy alternative selected in the 2001 NYSDEC ROD for protecting public drinking water wells was predicated on permanent wellhead treatment. The ROD failed to assess other viable alternatives and stuck to a traditional regulatory myopic approach. As summarized on Table 1.4.1, other viable and less costly alternative include the following:

- Permanent Alternate Source of Water - Lloyd Wells
- Permanent Alternate Source of Water - Purchase and import from regional systems
- Transitional Source of Water - Magothy wells south of Sunrise Highway
- Other measures - Investigation and proactive monitoring / Emergency Wellhead Treatment

Permanent wellhead treatment for MWD is estimated to cost $128,144,961 based on full implementation by 2016. Other viable options such as permanent alternate sources of water are estimated to be $27 to $37 million less than the myopic permanent wellhead treatment boundary condition.

MWD Case in Opposition to NYSDEC / NAVY ROD OU-2

Table 1.4.1

Cost Comparisons MWD Wells Only

	Alternatives	Time to Implement	Estimated Cost [1]	2001 ROD Cost	Source, Notes and Comments
A	Permanent Wellhead Treatment	5 years (2016)	$128,144,961	Not evaluated	Source NYSDEC/NAVY ROD. Provides wellhead treatment for all Massapequa W.D. Wells. Cost does not include $17,943,054 for "Other Measures" under Option E.
B	Permanent Alternate Source of Water - Lloyd Wells	4 years (2015)	$101,191,188	Not evaluated	Source MWD Proposal. Estimate is based on recent actual Lloyd well construction data. Cost does not include $17,943,054 for "Other Measures" under Option E.
C	Permanent Alternate Source of Water - Purchase and import from regional systems	3 years (2014)	$91,523,247	Not evaluated	Source MWD Proposal. **Must purchased water that is not subject to wellhead treatment.** Cost does not include $17,943,054 for "Other Measures" under Option E.
D	Transitional Source of Water - Magothy wells south of Sunrise Highway	3 years (2014)	$102,667,154	Not evaluated	Source MWD Proposal. Cost does not include $17,943,054 for "Other Measures" under Option E.
E	Other measures - Investigation and proactive monitoring / Emergency Wellhead Treatment	1 year (2012)	$17,943,054	Not evaluated	Source MWD Proposal.

Note:

[1] **- Includes O & M costs based on a 30 year life.**

Last Update:2/21/2011

1.4.2 – Cleanup / Health Effects

Wellhead treatment is not desirable based on a health risk concern. Proactive plume clean-up is the most desirable alternative. Over the past 25 years the EPA has continued to set forth more stringent requirements for public drinking water. These more stringent measures primarily have initiated more stringent wellhead treatment facilities. However the fact remains that even though these regulations are more stringent people are ingesting the water before the regulations are promulgated and during the time that wellhead treatment is brought into line. In other words we keep drinking the water until the technology and/or the resources of the EPA deemed that they need to be treated further. Again this is inviting a disease into your body and then hoping that the existing cure works. It begs the question of why these contaminants are allowed into the public water supply in the first place. Prior to 1986 people ingesting the Grumman plume water were perfectly safe according to the EPA regulations that were basically a 10 ppm total organic compounds threshold level for treatment. However when the new regulations were promulgated defining the specific contaminant organic compounds and requiring wellhead treatment to 5 ppm per each constituent the public had ingested (or potential) that water until the new regulations went into effect and the appropriate wellhead treatment for them was put online. Again the EPA promulgated more stringent regulations now being concerned with parts per billion for the removal of each contaminant. These current regulations are far more stringent than those of even 10 years ago requiring significant wellhead treatment and does not does not reclaim the contaminants that were already ingested over the previous 2 1/2 decades that have been ingested.

Although some argue that significant capital and operating expenses associated with wellhead treatment are a problem, and they are, they are minor in comparison to the health risk that continues to be ignored by the NYSDEC and EPA. Furthermore, the lack of complete plume delineation does not provide sufficient information to properly define the contaminants and therefore the requisite design of an effective treatment system. The public water supplier that was initially impacted by the Grumman plume is now forced by the county health department to take unexpected and expedited actions to upgrade treatment facilities to keep vital supply wells in operation. This will be the second such action over the past 2 1/2 decades and based on the historical facts indicates that upgrades will need to be done again and again.

It should be noted that the EPA is providing serious consideration to lower MCLs sometime in the near future for tetrachloroethylene (PCE) and trichloroethylene (TCE). It appears highly likely that EPA can lower the MCL to something closer to the current reliable detection limit of 0.5 ppb and this decision would be highly defendable in the context of the SDWA requirement that the MCL must be as close to the MCLG "as feasible". Both are common solvents and are found quite often in concentrations below the current MCLs of 5 ppb. The lowering of the MCLs will result in far higher wellhead treatment costs. Recent information indicates the preliminary position of EPA regarding these two regulated contaminants is contained in the 3/29/10 Federal Register Notice and

Request for Comments and is referred to as the Second 6-Year Review. The SDWA requires that the EPA Administrator determine the likelihood that a regulated contaminant may cause cancer. The EPA decisions at the time of their original regulation were that PCE and TCE were likely human carcinogens. Because of the carcinogenicity decision, at the time EPA established these two MCLs, two things happened as required by the SDWA in that the MCL Goal (MCLG) by law had to be set at zero and the MCLs had to be as close to the MCLG "as feasible". Therefore there is a very high likelihood that lower MCLs for PCE and TCE will be established in the near future.

1.5 -U.S. Schumer Committee Overview

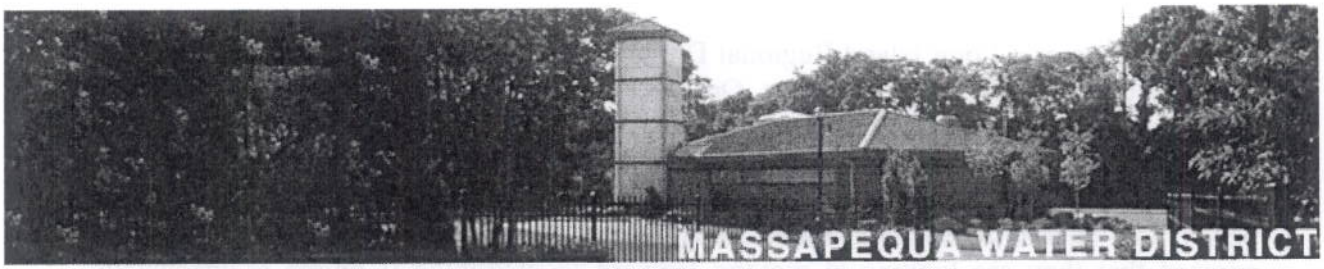
At the urging of the Board of Commissioners and the community, MWD has engaged U.S. Senator Schumer to provide federal leadership and assistance to facilitate clean-up of the Grumman-Navy plume. In particular he has compelled the USEPA along with the USGS are assessing the current groundwater model.
On September 27, 2010, Senator Schumer conducted a meeting the MWD. High level officials from EPA, USGS, NYSDEC, US NAVY, NYSDOH, NCDH, Grumman and local water suppliers were present at the meeting. The Massapequa Water District provided a presentation to Senator Schumer that summarized the following:

- The Massapequa Water District continues to be concerned with the lack of cleanup and lack of cleanup enforcement regarding the Grumman Bethpage site.
- The public drinking water supply wells operated by the Massapequa Water District are hydraulically down gradient of the massive and extensive Grumman groundwater contamination plume.
- It is not a matter of "if" but "when will" the plume impact the supply wells
- Full horizontal and vertical delineation of the plume must be performed.

