

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BROOKLYN-QUEENS AQUIFER FEASIBILITY STUDY

CITIZENS ADVISORY COMMITTEE MEETING: September 4, 2003

MINUTES

The 14<sup>th</sup> meeting of the Brooklyn-Queens Aquifer (BQA) Feasibility Study Citizens Advisory Committee (CAC) was held on Thursday, September 4, 2003 at the Hillside Manor Comprehensive Care Center. (See Attachment A for Attendance List.)

Helen Neuhaus, Helen Neuhaus & Associates (HNA), opened the meeting by welcoming CAC members back from their summer break and thanking those members who reviewed the project newsletter. She noted that the newsletter, which is “hot off the press”, will be mailed next week to approximately 500 persons on the project mailing list. Following adoption of the Minutes of the June 5<sup>th</sup> CAC meeting without changes, Ms. Neuhaus facilitated a discussion of follow-up items from that meeting. These included the following:

- In response to a question from Tracey Bowes, a handout was distributed that showed three facilities in New York State, as well as a number of plants in nearby states, that use ozone oxidation for drinking water treatment. (See Attachment B.) It was noted that many of these plants have been online for quite a while.
- Mark Lenz, Malcolm Pirnie, Inc., reported that in response to a previous request, information comparing the cost of nanofiltration and reverse osmosis systems is still being prepared.
- Following up on a question regarding the chemicals that were used as a sequestering agent during the drum test at Station 24, Nicole Brown, Malcolm Pirnie, Inc., noted that while the exact chemical compound is proprietary information, the agent is a type of organic co-polymer, which contains hydrochloric acid. She explained that unlike the treatment processes at the Station 6 Pilot Plant, where chemicals were used to change iron and manganese particles into solids to facilitate removal, the chemicals used at Station 24 were meant to prevent iron from solidifying and fouling equipment. Using photos, Ms. Brown illustrated the results of the drum test conducted at Station 24. The test, which was designed to determine the effect of iron on the carbon filter and piping, showed a build-up of iron when the sequestering agent was not used. The test confirmed that the sequestering agent worked as intended. Dr. Len Lion questioned if the carbon was also tested, since the sequestering agent is an organic compound that could potentially adsorb to the carbon. Ms. Brown indicated that carbon was not tested, since the purpose of the test was to examine the effects on iron. However, information on the adsorption onto carbon is still being collected.

Project Update

Don Cohen, Malcolm Pirnie, Inc., reported that over the summer the project team had worked on securing permits, including the State Pollutant Discharge Elimination System (SPDES) permit,

which is issued by the New York State Department of Environmental Conservation (DEC). While DEC is a partner in the project, and has been very responsive, the agency is looking for assurances that treated water discharged from Station 24 will not harm the receiving surface waters. (The water would discharge to Bergen Basin and eventually Jamaica Bay.) Mr. Cohen stated that there have also been discussions with DEC regarding any discharges from the proposed Station 6 plant. He explained that all of the treatment processes will have some water that is rejected and discharged to the local sewer system. This will require addressing a number of issues, including whether any new sewers will be needed to handle the additional flow from the plant. He observed that these permitting issues must be resolved before design plans can proceed.

In addition, Mr. Cohen reported that during permitting activities related to work at Station 24, it was discovered that several mapped streets (177<sup>th</sup> and 178<sup>th</sup> Streets, 108<sup>th</sup> Drive, 107<sup>th</sup> and 108<sup>th</sup> Avenues) actually run through the Station 6 and Station 24 sites. Since construction is prohibited on city streets even if the street doesn't exist, DEP must go through the city's Uniform Land Use Review Procedure (ULURP) in order to have the streets demapped. The project team has already met with representatives from the New York City Department of City Planning and the Queens Borough President's Office to discuss specific requirements of the demapping process. While the ULURP process is lengthy, Mr. Cohen stated that work on both Station 24 and Station 6 could move forward on a parallel track with ULURP. Richard Hellenbrecht remarked that the Community Boards are key to the ULURP process and suggested that the project team discuss this issue with Community Board #12 as soon as possible. Manny Caughman added that the community has been concerned about the possible opening of the streets and was pleased to hear about the proposed demapping.

