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

CITIZENS ADVISORY COMMITTEE MEETING: April 3, 2003

MINUTES

The eleventh meeting of the Brooklyn-Queens Aquifer (BQA) Feasibility Study Citizens Advisory Committee (CAC) was held on Thursday, April 3, 2003 at Hillside Manor Comprehensive Care Center. (See Attachment A for Attendance List.)

Helen Neuhaus, Helen Neuhaus & Associates Inc., opened the meeting by welcoming Scientific Review Panel (SRP) members Dr. Leonard Lion (Cornell University), Dr. Gil Hanson (State University of New York at Stony Brook), and Dr. James "Chip" Kilduff (Rensselaer Polytechnic Institute) and three staff members from Malcolm Pirnie: Mark Lenz, Colleen Arnold, and Phil Zimmerman.

After asking for comments on the Minutes of the March 6, 2003 CAC meeting, Ms. Neuhaus noted that Debora Hunte had submitted a memo to the project team seeking clarification regarding certain items in the February 2003 Minutes. Ms. Neuhaus stated that Ms. Hunte's questions would be addressed at tonight's meeting, or by Deputy Commissioner Doug Greeley, New York City Department of Environmental Protection (NYCDEP), in writing. Ms. Hunte then asked several questions regarding issues raised at the March meeting. After discussion of these items, Ms. Neuhaus stated that an addendum reflecting Ms. Hunte's questions and the answers provided would be sent out with the April Minutes (see Attachment B).

Ms. Neuhaus then facilitated a brief discussion of follow-up items from the March meeting. These included the following:

- Ms. Neuhaus noted that the 90% Design Report for the remediation of the West Side Corporation (WSC) was forwarded to members of the SRP. Dr. Paul Lioy (University of Medicine and Dentistry of New Jersey) had no comments; Dr. Jack Caravanos (Hunter College) suffered an injury and may not have reviewed it yet.

- Several CAC members participated in a tour of NYCDEP's water quality laboratory at Lefrak City on March 13th. (Due to a mix-up, three others missed the tour.) Ms. Neuhaus and Nicole Brown, Malcolm Pirnie, Inc., commented that they were impressed with the size and scope of the facility. Ms. Neuhaus indicated that NYCDEP is willing to schedule another tour for those CAC members who missed the first one.

- Ms. Neuhaus announced that the video of the Station 6 Pilot Plant is progressing. The project team has seen pieces of the footage, including interviews with elected officials and CAC members. Rick Meier, the videographer, will shoot additional footage in the community next week.

- The remaining follow-up items deal with the scheduling of community meetings. These will be discussed later in the agenda.

Project Update

Don Cohen, Malcolm Pirnie, reported that his firm is analyzing data and preparing technical memoranda relating to testing at the Station 6 Pilot Plant. The first three memoranda have been forwarded to SRP members for review and will be discussed tonight.

Mr. Cohen further noted that the New York State Department of Environmental Conservation (NYSDEC) has nearly completed the remediation design for the WSC, which incorporates comments provided by the SRP. One remaining item involves coordination with Con Edison to provide power for the clean-up operation. The contract will go out to bid once this issue is resolved.

Lastly, work is continuing on the water treatment process for the Station 24 recovery well. The process, which will remove perchloroethylene (PCE) from the groundwater before it is discharged in the sewer system, will be discussed with the CAC at an upcoming meeting.

Presentation of Station 6 Pilot Treatment Memoranda

Ms. Brown began by providing an overview of operations at the Pilot Plant. Using 100 gallons of water per minute (which was discharged to the sewer system after treatment) the facility tested various processes for pH adjustment and the removal of iron and manganese through filtration. The goal of the Pilot Plant was to evaluate treatment options in a "real life" situation in order to ensure the delivery of high quality drinking water. Referring to PowerPoint slides (see Attachment C), Ms. Brown then described the treatment flow, which started with raw groundwater, proceeded through pH adjustment, moved through iron and manganese oxidation, and ended with membrane filtration. Ms. Brown also outlined the information contained in the first three memoranda before turning the floor over to Mr. Lenz, who reviewed the documents in greater detail.