At the meeting MWD advised Senator Schumer that the community requires the following as it relates to the Grumman plume which includes leadership, better data, better modeling, hydraulic barrier, plume clean-up, adequate funding (no impact to the local taxpayers) and immediate action. The meeting has led to the following developments in order to protect drinking water from the Grumman plume. Among them:

- Scientists from the U.S. Geological Survey will begin a probe to better define the dimensions of the plumes. Officials hope to finish the work in six months.
- A technical committee of public health officials, environmental regulators, water district representatives and the Northrop Grumman and the U.S. Navy is being established. The committee is to meet next month to review existing cleanup efforts and recommend additional steps.
- Senator Schumer asked Northrop Grumman and the Navy to create a dedicated fund to pay for any cleanup costs that water districts absorb so that ratepayers aren't stuck with the bill.

Senator Schumer's Long Island Regional Director, Gerard Petrella, has been leading the committee on behalf of the Senator. On December 15, 2010 a follow-up committee meeting was held at MWD. At the meeting the EPA clearly stated and submitted documentation that the current Grumman-Navy groundwater model is not adequate for assessing down gradient impacts. The USGS advised that their agency requires more needs more data to determine if model documentation is adequate. In addition the USGS advised that they are looking at moving forward to determine if plume is adequately delineated. EPA officials advised that the model evaluation and final report to be completed by April 2011. Therefore the next committee meeting will be scheduled in mid April.



Important! Response to New York Times article on Water Quality

Residents Response Triggers Positive Actions by Senator Schumer.

We would especially like to thank the grassroots efforts of our local community, started by The Old Harbor Green Civic Association, and bringing forth our concerns regarding the Grumman Bethpage plume has been recognized and responded to by our Senior Senator Chuck Schumer.

On Monday, September 27, 2010 a meeting was convened by Senator Schumer at the Massapequa Water District bringing together top officials from the EPA, New York State DOH, New York State DEC, the Navy, and Grumman, as well as the US GS and other local water districts. The Senator and the summoned officials sat through a brief technical presentation by the Massapequa Water District (Mr. Paul Granger, P.E.) summarizing our concerns regarding the ominous constituents of that plume and the fact that it continues to migrate towards our drinking water wells. After a brief discussion Senator Schumer addressed the assembled group and outlined the following course of action: Monday's meeting convened by Sen. Charles Schumer (D-NY) led to developments in the ongoing campaign to protect drinking water from two chemical plumes. Among them:

- Scientists from the U.S. Geological Survey will begin a probe to better define the dimensions of the plumes. Officials hope to finish the work in six months.
- A technical committee of public health officials, environmental regulators, water district representatives and the Northrop Grumman and the U.S. Navy is being established. The committee is to meet next month to review existing cleanup efforts and recommend additional steps.
- Schumer asked Northrop Grumman and the Navy to create a dedicated fund to pay for any cleanup costs that water districts absorb so that ratepayers "aren't stuck with the bill".

The Board of Commissioners wishes to thank their employees, Massapequa Park Village, all local civic associations, and most of all the residents of the water district.

Agreement with Nassau County Police Department - Antennas on May Place Well Site

WATER DISTRICT COMMISSIONERS HOST SENATOR SCHUMER AND HIGH LEVEL MEETING TO ADDRESS THE GRUMMAN PLUME

At the urging of the Board of Commissioners of the Massapequa Water District and the community U.S Senator Schumer convened a meeting On Monday September 27th at the Massapequa Water District. High level officials from EPA, NYSDEC, US NAVY, State Health Department, Grumman and local water suppliers were present at the meeting. The Massapequa Water District provided a presentation to Senator Schumer that summarized the following:

- The Massapequa Water District continues to be concerned with the lack of cleanup and lack of cleanup enforcement regarding the Grumman Bethpage site.
- The public drinking water supply wells operated by the Massapequa Water District are hydraulically down gradient of the massive and extensive Grumman groundwater contamination plume.
- It is not a matter of "if" but "**when will**" the plume impact the supply wells
- Full horizontal and vertical delineation of the plume must be performed.

The Massapequa Water District advised Senator Schumer that the community requires the following as it relates to the Grumman plume:

- Leadership
- Better data
- Better modeling
- Hydraulic barrier
- Plume clean-up
- Adequate funding (no impact to the local taxpayer)
- Immediate action

The meeting has led to the following developments in order to protect drinking water from the Grumman plume. Among them:

Scientists from the U.S. Geological Survey will begin a probe to better define the dimensions of the plumes. Officials hope to finish the work in six months.

A technical committee of public health officials, environmental regulators, water district representatives and the Northrop Grumman and the U.S. Navy is being established. The committee is to meet next month to review existing cleanup efforts and recommend additional steps.

Senator Schumer asked Northrop Grumman and the Navy to create a dedicated fund to pay for any cleanup costs that water districts absorb so that ratepayers aren't stuck with the bill.

The District will be participating in on going meetings as a means to insure that the plume will be remediated and stop the he contamination from advancing toward our critical drinking water supply wells. The use of wellhead treatment methods to address the concern does not provide the comprehensive protection that we demand for the residents we serve. Please rest assured that the District will continue to aggressively address this serious water quality issue and will only be satisfied once the threat of contamination is completely eliminated. We would like to thank the community for there support and we will provide updates on the progress of the plume clean-up.

2.0 NYSDEC NAVY ROD – DRINKING WATER SUPPLY WELLS TO BE CONTAMINATED

One of the fundamental flaws of the 2001 NYSDEC-NAVY ROD is the failure to objectively and properly assess the full impacts to all public water supply wells that are in the path of the Grumman-Navy plume. Furthermore the deficiencies of the 2001 ROD are illustrated with the costly and comprehensive wellhead treatment system upgrades that the Bethpage Water District is currently implementing for four wells at two plant locations (Plants 4 and 6). The following sections present discussions and facts related to the 2001 ROD.

2.1 – Excerpts from the 2001 ROD

The ROD determined that the disposal activities have resulted in significant threats to the public health and/or the environment that included:

- 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.

Accordingly the ROD selected the remedy identified as Alternative 3. This Alternative contained the following measures related to public water supply protection:

- continued public water supply wellhead treatment to meet appropriate drinking water quality performance objectives at well fields already affected by the groundwater contaminant plume for as long as these affected well fields are used as community water supply sources;

- public water supply wellhead treatment or comparable alternative measures, as necessary, for well fields that become affected in the future; and

- long term monitoring of the groundwater contanant plume including outpost monitoring wells upgradient of potentially affected water supply wells.