Mr. Cohen reported that attorneys for DEP and DEC have finalized the technical and financial agreements required for remediation of the West Side Corporation (WSC) site and hope to have them executed shortly. Mr. Cohen also reported that DEC has completed the design for remediation work at the WSC site. As soon as funding is in place, the work will go out to bid. In addition, an agreement has been drafted between DEP and the Atlantic Bus Company that would provide the bus company with an alternate location to park its buses during work at the site. Commissioner Greeley noted that although Atlantic Bus has filed for bankruptcy, DEP is allowing the company to use the property north of 180<sup>th</sup> Street so that it can continue to provide a vital service to children in the community.

In response to a question from Linda Hazel, Mr. Cohen stated that all issues relating to electricity at Station 24 and the WSC site have been worked out. Bill Yulinsky, DEP, added that the project team will meet with Con Edison next week to determine how to route the service line to the site. Answering Ms. Hazel's question regarding backup systems for Station 6, Mr. Cohen explained that the plant would shut down in the event of a power failure. No contaminated water would enter the drinking water system. He commented that a bigger concern would be potential flooding due to a rise in the water table if pumping were to stop. However, it would take at least a week or two for the water table to rise, and presumably power would be restored long before any flooding occurred.

Presentation re: Pilot Treatment Memorandum-Volatile Organic Compounds (VOC)

Using a PowerPoint presentation (see Attachment C), Mr. Lenz explained that because the technologies used for VOC removal are well understood, it was not necessary to include them in the pilot testing program. However, VOC samples were collected and analyzed at least once a week during pilot testing, and a significant amount of information regarding raw water quality was developed.

Seven different VOCs were identified in the Station 6 wells during the Pilot Plant test. Five of the compounds were detected at levels below state and federal drinking water standards. The other two—perchloroethylene (PCE) and methyl-tertiary-butyl-ether (MTBE) were detected at levels above state and federal standards. It was noted that not all VOCs were found in every well or in every sample. Mr. Lenz described PCE as a colorless liquid solvent used primarily in dry cleaning and textile processing. PCE presents long-term health effects. MTBE is an unpleasant smelling gasoline additive that is used to make gasoline in car engines burn cleaner. However, in some areas, it has seeped into the groundwater from leaking underground storage tanks and pipelines. While Mr. Lenz stated that there is limited data on the health effects of MTBE, Deputy Commissioner Doug Greeley noted that there is increasing evidence that this VOC is carcinogenic.

Mr. Lenz explained that although the United States Environmental Protection Agency (EPA) sets primary drinking water standards with which each state must comply, the states have the option of setting even stricter standards. He noted that no federal standard exists for MTBE and that standards vary widely between states. Although New York State does not specifically include MTBE in its drinking water standards, it is listed under general standards for organic compounds. The target levels for the Station 6 Demonstration Plant will be based on very conservative assumptions (i.e. assuming the worst case scenario for water entering the plant).

Six treatment technologies were evaluated for their ability to remove VOCs. Of these, it was determined that Granular Activated Carbon (GAC) and Packed Tower Air Stripping are the most effective. Both technologies are defined by EPA as “Best Available Technologies” for the removal of PCE and MTBE and are used at hundreds of water treatment plants across the United States. After analyzing computer models, consulting published studies and reports and reviewing other evaluation tools, the project team recommended the use of Packed Tower Air Stripping with Off-Gas Treatment for the Station 6 Demonstration Plant. This recommendation was based on the system’s greater flexibility during operation, smaller space requirements, lower annualized cost and the fact that it would create less of a disruption on the adjacent neighborhood. It was also noted that nanofiltration and reverse osmosis, technologies that will be used for water softening, have the added benefit of removing residual VOCs.

A brief discussion followed regarding the air stripping towers. The four towers will be 50’ tall and 12’ in diameter. In order to lessen the visual impact on the surrounding neighborhood, the towers will be partially sunk into the ground and will be designed to blend in with the Demonstration Plant and its landscaping. In response to Ms. Hazel’s question regarding noise from the towers, Mr. Lenz acknowledged that minimizing noise will be an important consideration when designing the plant. In response to Debora Hunte’s follow-up question regarding the maintenance of packing materials within the cylinder, Mr. Lenz explained that the

packing, which is similar to wiffle balls, must be replaced every five or ten years. In general, three towers will operate at a time, with the fourth on standby for periodic cleaning and servicing.