Mr. Lenz explained that hundreds of water samples from several wells were tested to determine ambient levels of pH, iron, manganese and water hardness. Averages from each well, along with the blended average of all wells, are reported in Pilot Treatment Memorandum #1. In addition, the design average (the target average for the water after treatment under normal circumstances) and the maximum average (the highest level that will be allowed under a worst case scenario) are shown. Noting that the design average was set at a conservative level, Mr. Lenz stated that the goal is to produce better results than federal drinking water standards. He added that the presence of iron and manganese is not a health concern but an aesthetic issue.

In response to a question from Peter Richards, Mr. Lenz indicated that the treatment processes are addressing only the water's taste and appearance at this point. Linda Hazel commented that iron and manganese do have health effects at a certain level, interacting with medications and causing prostate problems for men. In response, Ms. Arnold stated that the level of these minerals found naturally in groundwater do not pose a health threat. Mr. Cohen added that there are no primary drinking water standards for iron and manganese and that the secondary standards are not considered critical in terms of health. He also reiterated that the water produced at the demonstration plant will have levels far below federal standards. In response to a question from Dr. Kilduff, Mr. Lenz indicated that it will be technically feasible to remove all but trace levels of iron and manganese from the groundwater.

Referring to Pilot Treatment Memorandum #2, Mr. Lenz defined pH as "a measurement of how basic or acidic water is." He noted that pH is routinely adjusted in water and soft drinks and is well understood. After explaining that the natural pH of Long Island aquifer groundwater is slightly

acidic, Mr. Lenz described the two treatment processes that were tested to adjust pH: aeration, which raises pH by mixing air and water together; and caustic addition, which adds a chemical caustic.

Mr. Richards and Kenneth Gill asked if the addition of treatment chemicals will create problems. Mr. Lenz responded that standard water treatment chemicals were used at low enough levels to avoid any problems. Bill Yulinsky, NYCDEP, added that New York City's drinking water usually has four or five chemicals added for health reasons, including chlorine and fluoride. He noted that the chemicals used in the Pilot Plant have been used for hundreds of years in municipalities around the world. As a point of clarification, Ms. Neuhaus indicated that although the Pilot Plant tested the chemical caustic, it is not being proposed for future use.

Ms. Arnold then described the two processes used to remove iron and manganese: oxidation with permanganate and ozone. She explained that potassium permanganate is a commonly used chemical oxidant that changes dissolved minerals to particles, making them easier to remove. Its optimal dose depends on the pH level. Ozone, also commonly used for water treatment, is a gas which, like permanganate, changes the form of iron and manganese into particles that can be filtered out. In response to a question from Manuel Caughman, Ms. Arnold explained that the contact time for permanganate is approximately ten minutes, while ozone works almost instantaneously. In response to further questions regarding the contact time, Mr. Cohen, Mr. Yulinsky and Mr. Lenz stated that an appropriately sized retaining vessel would be used to ensure the required contact time.

Mr. Richards asked if the water would contain residual oxidant and whether this oxidant would affect human cells. Mr. Lenz explained that two actions will be taken to eliminate the oxidant: 1) a de-gasser will draw ozone out of the water and convert it to oxygen, which will be released into the air; and 2) one of two chemicals will be added to ensure that no oxidants remain in the water. Ms. Arnold reported that no chemicals have been added to date, because the residual oxidants have been low. Mr. Cohen added that a special meter will measure ozone levels. In response to a question from Dr. Kilduff, Ms. Arnold explained that bromate, a byproduct of the ozone process, was not detected during Pilot Plant testing. Bromate is a regulated compound, and there is a stringent limit to its allowable presence in drinking water.

Ms. Arnold summarized the findings of the testing program by indicating that ozone is the preferred option for oxidizing iron and manganese. She noted that ozone eliminates the need for adding caustic to adjust pH, thereby minimizing the use of chemicals. She concluded by stating that the next two memoranda will address the filtration processes.

Discussion of Station 6 Demonstration Plant

Following up on last month's brainstorming session with the CAC, Mr. Zimmerman displayed a model of the proposed Demonstration Plant. After reiterating his goals for the project, he distributed a list of "building concepts" that he prepared for the CAC's consideration (see Attachment D). Mr. Zimmerman also presented draft sketches of the facility. He noted that he is taking "baby steps" towards designing the plant, by proceeding parallel to the engineering work that is being done. Mr. Zimmerman then outlined some of the proposed features of the building:

- Its design includes three wings (administrative, process and public) that separate the operations of the plant, while integrating its overall function.
- Current plans include 24,000 square feet for process (water treatment) and 24,000 square feet for administration. All process operations would be located at the basement or "sub-level".