The ROD acknowledged that there is a possibility of site-related contamination impacting additional public water supply wells. It was stated in the ROD that the wells will 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 or comparable alternative measures, if necessary.

As indicated above, the NYSDEC implemented measures that strictly rely on wellhead treatment rather than implementing the most protective Alternative which was identified as Alternative 8 in the ROD. This alternative would have provided off-site plume

containment, treatment and discharge to off-site storm water sewers and HN-24 area treatment.

2.2 - Wells Unaccounted For

The 2001 ROD failed to properly evaluate the number of drinking water supply wells that are in the path of the Grumman-Navy plume. Only five (5) Bethpage Water District wells were considered (Wells 4-1, 4-2, 5-1, 6-1 and 6-2). Therefore the costs associated with the wellhead treatment option were grossly incorrect.

As summarized on Table 2.2, a total of thirty six (36) public drinking water supply wells operated by six (6) regional purveyors are threatened or impacted by the plume. In aggregate the wells provide 78.43 million gallons of day (MGD) of authorized capacity. The 2001 ROD accounted for only 14 % of the threatened or impacted supply wells. Therefore the selection of Alternative 3 that was based on wellhead treatment for supply well protection was abhorrently inaccurate and a grossly misleading when compared to the plume containment option (Alternative 8).

2.3 – Cost Estimates in NYSDEC Navy ROD

Table 2.3 provides a summary and comparison of the cost estimates in the 2001 ROD. At that time a total cost for plume remediation under Alternative 8 was projected to be $64,700,000 while the selected remedy (Alternative 3) was estimated to be $33,600,000. The following Section will review the estimates in greater detail and apply the appropriate inflation factors to assess costs based on implementation scenarios by 2014 and 2015. Furthermore the cost estimating flaws in the ROD will be elucidated.

2.4 - NYSDEC Navy ROD Plume Remediation Costs

It must be noted that the selected remedy was based on five (5) supply wells requiring wellhead treatment to treat a combined flow of 9.95 MGD. However the actual number of supply wells requiring wellhead treatment will be thirty six (36) with a total maximum production of 78.43 MGD.

Table 2.4 provides a summary of the Alternative 8 (*Plume Remediation*) total costs projected from 2010 through 2016 based on escalating the original estimate based on an annual inflation rate of 2.6 %. Implementation of the Alternative by 2015 yields an estimated total cost of $90,950,189. If the Alternative was selected and implemented in a timely manner it would have provided protection to thirty one (31) down gradient supply wells. Unfortunately this Alternative was not selected.

Erroneously Alternative 3 (*Wellhead Treatment and Partial Plume Remediation*) was the selected remedy and if implemented by 2016 would yield an estimated total cost of $48,467,602 (refer to Table 2.5). While this estimate appears to be significantly lower that Alternative 8, it is grossly misleading since it is based on providing wellhead treatment for five (5) wells rather than the full thirty six (36) that are in the projected path of the Grumman-Navy plume.

In summary the 2001 NYSDEC ROD is grossly inaccurate and outdated. It was based on the plume being present north of Hempstead Turnpike. The plume has now travelled well beyond Hempstead Turnpike in a southerly direction. It also utilized figures for wellhead treatment that are substantially lower than the recent evaluation by the Navy.

Table 2.2

Drinking Water Supply Wells Threatened or Impacted by Grumman-Navy Plume

Supplier	Plant Site	Well No.	Number of Wells	Capacity (MGD) [1]	Status	Notes and Comments
AQUA of NY	Seaman Neck	3 & 4	2	6.04	Impacted	WHT under construction
	Demot	4, 5 & 6	3	7.82	Threatened	
	Sunrise Mall	6, 7 & 8	3	9.06	Threatened	
Bethpage	Plant 4	4-1 & 4-2	2	3.98	Impacted	WHT upgrade underway
	Plant 5	5-1	1	1.99	Impacted	WHT in operation
	Plant 6	6-1 & 6-2	2	3.98	Impacted	WHT upgrade underway
Farmingdale (Village)	Ridge Road	2-2 & 2-3	2	3.72	Threatened	OU-3 (eastern edge) plume is a threat
Levittown (Town of Hempstead)	Wantagh Ave	?	1	1.78	Threatened	
Massapequa	Northwest	4 & 5	2	3.98	Threatened	
	New York Ave.	6 & 7	2	3.98	Threatened	
	Sunrise Hwy	9	1	1.99	Threatened	
	Northeast	1, 2R, 3 & 8	4	8.85	Threatened	
South Farmingdale	Plant 1	1-2, 1-3 & 1-4	3	5.97	Imminent threat	WHT under construction
	Plant 2	2-2 & 2-3	2	3.56	Threatened	
	Plant 3	3-1	1	1.99	Imminent threat	WHT in design
	Plant 4	4-1	1	1.78	Threatened	
	Plant 5	5-1 & 5-2	2	3.98	Threatened	
	Plant 6	6-1 & 6-2	2	3.98	Threatened	
Total Wells Threatened or Impacted:			**36**	**78.43**	MGD	**Notes:**
Total Wells with WHT (Total ROD Wells):			**5**	**9.95**	MGD	(1) - Authorized Capacity
Totals Wells with WHT planned or under construction:			**6**	**14.00**	MGD	MGD- Million Gallons per Day
Total Threatened Wells (Total Wells Unaccounted for in ROD):			**25**	**54.48**	MGD	

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Table 2.3

Cost Estimate NYSDEC Navy ROD

	Alternative	Time to Implement	Estimated Cost [1]	2001 ROD Cost	Projected		Actual		Notes and Comments
					Number of wells	Authorized Capacity (MGD)	Number of wells	Authorized Capacity (MGD)	
8	Plume remediation -2001 ROD	4 years (2015)	$90,950,189	$64,700,000	5	9.95	36	78.43	March 2001 NYSDEC ROD estimates plume remediation to be $64,700. Estimated cost has been converted to 2015 dollars.
3	Partial Off-site Clean-up and Wellhead Treatment - 2001 ROD (Selected Remedial Action)[2]	5 years (2016)	$48,467,602	$33,600,000	5	9.95	36	78.43	**Based on the selection of Alternative 3 in the March 2001 NYSDEC ROD that provided only partial off-site plume removal and continue with WHT for Bethpage W.D. Plants 4, 5 and 6 (five wells).**

Note:

(1) - Includes O & M costs based on a 30 year life.

(2) - Alternative 3 has proved to be grossly ineffective from an economic and technical aspect since plume is significantly expanding and has impacted or will be impacting numerous public water supply wells.