Dr. Paul Lioy stated that although the presentation was excellent, it focused on the preferred remediation strategy and did not present all technologies considered. He expressed concern that although the advantages and disadvantages of each are discussed in the document, this information was not presented to the CAC. Dr. Lioy requested that a discussion of specific issues (height, noise, etc.) associated with air stripping be scheduled for the next CAC meeting. Ms. Neuhaus asked Scientific Review Panel (SRP) members to review the memorandum carefully and to provide comments, either in writing or at next month's meeting.

The following additional questions and comments were raised during the presentation:

- Irving Hicks asked if each well will serve a specific neighborhood. Mr. Lenz replied that water from all of the wells will be blended at the start of the treatment process; therefore, the treated water entering the distribution system will be uniform.
- In response to a question from Debora Hunte, Mr. Lenz said that the water from each well will continue to be tested after the Station 6 plant goes online. Mr. Yulinsky added that the New York State Department of Health (NYSDOH) requires quarterly testing of water from contaminated wells; however, DEP will perform monthly testing.
- Michael Turner asked what the Maximum Contaminant Level (MCL) will be for PCE. Mr. Lenz answered that although the MCL for PCE is 5.0 ug/l, the design target will be less than 0.5 ug/l. He explained that 0.5 is the lowest value at which a laboratory can detect PCE in the water.
- In response to a question from Ms. Hazel, Dr. Lion explained that MTBE would not bond very strongly to manganese. In a follow-up discussion, it was noted that the MCL for MTBE has been changing and varies considerably from state to state. New York State has no specific MCL for MTBE, but the MCL is currently set at 50 ug/l based on an overall standard that no single volatile organic compound should be present in drinking water at a concentration greater than 50 ug/l.
- In response to Ms. Hunte's question regarding the source of the PCE, Mr. Cohen speculated that the contamination probably came from dry cleaning businesses or other commercial businesses located along Merrick Boulevard. It was noted that PCE levels detected in the Station 6 wells are lower than what has been seen at the WSC site.
- In response to Kenneth Gill's question regarding which laboratories were used for analyses, Mr. Lenz noted that several laboratories, all of them EPA and NYSDOH certified, were used. He added that analysis of VOC samples was primarily done by Montgomery Watson Harza, one of the most renowned and respected laboratories in the country.
- Mr. Caughman asked if reverse osmosis will be used in combination with air stripping. Mr. Lenz replied that the water will be treated by reverse osmosis after going through air stripping.
- In response to a question from Dr. Jack Caravanos, Mr. Lenz stated that emissions from the air stripper will be monitored. However, the frequency of monitoring (i.e., continuously, weekly, monthly, etc.) has not yet been determined.

- Mr. Turner asked how DEP would determine if a particular well is too contaminated to continue in use. Mr. Cohen explained that if such a situation arose, the well would not be shut down as the contaminated plume would be drawn to another well. Instead, water from the well would be captured and treated before being discharged to the local sewer system.

#### Presentation of Station 6 Video

Ms. Neuhaus introduced the video “Partners: The Brooklyn-Queens Aquifer Feasibility Study” by acknowledging Rick Meier, the filmmaker, and by noting that the video is not quite finished. After watching the 13-minute video, CAC and SRP members expressed their enthusiasm, with Dr. Liroy calling the film “superb.” Dr. Caravanos noted that several videos may be needed as the project moves ahead. The CAC responded positively to Ms. Neuhaus’ question about whether they saw the video as an informational tool for their community. Mr. Gill asked if CAC members would be provided with copies and was told that they would.

Referring to the portion of the video that discusses how flooding has been alleviated in the Brinkerhoff area, Ms. Hunte stated that the video would create controversy in her neighborhood where flooding is still a problem. After Ms. Neuhaus noted that DEP is working to resolve the flooding problem, it was agreed that the video would be modified to convey the ongoing nature of this work to residents.

A brief discussion followed regarding the question of whether the video should be time specific. It was decided that references to dates would be left out, in order to make the video relevant for the indefinite future.

#### Discussion re: October Public Meeting

Ms. Neuhaus announced that a public meeting has been scheduled for Wednesday, October 22<sup>nd</sup> with an open house starting at 6:30 p.m. and a formal presentation at 7 p.m. The purpose of the meeting, which will be held at York College, is to provide an update on all aspects of the BQA Study, including Pilot Plant testing results, remediation of the WSC site and plans for the Station 6 Demonstration Plant.