- A second level (plaza deck) would consist of three pavilions, including a 1600 square foot public space. This area could include interactive displays, a library, and other community resources. The plaza deck would also be the level from which the public could view the processes of the plant.
- The "dark side" of the building would face neighborhood residences and be windowless. However, its character would be defined through form and texture.
- In response to suggestions at the last meeting, the plant could include a small waterfall. However, members of the immediately adjacent neighborhood will be consulted regarding the suitability of this feature before it is integrated into the plan.
- Suggested building materials include matte-type stainless steel, cast concrete to resemble bedrock and white pulverized glass and brick. The colors represent the colors of the sea--muted blues, greens and whites.
- HVAC equipment would be concealed by a stainless steel screen.
- A solid fence with a trellis would hide the parking lot and a wrought iron "art" fence would delineate the border.

In response to a question from Ms. Neuhaus regarding the next steps, Mr. Zimmerman stated that he needs further information from the engineers before going to the New York City Art Commission with a conceptual design. Mr. Lenz indicated that the technical information required to complete this level of design will be available in June. The project will then be presented to the community for its input.

Responding to questions about parking at the Demonstration Plant, Mr. Zimmerman stated that the current plan calls for 36 spaces for staff parking. School buses could drop students off either at street level or from the service road; buses could possibly park along the service road or on the street. Other comments and concerns related to noise that would be generated by the plant; the type of trees to be planted; and the impact of truck traffic (both during and after construction) on residential service lines.

Other Business

Mr. Gill remarked that he observed a drilling rig at 180th Street and Murdock Avenue, which drilled and collected samples over the course of several days. He reported that, when questioned, the workers stated it was a New York City Department of Design and Construction project. Mr. Cohen indicated that he would investigate the reasons for the drilling and sampling.

The next CAC meeting is scheduled for **Thursday, May 1st at 7 p.m.** at the Hillside Manor Comprehensive Care Center, 188-11 Hillside Avenue, Jamaica Estates.

Follow-Up Items

1. Investigate purpose of drilling activity recently done by the Department of Design and Construction in the vicinity of 180th Street and Murdock Avenue. Responsibility: Don Cohen, Malcolm Pirnie.
2. Draft addendum to Minutes of March 6th meeting clarifying questions raised by Debora Hunte. (Addendum to be distributed with Minutes of April 3rd meeting.) Responsibility: HNA.
3. Schedule second tour of DEP's water quality laboratory. Responsibility: DEP, Malcolm Pirnie, HNA.
4. Identify Con Edison representative coordinating with DEC on design issues related to remediation of the West Side Corporation site. Responsibility: Don Cohen, Malcolm Pirnie.

Attachment A

Brooklyn-Queens Aquifer Feasibility Study
Citizens Advisory Committee
Thursday, April 3, 2003

Attendance List

CAC Members/Alternates

Tracey Bowes
Community Board #12

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

Irving Hicks
Brinkerhoff Action Association

Debora Hunte
Brinkerhoff Action Association

Yvonne Reddick
Community Board #12

Peter Richards
Community Board #13

Earl Roberts
113th Precinct Community Council

Guests

Sarah Hicks
Resident

Maurice R. Muir
Community Board #12

Scientific Review Panel

Gilbert Hanson
State University of New York at Stony Brook

James "Chip" Kilduff
Rensselaer Polytechnic Institute

Leonard Lion
Cornell University

Project Team

Colleen Arnold
Malcolm Pirnie, Inc.

Nicole Brown
Malcolm Pirnie, Inc.

Don Cohen
Malcolm Pirnie, Inc.

Mark Lenz
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

Philip Zimmerman
Malcolm Pirnie, Inc.

Attachment B

BROOKLYN-QUEENS AQUIFER FEASIBILITY STUDY

CITIZENS ADVISORY COMMITTEE MEETING

Addendum to March 6, 2003 Minutes: Response to Questions Raised by Debora Hunte

page 3, top ¶, last sentence "Vendors will then recycle the carbon by burning off the contamination."