Last Update:2/21/2011

MWD Case in Opposition to **NYSDEC Navy ROD**

Table 2.4

Plume Remediation 2001 ROD

Category	2001	2010	2011	2012	2013	2014	2015	2016
Plume remediation -2001 ROD	$64,700,000	$79,935,370	$82,026,072	$84,171,455	$86,372,951	$88,632,027	$90,950,189	$93,328,982

Notes:

Annual inflation rate = 2.62% (from 2001 to 2010)
Annual inflation rate = 2.60% (from 2004 to 2010)

Source:

U.S. Department of Labor - Bureau of Labor Statistics (BLS)
CPI Inflation Calculator - http://www.dol.gov/dol/topic/statistics/inflation.htm
About the CPI inflation calculator: The CPI inflation calculator uses the average Consumer Price Index for a given calendar year. This data represents changes in prices of all goods and services purchased for consumption by urban households. This index value has been calculated every year since 1913. For the current year, the latest monthly index value is used.

Last update:2/21/2011

MWD Case in Opposition to NYDEC Navy ROD

Table 2.5

Partial Remediation and Wellhead Treatment 2001 ROD

Category	2001	2010	2011	2012	2013	2014	2015	2016
Partial Off-site Clean-up and Wellhead Treatment - 2001 ROD	$33,600,000	$41,512,032	$42,597,775	$43,711,916	$44,855,196	$46,028,380	$47,232,247	$48,467,602

Notes:

Annual inflation rate = 2.62% (from 2001 to 2010)
Annual inflation rate = 2.60% (from 2004 to 2010)

Source:

U.S. Department of Labor - Bureau of Labor Statistics (BLS)
CPI Inflation Calculator - http://www.dol.gov/dol/topic/statistics/inflation.htm

About the CPI inflation calculator: The CPI inflation calculator uses the average Consumer Price Index for a given calendar year. This data represents changes in prices of all goods and services purchased for consumption by urban households. This index value has been calculated every year since 1913. For the current year, the latest monthly index value is used.

Last update: 2/21/2011

3.0 MWD PROPOSED ALTERNATIVES

MWD recognizes the significant deficiencies of the 2001 NYSDEC Navy OU-2 ROD and has been highly critical of the document. It is evident that the remedy put forward in the ROD in not cost effective and protective of public health. Therefore we have developed the following alternatives that will keep the drinking water clean and avoid costly and problematic wellhead treatment. Table 3.0 provides a list of our proposed alternatives, estimated implementation time and estimated total cost.

3.1 – Summary of Alternatives

3.1.1 - Lloyd Wells

Under this alternative the Lloyd aquifer would be used as viable source of clean drinking water. This confined aquifer is situated beneath the impacted Magothy formation and is protected by the Raritan clay. USGS studies and use of the Lloyd aquifer by local suppliers, such as the City of Long Beach and Jones Beach State Park, have demonstrated that the Lloyd formation will be able to produce the water necessary to replace all of the current MWD magothy wells. Iron removal will be required since the water produced from the deep confined aquifer contains dissolved iron will above the secondary drinking standard. Additional savings can be realized if the new wells are drilled and constructed on existing MWD plant sites. Table 3.1.1 provides a cost summary for this viable alternative.

3.1.2 - Interconnections with other Water Suppliers

Table 3.1.2 provides a cost estimate that would facilitate the importation of "non wellhead treated" water from regional water systems. This alternative includes provisions for the necessary infrastructure to interconnect and transfer water to the MWD. To replace current design capacity of MWD, a total of ten 2 MGD interconnections would be required.

3.1.3 - Hydraulic Blocking and Plume Remediation

The 2001 ROD presented a proposed remedy (ROD Alternative 8) that would have facilitated blocking and remediating the plume. The 2001 ROD estimate for this option was $64,700,000 which translates into a total cost of $90,950,189 if implemented by 2015. Table 3.1.3 was developed along the same principals presented in the 2001 ROD. The MWD alternative proposes the installation of extraction wells that would be clustered and screened at strategic location and intervals. Since the plume has traveled deeper and further south the amount of extraction wells, treatment systems and infrastructure would be expanded when compared to the 2001 ROD. Our estimate for this alternative based on implementation by 2015 is projected to be $93,573,991. This estimate is well within the range of the 2001 ROD projection based on inflation.

3.1.4 - Additional Time – New Wells south of Sunrise Highway

This option provides additional time for the MWD to provide clean drinking water to the community. Ultimate the new Magothy supply wells will be impacted by VOCs as the plume moves further south. As summarized on Table 3.1.4, the estimate cost for new wells south of Sunrise Highway is $94,951,449. This is not a long term cost effective solution.

3.1.5 - Emergency Measures

As the Navy and Grumman continues to undertake a slow response and should the responsible parties not be compelled to undertake prompt action to contain and remediate the plume, emergency measures must be implemented to ensure that an uninterrupted supply of water is available to the community for both domestic and fire protection needs. This measure would employ the temporary use of granular actives carbon (GAC) filtration until a permanent measure is implemented. This highly undesirable measure is projected to cost $10,593,258 (refer to Table 3.1.5).

3.2 - MWD Cost Summaries Based on Start Dates

Table 3.2 summarizes the cost summaries for the alternative presented in this document based on varying implementation periods since action will be dictated by the actions of the EPA, NYSDEC and responsible parties (Grumman-Navy). This table also provided a clear comparison of options based on various implementation scenarios. The option that summarizes "Other Measures" includes the emergency measures described in subsection 3.1.5. and include cost associated with the construction of early warning sentinel wells and other proactive plume tracking measure that are required for compliance with Part 5 of the State Sanitary Code.

3.3 - Detailed Cost Estimates

The impact to MWD taxpayers will significant should implementation of permanent wellhead treatment, construction of new Lloyd wells or interconnections be required. The following subsections provide a summary of the total costs that the MWD community will have to address. The details related to the operating and maintenance cost projections are available upon request.

3.3.1 – Permanent Wellhead Treatment

This option for providing treatment for all nine (9) MWD supply wells has a projected total cost of $112,449,776 and is summarized on Table 3.3.1. Based on the implementation period this cost could range upward to $128,144,961. It should be noted that all MWD wells have elevated iron levels, therefore pretreatment (iron removal filtration) would be required prior to VOC removal.

As previously discussed in Section 2.0, the 2001 ROD selected a remedy that was based on wellhead treatment for five (5) Bethpage Water District wells which translates into a 2016 cost of $48,467,602. The Bethpage wells have low levels of iron and pretreatment is not required. Therefore, treatment for Bethpage wells would be lower when compare to MWD.

It should ne noted there are twenty seven (27) supply wells outside of MWD and Bethpage that are in the path of the Grumman-Navy Plume. The estimated cost to provide wellhead treatment for these additional wells can range from $150 to $170 million. Therefore the total cost range for wellhead treatment for all supply wells is well **over a quarter billion dollars!** This underscores the extreme deficiencies and lack of long term planning in the 2001 ROD. The selected remedy was clearly not the most cost effective option. In addition the remedy was not the most protective public health option either.

3.3.2 – New Lloyd Wells

The installation of new Lloyd wells would require NYSDEC approval. As previously discussed the deep confined water bearing formation will provide "non-VOC" contaminated water to MWD residents. Depending upon implementation the cost for this option is estimated to range from $91,180,674 to $103,861,041. This alternative provided the public health protection that is demanded by MWD, has a lower total cost when compared to wellhead treatment and can be expanded to other impacted water suppliers such as Aqua of New York, Bethpage W.D. and South Farmingdale W.D.