A discussion ensued regarding the CAC’s role in the meeting. In response to Ms. Hazel’s suggestion that the public might wish to speak with CAC members, Ms. Neuhaus noted that there would definitely be an opportunity for this type of interaction at the open house. In response to a question from Ms. Hunte, it was confirmed that the video would be part of the meeting. The following additional ideas were floated: open the meeting with the videotape; encourage CAC members to answer questions and have a CAC member introduce the SRP. Ms. Hazel also expressed her opinion that DEP Commissioner Christopher Ward, who is expected to attend, should “stick around” for the entire meeting.

Ms. Neuhaus invited CAC members to work with the project team to develop the meeting agenda.

### Other Issues

- Commissioner Greeley noted that he recently met with the Brinkerhoff Action Association to look at sewers in the area east of Brinkerhoff Avenue. This resulted in the identification of another 65 catch basins that are attached to the sanitary system. The Department is working to get them disconnected.
- Commissioner Greeley stated that the city is considering a lawsuit against the gasoline companies and EPA for the use of MTBE as a gasoline additive, because of its leakage into the ground, which contaminated the aquifer.
- Mr. Gill remarked that the community is a “hard sell.” He noted that his efforts to convince his neighbors that DEP is doing the right thing have been undermined by reports that the EPA misled the public regarding air quality in Lower Manhattan after the September 11<sup>th</sup> terrorist attacks. He complimented this group for “doing a good job.”
- Ms. Hazel stated that the community should be informed that the increase in water rates is not related to the BQA project.

The next CAC meeting is scheduled for **Thursday, October 2nd at 7 p.m.** at the Hillside Manor Comprehensive Care Center, 188-11 Hillside Avenue, Jamaica Estates.

### Follow-Up Items

1. Provide comparative cost and technical analysis information for nanofiltration and reverse osmosis, when available. Responsibility: Malcolm Pirnie, HNA.
2. Contact Community Board #12 regarding demapping of streets located on Station 24 property. Responsibility: DEP, Malcolm Pirnie, HNA.
3. Revise video to incorporate comments from CAC, as appropriate. Responsibility: DEP, Malcolm Pirnie, HNA.
4. Make copies of video, when complete, available to members of the CAC and the community. Responsibility: HNA.
5. Prepare “briefing booklet” or, at a minimum, glossary of terms for distribution to audience viewing video. Responsibility: HNA.
6. Involve students from private and parochial schools in educational outreach program. Responsibility: DEP, Malcolm Pirnie, HNA.
7. Request comments from SRP on VOC Technical Memorandum prior to October 2<sup>nd</sup> CAC meeting. Responsibility: HNA.
8. Suggestion to inform residents that increase in water rates is not due to work related to the BQA project. Responsibility: DEP, HNA.

Brooklyn-Queens Aquifer Feasibility Study  
Citizens Advisory Committee  
Thursday, September 4, 2003

Attendance List

CAC Members/Alternates

Linda Caleb Hazel  
A Better Day Inc./St. Benedict The Moor/  
St. Bonaventure

Manuel Caughman  
Community Board #12/Brinkerhoff Action  
Association

Kenneth Gill  
Addisleigh Park Civic Association

Richard Hellenbrecht  
Community Board #13

Irving Hicks  
Brinkerhoff Action Association

Debora Hunte  
Brinkerhoff Action Association

Earl Roberts  
113<sup>th</sup> Precinct Council

Michael Turner  
Addisleigh Park Civic Association

Guests

Sarah Hicks  
Resident

Media

Courtney Dentch  
Jamaica Times

Scientific Review Panel

Jack Caravanos  
Hunter College

Gilbert Hanson  
State University of New York at Stony Brook

Leonard Lion  
Cornell University

Paul Lioy  
Environmental and Occupational Health  
Sciences Institute

Project Team

Marnie Bell  
Malcolm Pirnie, Inc.

Nicole Brown  
Malcolm Pirnie, Inc.

Don Cohen  
Malcolm Pirnie, Inc.

Doug Greeley  
New York City Department of  
Environmental Protection

Natasha Harper  
New York City Department of  
Environmental Protection

Mark Lenz  
Malcolm Pirnie, Inc.

Nabeel Mishalani  
Malcolm Pirnie, Inc.

Helen Neuhaus  
Helen Neuhaus & Associates Inc.

Denise Woodin  
Helen Neuhaus & Associates Inc.

Anita Wright  
Helen Neuhaus & Associates Inc.