In response to Ms. Hunte's questions regarding who the vendors are and where they are located, Ms. Brown indicated that the project team was considering four (4) vendors, none of which are located locally. She noted that many of the vendors, who heat the carbon and regenerate it before reselling it, have facilities located in the Midwest.

page 3, first ¶

In response to Ms. Hunte's questions regarding the need for installation of a second well at Station 24, Mr. Cohen explained that a layer of clay is located beneath the layer of sand. The depth of sand in the vicinity of Station 24 is an average of 60 feet deep. However, when the first well was drilled, clay was found at 53 feet -- 7 feet shallower than anticipated. The seven foot depth was significant enough to impact the total volume of water that could be pumped from the well. As a result, a second well will need to be installed. Ms. Hunte questioned if this experience would prevent a similar situation from occurring. Mr. Cohen explained that the depth at which the clay is reached varies. In fact, Dr. Alan Rabideau, Scientific Review Panel, has raised concerns about the configuration of the top of the clay layer, questioning if there may be a trough located in the clay somewhere below the site. As a result, the New York State Department of Environmental Conservation has agreed to install two (2) additional wells and drill four (4) additional borings in an attempt to further define the area. Mr. Cohen explained that it is difficult to guarantee exactly at what depth the clay will be reached at any one point unless an unlimited amount of holes were drilled.

page 3, first ¶, "Clarifying a point raised by Yvonne Reddick, Mr. Cohen said that the wells will operate 24 hours a day and that NYCDEP will upgrade the sewers to ensure that they can handle the flow."

Ms. Hunte questioned when work related to upgrading the sewers would be done. Mr. Cohen explained that a great deal of work has already been done to correct problems in the area. He added that the repair of over 80 cross connections has already been completed. Any additional upgrades that are needed will be done before any additional flow is discharged to the sewers. Mr. Cohen added that as a result of many of the upgrades that have already occurred, Mr. Hicks and a number of other residents have not been experiencing sewer backups.

Outline

- Brief Background – Station 6 Pilot Test Program
- Raw Water and Treated Water Quality Design Criteria
- Pilot Testing Results
  - pH Adjustment and Aeration
  - Iron (Fe) and Manganese (Mn) Oxidation with Potassium Permanganate and Ozone

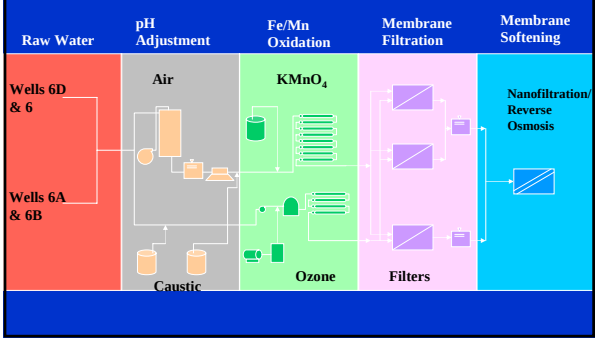
Goal

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

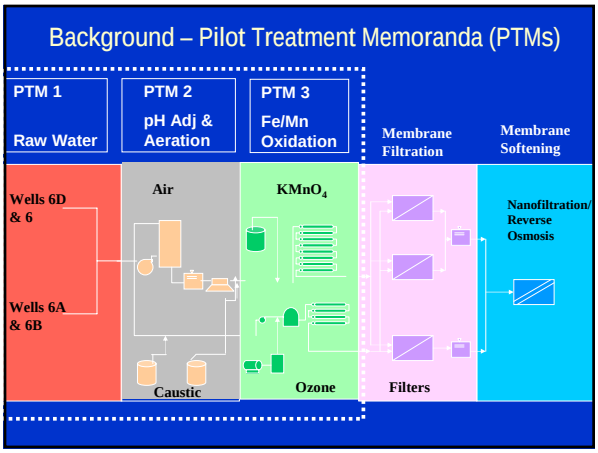
Objectives

- pH Adjustment
- Oxidation of Iron and Manganese
- Membrane Filtration

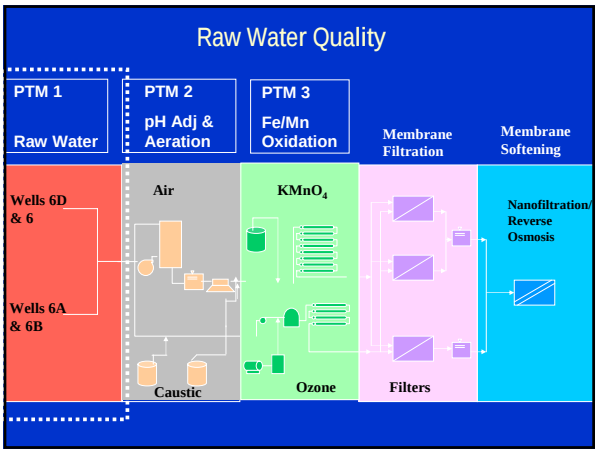
Background – Pilot Plant Flow Diagram



Background – Pilot Treatment Memoranda (PTMs)