3.3.3 - Possible Interconnections

This option depending upon implementation can range in estimated cost from $84,645,036 to $96,416,501. The challenge will be the ability to obtain a sufficient supply of non wellhead treated water from regional suppliers since the plume will be impacting additional South Farmingdale and AQUA of New York supply wells. The Suffolk County Water Authority could be a viable source of water however the Fairchild – Republic Airport plume is impacting supply wells in East Farmingdale and the project path of the Grumman-Navy plume will cross over the Nassau-Suffolk county line.

MWD Case in Oposition to NYSDEC / NAVY ROD OU-2

Table 3.0

Cost Comparisons MWD Wells Only

	Alternatives	Time to Implement	Estimated Cost [(1)]	2001 ROD Cost	Source, Notes and Comments
A	Permanent Wellhead Treatment	5 years (2016)	$128,144,961	Not evaluated	Source NYSDEC/NAVY ROD. Provides wellhead treatment for all Massapequa W.D. Wells. Cost does not include $17,943,054 for "Other Measures" under Option E.
B	Permanent Alternate Source of Water - Lloyd Wells	4 years (2015)	$101,191,188	Not evaluated	Source MWD Proposal. Estimate is based on recent actual Lloyd well construction data. Cost does not include $17,943,054 for "Other Measures" under Option E.
C	Permanent Alternate Source of Water - Purchase and import from regional systems	3 years (2014)	$91,523,247	Not evaluated	Source MWD Proposal. **Must purchased water that is not subject to wellhead treatment.** Cost does not include $17,943,054 for "Other Measures" under Option E.
D	Transitional Source of Water - Magothy wells south of Sunrise Highway	3 years (2014)	$102,667,154	Not evaluated	Source MWD Proposal. Cost does not include $17,943,054 for "Other Measures" under Option E.
E	Other measures - Investigation and proactive monitoring / Emergency Wellhead Treatment	1 year (2012)	$17,943,054	Not evaluated	Source MWD Proposal.

Note:

(1) - Includes O & M costs based on a 30 year life.

Last Update:2/21/2011

MWD Case in Opposition to NYSDEC Navy ROD OU-2

Table 3.1.1

Lloyd Supply Wells

New Lloyd Supply Well Cost Summary

Category	Size	Number of Units	Unit Cost	Total	Notes and Comments
Well and Plant	2.0 MGD	9	$4,744,025	$42,696,225	18 MGD of total well capacity would be shifted to the Lloyd Aquifer
Iron Removal*	2.0 MGD	9	$5,387,161	$48,484,449	High probability that Iron removal treatment will be required. Treatment to be confirmed at time of test well pumping and sampling.
Land Acquisition	2 acres	9	$1,000,000	$9,000,000	Very rough estimate. Further review and verification is required to confirm unit cost.
			TOTAL (for new site locations):	**$100,180,674**	
			TOTAL (using existing plant sites):	**$91,180,674**	

* Unit cost is based on capital and O&M costs

Source and back-up data:

New Lloyd Supply Wells - Updated draft

Last update:2/21/2011

MWD Case in Opposition to NYDEC Navy ROD OU-2
Table 3.1.2
Interconnections with other Water Suppliers

Cost Estimate for MWD Option to Connect to Neighboring System

This estimate includes installing approximately 5500 feet of 12 inch D.I. water main, two 12 inch directional drills, an additional well at a nearby well field, an underground can type booster station to achieve 2000 gpm, 30 years of electric to operate booster, 30 years of purchasing water, tie-ins and meter installation, design, and contingency

5500 ft 12" main at $260 per ft		$ 1,430,000.00
Two directional drills		$ 200,000.00
Additional well		$ 700,000.00
Underground Can Booster		$ 400,000.00
SCADA control of booster		$ 175,000.00
Meters / tie-ins/ Distribution improvements		$ 250,000.00
	Total	$ 3,155,000.00
Design, construction administration 12%		$ 378,600.00
Inspection 5%		$ 157,750.00
Legal 2%		$ 63,100.00
Contingency 10%		$ 315,500.00
	Total	$ 914,950.00
30 years of electric		$ 84,198.00
30 years of purchasing water		$ 7,938,000.00
	Total	$ 8,022,198.00
	Total Estimate	**$ 12,092,148.00**

2000 gpm 14 hours per day 105 days per year (June through mid September) for 30 years

To replace 20 MGD of total supply well capacity ten (10) connections will be required.
Therefore the Grand Total for this option is: **$120,921,480**

Source and back-up data:
Alternate Supply Option - Updated draft.xls

Last update:2/21/2011

MWD Case in Opposition to NYDEC Navy ROD OU-2
Table 3.1.3
Hydraulic Blocking and Plume Remediation

Task	Unit Price	Units	Number of units	Total Cost
Extraction Wells - cluster and screen at minimum three zones	$500,000	Well cluster	20	10,000,000
Effluent water treatment	$10,000,000	systems	5	50,000,000
Effluent piping for water treatment	$260	L.F.	10,500	2,730,000
Treated water reinjection piping - tranfer water to existing recharge basins	$260	L.F.	10,500	2,730,000
			Construction subtotal:	65,460,000
			Engineering design, permits and construction admin.:	$7,855,200
			Inspection:	3,273,000
			Legal:	1,309,200
			Contingencies:	6,546,000
			Grand Total - 2011	**$84,443,400**
			Grand Total - 2015	**$93,573,991**

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MWD Case in Opposition to NYDEC NAVY ROD OU-2
Table 3.1.4
Additional Time - New Wells South of Sunrise

New Magothy Well Summary - South of Sunrise Highway					
Category	Size	Number of Units	Unit Cost	Total	Notes and Comments
Well and Plant	2.0 MGD	9	$4,163,000	$37,467,000	18 MGD of total well capacity would be shifted south of Sunrise Hwy.
Iron Removal*	2.0 MGD	9	$5,387,161	$48,484,449	Iron removal treatment may be required and will be determined at time of test well pumping and sampling. May not be required at all sites.
Land Acquisition	2 acres	9	$1,000,000	$9,000,000	Very rough estimate. Further review and verification is required to confirm unit cost.
			TOTAL:	**$94,951,449**	
* Unit cost is based on capital and O&M costs (refer to New Lloyd Supply Well Cost Summary for O&M cost data)					

Source and back-up data:
New Well Magothy Wells South of Sunrise- Updated draft

Last update: 2/21/2011

MWD Case in Opposition to NYSDEC Navy ROD OU-2
Table 3.1.5
Emergency Measures

Massapequa Water District				
All Supply Wells				
Emergency Wellhead Treatment Cost Estimate Summary				
Treatment Method: GAC Filtration				
Plant	Plant Capcaity (MGD)	Capital Cost	Annual Operating Cost	Two Year Total Cost
Northwest	4.0	1,960,200	160,464	2,281,128
New York Ave.	4.0	1,960,200	160,464	2,281,128
Sunrise Hwy	2.0	980,100	80,232	1,140,564
Northeast	9.0	4,168,350	361,044	4,890,438
	Totals:	$9,068,850	$762,204	$10,593,258