Bill Yulinsky  
New York City Department of  
Environmental Protection

Location	Plant Name	Water Source	Capacity (MGD)	Year On-line	Treatment Goals
Port Jervis, NY	City of Port Jervis Water Treatment Plant	Surface	2	1992	Color, Taste & Odor, Disinfection
Middletown, NY	Middletown Water Treatment Plant	Surface	6	1993	Color, Disinfection
New Castle, NY	Millwood Water Treatment Plant	Surface	7.5	1993	Color, Taste & Odor, Disinfection
Rochester, NY	Monroe County Water Treatment Plant	Surface	No information	2003	Pilot Studies
Hackensack, NJ	Haworth Plant	Surface	220	1989	Fe/Mn Oxidation, DBP Control, Color
Wall Township, NJ	Manasquan Water Treatment Plant	Surface	4	1991	Disinfection, Color, Taste & Odor, DBP Control
Delran, NJ	Tri-County Water Treatment Plant	Surface	20 - 30	1995	Coagulation Aid, Disinfection
Elizabethtown, NJ	Canal Road Water Treatment Plant	Surface	40 (Expandable to 100)	1996	Disinfection, Color, Taste & Odor, Coagulation Aid
Totowa, NJ	Little Falls Water Treatment Plant	Surface	87 MGD	2003	Taste & Odor, Disinfection
Dover, DE	Long Point Road Water Treatment Plant	Ground	5	1995	Disinfection
Strasburg, PA	Strasburg Water Treatment Plant	Ground	0.1	1973	Disinfection
Harmar Township, PA	Harmar Water Treatment Plant	Ground	1.2	1990	Fe/Mn Oxidation
Chalfont, PA	Forest Park Water Treatment Plant	Surface	12	1993	Disinfection, Taste & Odor, DBP Control, Coagulation Aid
Altoona, PA	Tipton Water Treatment Plant	Surface	4	1994	Disinfection, Fe/Mn Oxidation
Altoona, PA	Plane Nine Water Treatment Plant	Surface	4	1994	Disinfection, Fe/Mn Oxidation
Altoona, PA	Bellwood Water Treatment Plant	Surface	5	1994	Disinfection, Fe/Mn Oxidation
Altoona, PA	Homer Gap Water Treatment Plant	Surface	1	1995	Disinfection, Fe/Mn Oxidation
Altoona, PA	Kettle Water Treatment Plant	Surface	2	1995	Disinfection, Fe/Mn Oxidation
Altoona, PA	Mill Run Water Treatment Plant	Surface	5	1996	Disinfection, Fe/Mn Oxidation
West Chester, PA	Fern Hill Water Treatment Plant	Surface	3	1995	Disinfection
West Chester, PA	Fern Hill Water Treatment Plant	Surface	1.5	1998	Disinfection
Lewistown, PA	Laurel Creek Water Filtration Plant	Surface	5	1999	No information
Andover, MA	Andover Water Filtration Plant	Surface	24	1990	Coagulation Aid, Taste & Odor, Disinfection, DBP Control
North Andover, MA	North Andover Water Treatment Plant	Surface	12	1991	Coagulation Aid, Disinfection
Attleboro, MA	West Street Water Treatment Plant	Surface	12	1995	Taste & Odor
Holden, MA	Worcester Water Filtration Plant	Surface	50	1997	Coagulation Aid, Disinfection
Amherst, MA	Amherst Water Treatment Plant	Surface	1.5	1997	Color, Taste & Odor
Billerica, MA	Billerica Water Treatment Plant	Surface	14	1997	Mn Oxidation, Taste & Odor
Cambridge, MA	Walnut Hill Water Treatment Plant	Surface	24	2000	Disinfection
Gardner, MA	Crystal Lake Water Treatment Plant	Surface	4	2000	No information

- Color Forces naturally occurring organic matter which cause color to clump together which aids their removal
- Disinfection Destruction of pathogen-carrying microorganisms
- Taste & Odor Removal of organic matter from water that contribute to taste & odor concerns
- Fe/Mn Oxidation Conversion of iron (Fe) and manganese (Mn) from dissolved to solid form to assist with removal
- DBP Control Limits the amount of disinfection byproducts (DBPs)
- Coagulation Aid Forces naturally occurring organic matter to clump together which aids their removal