Raw Water Quality

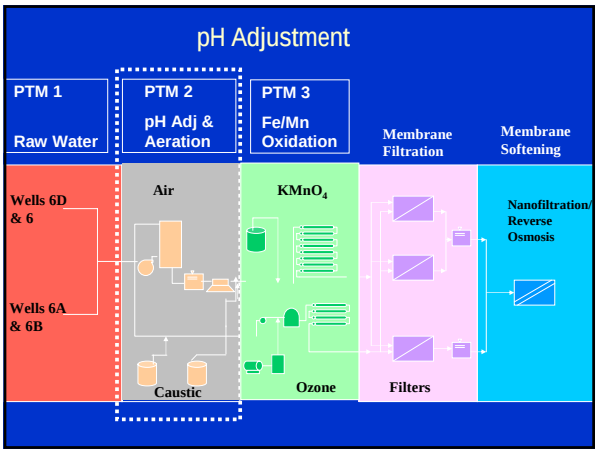


Raw Water Quality

		Blended Avg		Design Avg	Design Maximum
pH	Units	6.3		6.2	6.0
Total Iron	mg/L	3.8		4.0	6.0
Total Manganese	mg/L	0.7		0.8	1.0

Treated Water Quality

Parameter	Raw Water Criteria	Drinking Water Standard	Treated Water Target
Iron, mg/L	Avg: 4.0 Max: 6.0	0.3	<0.05
Manganese, mg/L	Avg: 0.8 Max: 1.0	0.05	<0.05



Pilot Testing Results
pH Adjustment

pH is a measurement of how much hydrogen ion (H^+) is in water.

- pH is a measure of whether the water is acidic or basic.
- pH can play a major role in taking iron and manganese out of the water.
- A higher pH is better for converting iron and manganese to a solid state.

Pilot Testing Results
pH Adjustment

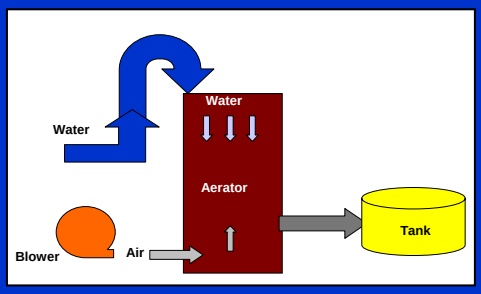
What is Aeration?

- Raises the pH of the process water, by mixing air and water together.
- Oxygen in air forces naturally occurring carbon dioxide (CO_2) out of the water
- Lower CO_2 → Higher pH

Pilot Testing Results
pH Adjustment

Pilot Testing Results
pH Adjustment and Aeration Testing

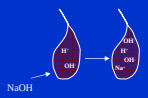
Pilot Plant Aerator Layout



Pilot Testing Results
pH Adjustment

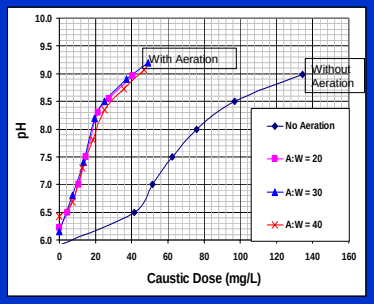
Caustic Addition - What is the process?