Source and back-up data:
Other - Emerg GAC Treatment - Updated draft

Last update:2/21/2011

MWD Case in Opposition to NYSDEC Navy ROD OU-2

Table 3.2

Cost Summary Based on Time

Option	2011	2012	2013	2014	2015	2016
Permanent Wellhead Treatment	$112,499,776	$115,467,997	$118,514,533	$121,641,449	$124,850,866	$128,144,961
Permanent Alternate Source of Water - Lloyd Wells (using existing Plant sites)	$91,180,674	$93,586,406	$96,055,613	$98,589,967	$101,191,188	$103,861,041
Permanent Alternate Source of Water - Purchase and import from regional systems	$84,645,036	$86,878,331	$89,170,550	$91,523,247	$93,938,018	$96,416,501
Transitional Source of Water - Magothy wells south of Sunrise Highway	$94,951,449	$97,456,671	$100,027,991	$102,667,154	$105,375,948	$108,156,213
Other measures - Investigation and proactive monitoring / Emergency Wellhead Treatment	$17,481,810	$17,943,054	$18,416,468	$18,902,373	$19,401,097	$19,912,981
Plume remediation	$82,026,072	$84,171,455	$86,372,951	$88,632,027	$90,950,189	$93,328,982

Notes:

Annual inflation rate = 2.60% (from 2004 to 2010)

*** It should be noted that the Engineer News Record (ENR) documents the construction inflation rate to be as high as 12 % for the New York Metropolitain Area.**

Source:

U.S. Department of Labor - Bureau of Labor Statistics (BLS)

CPI Inflation Calculator - http://www.dol.gov/dol/topic/statistics/inflation.htm

About the CPI inflation calculator: The CPI inflation calculator uses the average Consumer Price Index for a given calendar year. This data represents changes in prices of all goods and services purchased for consumption by urban households (nationally). This index value has been calculated every year since 1913. For the current year, the latest monthly index value is used.

Last Update:2/21/2011

MWD Case in Opposition to NYSDEC Navy ROD OU-2
Table 3.3.1
Permanent Wellhead Treatment

Massapequa Water District
All Supply Wells
Permanent Wellhead Treatment Cost Estimate Summary
Treatment Method: Iron Filtration and Air Stripping

Plant	Plant Capcaity (MGD)	Capital Cost	Annual Operating Cost	Present Worth Value -Operating Cost	Total Cost
Northwest	4.0	8,448,000	357,432	7,972,521	24,393,042
New York Ave.	4.0	8,448,000	357,432	15,945,042	24,393,042
Sunrise Hwy	2.0	4,224,000	178,716	7,972,521	12,196,521
Northeast	9.0	17,312,000	768,479	34,205,173	51,517,173
	Totals:	$38,432,000	$1,662,059	$66,095,256	**$112,499,776**

Source and back-up data:
Perm WHT for All Supply Wells - Updated draft

Last Update: 2/21/2011

4.0 INEFFECTIVE GRUMMAN NAVY MODEL

Groundwater modeling on behalf of Grumman has been performed in the past. Such modeling forecasted that outpost early detection wells installed upgradient of threatened South Farmingdale wells were projected to remain clean for approximately 10 years but were impacted only in a few years. This clearly demonstrates the inaccuracy of the present model and the need for more comprehensive horizontal and vertical delineation of the plume. Such information is also vital to develop a plan to prevent the plume from impacting the Massapequa Water District. This clearly demonstrates that the plume is moving at a faster rate than expected.

The Bethpage Water District is currently upgrading wellhead treatment systems at vital drinking water plants based on deteriorating groundwater quality conditions. The water quality information provided by the responsible parties to develop the original wellhead treatment system design was inaccurate. New water quality data clearly demonstrates that off site groundwater quality conditions are far worse than originally disclosed.

5.0 EMERGENCY AND INTERIM MEASURES

Unless the Senator Schumer edict is followed by the EPA and implemented immediately, MWD will be forced into actions necessary to protect public health and provide an adequate water supply to our customers.

The MWD has an obligation under New York State Law and Part 5 of the New York State Sanitary Code to undertake specific actions to protect public health. Such action would include provisions for emergency wellhead treatment since it is unclear as to when the plume will impact MWD wells. Emergency measures would utilize granular activate carbon (GAC) filtration units as a temporary wellhead treatment method. GAC is effective for the temporary removal of low level VOCs and can be quickly implemented since the filter units are modular and readily available. The use of GAC is not a long term solution based on the magnitude of the contamination that is migrating toward the district. As summarized on Table 5.1, emergency wellhead treatment has a total estimated cost of $10,593,258. This is based on a 2 year operational period until permanent measures are implemented.

The $10,593,258 cost impact can be avoided if prompt and comprehensive action is undertaken to contain and remediate the plume.

MWD Case in Opposition to NYSDEC / Navy ROD OU-2

Table 5.1

Emergency Wellhead Treatment

Massapequa Water District				
All Supply Wells				
Emergency Wellhead Treatment Cost Estimate Summary				
Treatment Method: GAC Filtration				
Plant	Plant Capcaity (MGD)	Capital Cost	Annual Operating Cost	Two Year Total Cost
Northwest	4.0	1,960,200	160,464	2,281,128
New York Ave.	4.0	1,960,200	160,464	2,281,128
Sunrise Hwy	2.0	980,100	80,232	1,140,564
Northeast	9.0	4,168,350	361,044	4,890,438
	Totals:	$9,068,850	$762,204	$10,593,258

Source and back-up data:

Other - Emerg GAC Treatment - Updated draft

Last update:2/21/2011

6.0 MEASURES TO BE UNDERTAKEN BY MWD

For over a decade the MWD has voiced strong opposition to the regulatory approach that has been undertaken to address the Grumman-Navy plume. It is clearly evident that the NYSDEC has supported the use of wellhead treatment as the only means to address public water supply impacts. Furthermore the responsible parties have failed to provide full and comprehensive delineation of the Grumman-Navy plume in an expedient manner. To compound the challenges that are faced by the water suppliers in the path of the plume, a highly inadequate groundwater model was developed. This has lead to erroneous time of travel / impact predictions.

The 2001 OU-2 ROD has implemented a remedy that was based on extremely inaccurate data and a flawed planning approach. Furthermore the 2001 ROD is outdated. It was based on the plume being present north of Hempstead Turnpike. The plume has now travelled well beyond Hempstead Turnpike in a southerly direction. In addition the selected ROD remedy and cost estimate was predicated on provide wellhead treatment to only 14 percent of the wells that are in the path of the plume. This lead to the development of extremely inaccurate cost estimates that made a false determination that plume remediation was not cost effective. Had the NYSDEC and Navy invoked a long term planning approach, then the cost estimates and approach should have considered 36 supply wells rather than 5. Incompetence at such a high level that has the potential to compromise public health, cannot be tolerated. Nor can future actions and measure be trusted or invoke confidence that proper actions are being undertaken. It is evident that the EPA must take a leading role in reviewing and compelling the responsible parties to contain and remediate the plume. Senator Schumer has gone on record and stated that the Navy must pay for the investigation, modeling and plume hydraulic barrier / remediation approach.