## Station 6 VOC Removal Technologies



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### Outline

- Brief Recap – Station 6 Pilot Test Program
- Volatile Organic Compounds (VOCs)
- Determining Design Criteria and Design Targets
- Treatment Technology Evaluation
- Recommendation

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### Goal

**Evaluate Treatment Processes to ensure that Station 6 Demonstration Plant provides drinking water of the highest quality.**

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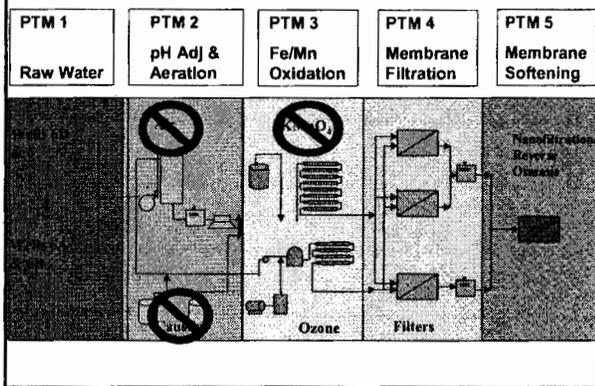
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### Pilot Plant Process Flow Diagram




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### VOC Pilot Testing

- VOC Testing **WAS NOT** a primary goal of Pilot Test Program
  - Some testing of chemical & membrane processes was done
  - Technologies evaluated are well understood and therefore can be designed based on modeling and past experiences
- Extensive sampling and analysis for VOCs **WAS** part of the Pilot Test Program

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### Volatile Organic Compounds (VOCs)

- What are they ?
- Where do they come from ?
- Why are we concerned about having them in our drinking water ?

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## Drinking Water Regulations & Terms

### MCL - Maximum Contaminant Level

The maximum permissible level of a contaminant in water delivered to any user of a public water system. MCLs are the **legally enforced** standards in the U.S.

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### Volatile Organic Compounds (VOCs)

■ 7 different VOCs were identified in the Station 6 wells during pilot plant sampling:

5 were detected **below** the NYS/EPA drinking water MCL:

- cis 1,2 Dichloroethylene (cis 1,2 DCE)
- Trichloroethylene (TCE)
- 1,2 Dichloroethane (1,2 DCA)
- 1,1,1 Trichloroethane (1,1,1 TCA)
- Tertiary Butyl Alcohol (TBA)

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### Volatile Organic Compounds (VOCs)

■ 5 VOCs identified in Station 6 pilot plant sampling were below Drinking Water Regulations:

Parameter	NYS MCL	EPA MCL	Highest Value Detected	Blended Average @ 9 MGD
cis 1,2 DCE, ug/L	5	70	2.7 @ Well 6B	0.8
TCE, ug/L	5	5	1.5 @ Well 6D	0.8
1,2 DCA, ug/L	5	5	0.8 @ Well 6D	<0.5
1,1,1 TCA, ug/L	5	200	0.6 @ Well 6B	<0.5
TBA, ug/L	50	N/R	2.4 @ Well 6B	<2

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## Volatile Organic Compounds (VOCs)

- 7 different VOCs were identified in the Station 6 wells during pilot plant sampling:

2 were detected **above** the NYS/EPA drinking water MCL:

- Perchloroethylene (PCE or PERC)
- Methyl Tertiary-Butyl Ether (MTBE)

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## Perchloroethylene (PCE or PERC)

- What is it?
  - Colorless liquid solvent
- Where does it come from?
  - Dry cleaning & textile processing
- Why are we concerned about it in drinking water?
  - Long term health effects
- Drinking Water Standards:
  - EPA & NYSDOH MCL - 5 ug/L

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## Selection of PCE Design Criteria & Targets

### Determining Raw Water PCE Concentrations

Parameter	Well 09 Avg	Well 0A Avg	Well 8 Avg	Well 0C Avg	Well 11 Avg	Blended Avg @ 8 MCD	Selected PCE Raw Water Criteria
PCE, ug/L	102	88	7	7	1	53	160

### Determining PCE Treatment Goals

Parameter	NYS & EPA MCL	Treated Water Design Criteria	Treated Water Design Target
PCE, ug/L	5.0	< 5.0	< 0.5

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### **Methyl Tertiary-Butyl Ether (MtBE)**