As depicted on the attached timeline, MWD actions have resulted in engaging Senator Schumer. This has brought the responsible parties, EPA, USGS and NYSDEC together with the impacted and threatened water suppliers. This has resulted in the EPA / USGS determining that the groundwater model is in adequate. A report from EPA on the plume evaluation is scheduled to be complete by this spring. An optimization review of the groundwater model by the Navy is presently underway. MWD will continue to be engaged with Senator Schumer and his committee and will continue to apply pressure to ensure that wellhead treatment is not the solution for addressing the plume.

Time is now of the essence. Supply wells in the path of the plume are being impacted or are imminently threaten more rapidly than expected. Furthermore, wells that have been impacted are now required to undergo major upgrades because of waves of additional higher magnitude contamination that were not anticipated. A recent memo issued by the EPA advises that the Grumman-Navy groundwater model is inadequate. It is clearly evident that the NYSDEC has been inept with its oversight of the plume and regulatory approach to protect water supply wells. What is highly outrageous is that the NYSDEC is

seeking to conduct a public hearing on the OU-3 Feasibility Study. The regulatory agency is seeking to implement remedies that are predicated on past practices that have clearly failed. Such a hearing must be suspended until the NYSDEC is compelled to implement measure that will truly protect public supply wells and public health.

At this time additional and proper plume delineation and groundwater modeling must be performed without further delay. Hydraulic containment and plume remediation measures must be implemented without any further delay.

To ensure the continued production of the supply wells at risk, and protect the public drinking water supply and public health, the MWD must undertake proactive measures. These measures, as outlined on Table 6.1, would be in addition to emergency wellhead treatment and include but not be limited to the installation of early warning sentinel wells clusters, proactive sentinel and supply well sampling and plume data review.

The MWD will continue to be engaged with Senator Schumer and his committee to ensure that the following actions be expeditiously implemented:

1. Full horizontal and vertical delineation of the plume must be performed.
2. Outpost early warning detection wells must be installed at strategic locations and depths upgradient of all MWD supply wells.
3. Upon successful comprehensive plume delineation, updated groundwater modeling must be performed using the latest proven software application.
4. Remediation and / or a hydraulic barrier must be implemented to prevent the plume from migrating further south toward the MWD. Items 1 through 3 must be completed in order to properly assess and implement this action.

In summary, plume containment / remediation will result in:

- potentially significant cost savings given the cost for wellhead treatment, as compared to cleanup of the groundwater,
- the cleanup of the environment which otherwise would be allowed to remain in a contaminated condition if the wellhead treatment option is allowed to stay in place,
- increased employment through the construction and operation of the groundwater cleanup system, and
- elimination of an impact to Great South Bay.

In closing it should be noted that the EPA issued a memo on December 15, 2010 that clearly and firmly stated that model is not adequate for assessing down gradient impacts (refer to the attachment at the end of Section 6). This is clear evidence that the 2001 NYSDEC ROD is flawed.

MWD CASE IN OPPOSITION TO NYSDEC / NAVY ROD OU-2
SENATOR SCHUMER COMMITTEE
TIMELINE OF STUDIES AND EVENTS

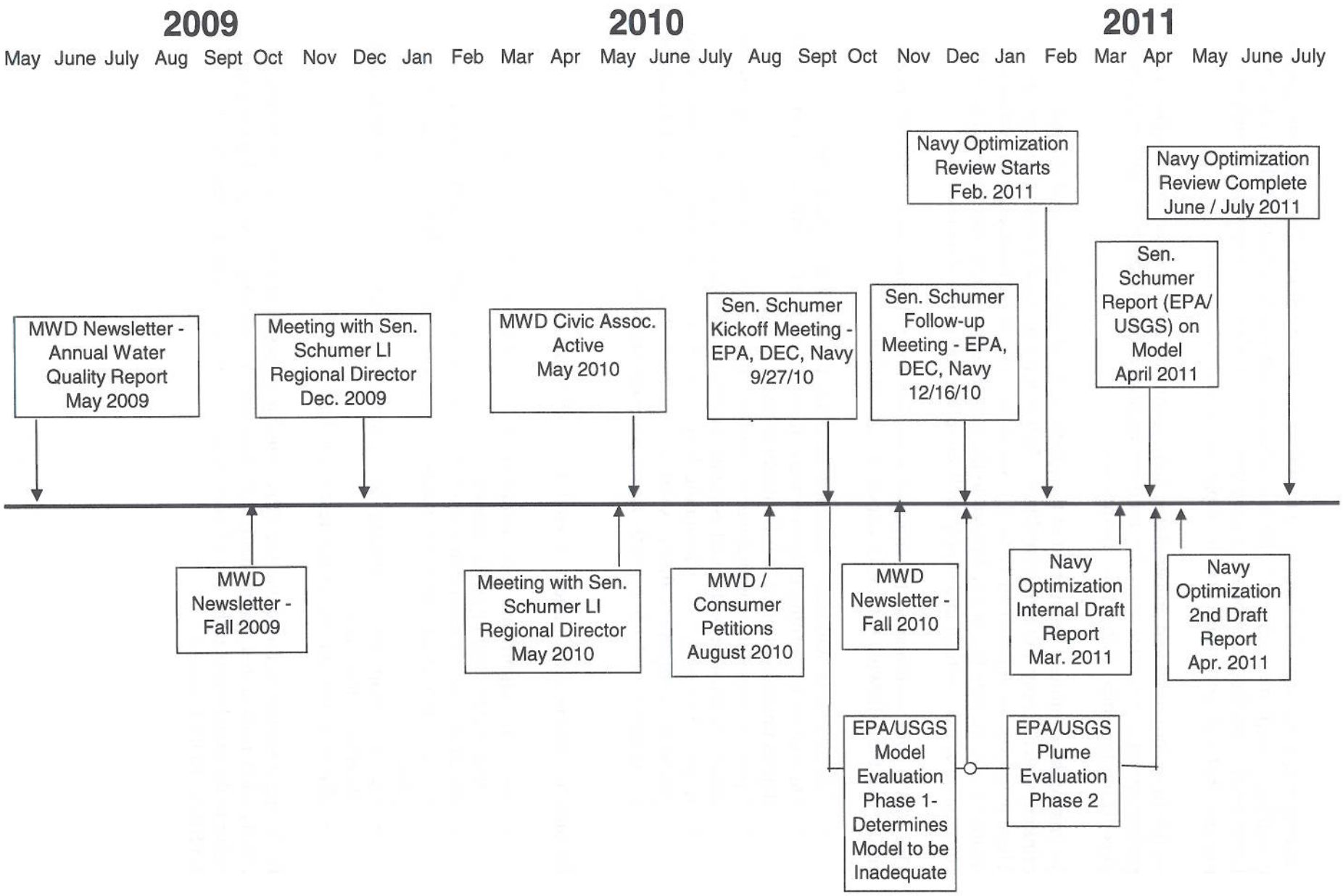

Table 6.1

Emergency Wellhead Treatment

Massapequa Water District All Supply Wells Emergency Wellhead Treatment Cost Estimate Summary Treatment Method: GAC Filtration				
Plant	Plant Capcaity (MGD)	Capital Cost	Annual Operating Cost	Two Year Total Cost
Northwest	4.0	1,960,200	160,464	2,281,128
New York Ave.	4.0	1,960,200	160,464	2,281,128
Sunrise Hwy	2.0	980,100	80,232	1,140,564
Northeast	9.0	4,168,350	361,044	4,890,438
	Totals:	$9,068,850	$762,204	$10,593,258