- What is it?
  - Gasoline additive
- Where does it come from?
  - Leaking underground storage tanks & pipelines
- Why are we concerned about it in drinking water?
  - Aesthetics –unpleasant taste & odor
  - Limited data on potential health effects
- Drinking Water Standards:
  - NYSDOH MCL - 50 ug/L
  - No EPA MCL

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### **Drinking Water Regulations & Terms**

#### **DWA - Drinking Water Advisory**

**Guidance for utilities on contaminants which are not currently regulated - values are *NOT enforceable*.**

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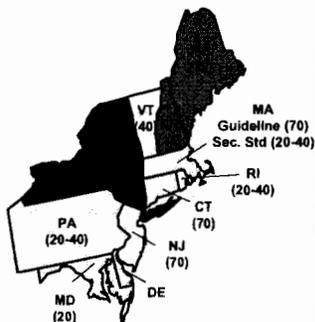
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### **Methyl Tertiary-Butyl Ether (MtBE)**

- Current Regulations vary widely
  - NYSDOH MCL 50 ug/L
  - EPA DWA 20 - 40 ug/L
- EPA DWA is for 'Consumer Acceptability' and is based on taste and odor concerns



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## Selection of MtBE Design Criteria & Targets

Parameter	Well 6B	Well 6A	Well 6	Well 6D	Well 33	Blended Avg. @ 9 MGD	Selected MtBE Raw Water Criteria
	Avg	Avg	Avg	Avg	Avg		
MtBE, ug/l	4.8	5.9	1.8	177	<0.5	24	210

Parameter	NYS MCL	EPA DWA	Treated Water Design Criteria	Treated Water Design Target
MtBE, ug/L	50	20-40	< 10	< 3

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## Treatment Technology Evaluation

- Screening analysis of the following technologies was performed
  - Advanced Oxidation Process (AOP)
  - Vacuum Air Stripping
  - Granular Activated Carbon (GAC)
  - Packed Tower Air Stripping
  
- AOP and Vacuum Air Stripping were eliminated because they are more appropriate for small systems

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## Treatment Technology Evaluation

- Detailed feasibility analysis of the two remaining technologies was performed:
  - Granular Activated Carbon (GAC)
  - Packed Tower Air Stripping
  
- Both are defined as 'Best Available Technologies (BAT)' by USEPA for both PCE and MtBE.




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### **Evaluation of Technologies**

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- Both technologies are well understood and employed at hundreds of water treatment plants in the United States.
- Both technologies are considered BAT by USEPA for VOC removal.
- Both technologies have been extensively modeled and studied by Universities and Water Utilities.

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### **Evaluation Tools**

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- Computer models were used to evaluate GAC and air stripping.
- Published studies and reports were consulted to confirm design parameters.
- Sensitivity analyses were performed on key design parameters (including changes to PCE & MTBE concentrations).
- Manufacturer recommendations were obtained to confirm model output.

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### **Recommendation**

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**Packed Tower Air Stripping  
with Off-Gas Treatment**

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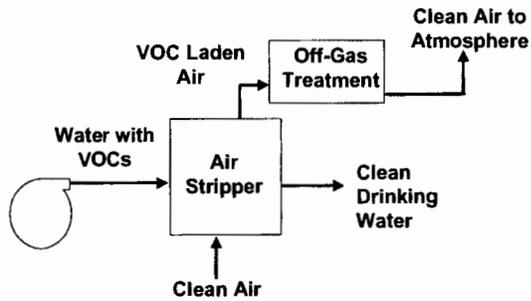
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## Packed Tower Air Stripping

- How does it work ?



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## Packed Tower Air Stripping

- What does it look like ?



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## Recommendation

- Packed Tower Air Stripping with Off-Gas Treatment
- Rationale:
  - Greater flexibility during Operation
  - Smaller space requirements
  - Less community disruption
  - Lower annualized cost

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## Air Stripper Design Parameters

Parameter	Average Raw Water @ 9 MGD	Raw Water Design Criteria	Removal by Air Stripper	Treated Water Concentration
cis 1,2 DCE, ug/L	0.8	2.7	99.96%	0.001
TCE, ug/L	0.8	1.5	99.95%	0.0007
1,2 DCA, ug/L	<0.5	0.8	99.34%	0.005
1,1,1 TCA, ug/L	<0.5	0.5	99.96%	0.0002
TBA, ug/L	<2.0	2.4	98.77%	0.007
PCE, ug/L	53	160	99.95%	0.08
MTBE, ug/L	24	210	98.59%	3.0

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