Source and back-up data:
Other - Emerg GAC Treatment - Updated draft

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION II
Robert M. Alvey, Geologist -Technical Support Team
Emergency and Remedial Response Division
290 Broadway, 18th Floor
New York, NY 10007-1866
alvey.robert@epamail.epa.gov

From: Rob Alvey, P.G.

To: Distribution and Files

Date: December 15, 2010

Re: Groundwater Computer Model Review Task

As a follow-up to the September 27, 2010 meeting at the Massapequa Water District, EPA Regional Administrator Judith Enck confirmed EPA commitment to protecting Long Island's drinking water resources and agreed to have EPA participate in a work group in conjunction with Senator Schumer's office and representatives of the other parties that attended that meeting.

Based on the work group meetings, an agreement was made to have an independent review by the USGS of the groundwater computer model used in conjunction with groundwater contamination associated with the former Naval Weapons Industrial Reserve Plant in Bethpage. In order to accommodate that desired task, EPA is utilizing its existing Interagency Agreement (IA) with the USGS-NY and has provided $100,000.00 funding to the IA for this purpose. Currently, two individual Tasks to the USGS-NY have been authorized:

1. November 22, 2010 ($18,000.00) Access and compile data from a variety of sources pertaining to eastern Nassau County in conjunction with a pending request from EPA to review and comment on the existing groundwater model(s) that have been prepared by Grumman and Navy consultants and others regarding contaminated groundwater and potential impacts to public supply wells.

2. December 7, 2010 ($40,000.00) Provide an initial review and assessment of groundwater model(s) developed by consultants for Grumman in connection with the Grumman and Navy sites in Bethpage NY and contaminated groundwater flow potentially affecting public supply wells. The goal of this review and assessment is provide an independent, unbiased professional opinion as to whether the current groundwater model is technically sound and appropriate for its use to estimate impacts to the public supply wells and the ultimate fate and transport of contaminants downgradient of the release points.

The work group representatives were also contacted to access and provide information they might have available regarding hydrogeologic, well detail, pumping, sampling, and chemical analyses for the geographic area so that a more comprehensive record base could be available if needed. The contributions by the Nassau County Department of Public Works and Nassau County Department of Health as well as the individual water districts are noted and appreciated in this collaborative effort.

A significant issue that needed to be addressed was which specific groundwater computer model(s) had been developed and which groundwater model version required the independent review and assessment. After conducting research on the history of the development of groundwater modeling used in conjunction with the contaminated groundwater affecting this area, and discussions with Grumman\Navy and the primary consultant- Arcadis, EPA concluded that the "2010" groundwater model by Arcadis is the specific version to be reviewed by USGS. This model was recently developed for use regarding OU-3 of the former Naval Weapons Industrial Reserve Plant. Information on this updated version of the groundwater model is included in the Feasibility Study Report submitted to NYSDEC in November 2010.

The groundwater computer model has evolved extensively since it was initially developed in the mid 1990s. The "2010" groundwater model version is based on the original groundwater model developed by Arcadis, and was reported to be an extensive update of the earlier groundwater model version used for OU-2. The focus of the USGS review and assessment task is therefore limited to the "2010 groundwater model".

Extensive communications were made between EPA, USGS, Grumman, Navy, Arcadis, and NYSDEC regarding the 2010 groundwater model. Meetings and teleconferences were held to discuss the model development and its applications. The discussions and exchange of information required exceptional efforts by all concerned, and those efforts are personally very much appreciated.

In order to provide a thorough and accepted basis for the model review, USGS relied on "*Guidelines for Evaluating Groundwater Flow Models*", SIR2004-5038". http://pubs.usgs.gov/sir/2004/5038/ . This enables a systematic review of the input data and documentation used to construct the model so the evaluation is technically sound. Review of the currently available data, however, indicates that not all of the documentation is available and some was not sufficiently documented when the initial model was constructed in the past.

I am in receipt of a December 14 draft, submitted to EPA, of the USGS Technical Memorandum on their independent review and assessment of the 2010 groundwater model. It is currently undergoing USGS internal review and it will then be reviewed by EPA. EPA will provide comments on the draft and a final Technical Memorandum will then completed by USGS and submitted to EPA. The Technical Memorandum will then be available to the work group. I anticipate that this process will be completed by April 2011.

In order to assist the work group and answer the basic question asked, "*Is the groundwater model reliable and appropriate for use to address downgradient impacts*" the answer is "No". It is my opinion, based on review of the draft report prepared by the USGS, that several factors render the 2010 groundwater model with too much inherent uncertainty to proceed with further application, especially to address the full fate and transport of groundwater contamination. It should also not be used to attempt to make a reliable prediction of potential impacts on the public supply wells downgradient of the sources of groundwater contamination. The groundwater model was not adequately initially designed to address these questions and it is not a model that can be simply modified and used for applications of this nature.

As an example, one drawback in the 2010 groundwater model for these applications is that Long Island has much more heterogeneity in the stratigraphy than is reflected in the 2010 model. There is much more variability in the soil types- gravels, sands, silts, and clays that make up the aquifers, and these features certainly affect flow, particularly in local areas. A further drawback is that it appears the 2010 groundwater model does not provide an adequate representation of the actual hydrogeologic stresses over time. Each water district pumps different wells at different rates depending on the season and demand, so that the hydrogeologic stresses vary widely. There are other items addressed in the draft 2010 groundwater model review, and a full report will be in the Technical Memorandum.

It is important to note that groundwater modeling is only one 'tool' among many tools available for hydrogeologic investigations, and that technological developments render many tools obsolete over time. The concerns of contaminant fate and transport and the potential impacts to the public supply wells remain. After release of the USGS Technical Memorandum, recommendations can be considered as to what types of groundwater models could be developed and applied as tools to address the various concerns for Long Island's drinking water supply and the environment. In the interim, a conservative approach regarding the potential impacts of the groundwater contamination is suggested -- using other "tools" available to obtain additional data on the actual hydrogeology of the downgradient area, and it is suggested that the Technical Advisory Committee re-convene so that the planning process can proceed on that effort.

Should you have any questions, please do not hesitate to contact me at either (212) 637-3258 or via email at alvey.robert@epa.gov.