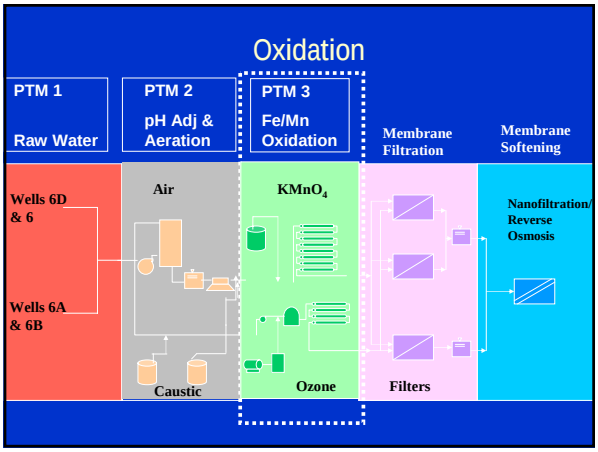
- Raises the pH of the raw water by addition of caustic (NaOH).
- More OH- → Higher pH



Pilot Testing Results
pH Adjustment

- Aeration reduced caustic dose ~ 40 to 90%





Pilot Testing Results
Oxidation

Oxidation with Permanganate

What is Potassium Permanganate, $KMnO_4$ and how is it used?

- KMnO4 is a purple-colored chemical.
- Commonly used water treatment chemical.
- Optimal dose also dependent on pH .
- Overdoses can cause water to turn slightly pink.

Pilot Testing Results
Oxidation

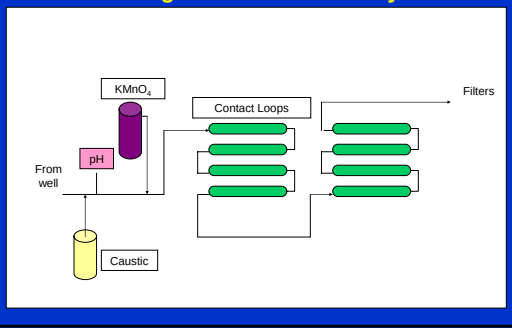
Oxidation with Permanganate

What is the process and how does it work?

- Potassium Permanganate, $KMnO_4$ is an oxidant.
- An oxidant reacts with the dissolved metals Fe^{2+} and Mn^{2+} to change their form in the water.
- $KMnO_4$ reacts with Fe^{2+} and Mn^{2+} to form solid compounds $Fe(OH)_3$ and MnO_2.
- These solid metal forms can then be filtered and removed from the water.

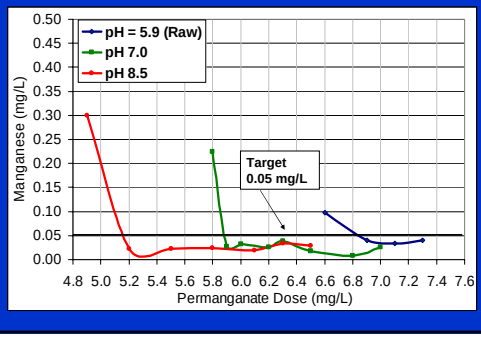
Pilot Testing Results
Oxidation

Permanganate Pilot Plant Layout



Pilot Testing Results
Oxidation

Oxidation with Permanganate – Effect of pH and Dose



Pilot Testing Results
Oxidation

Oxidation with Permanganate
Overall Summary

		Results of Testing
Proposed Operating Conditions	Optimal Dose	2.5
	pH	7.0
	Contact time, min	10
Raw Water Quality	Iron, mg/L	4
	Manganese, mg/L	0.8
Treated Water Target	Iron, mg/L	<0.05
	Manganese, mg/L	<0.05

Pilot Testing Results
Oxidation

Oxidation with Ozone
What is Ozone, O_3 and how is it used?

- Ozone is a gas.
- Commonly used water treatment chemical.
- Optimal dose also dependent on pH.
- Overdoses of ozone can also cause water to turn slightly pink.

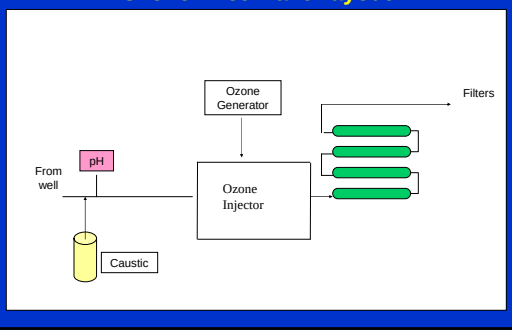
Pilot Testing Results
Oxidation

Oxidation with Ozone
What is the process and how does it work?

- Ozone, O_3 is a powerful oxidant.
- Ozone also reacts with the dissolved metals Fe^{2+} and Mn^{2+} to change their form to solid compounds $Fe(OH)_3$ and MnO_2.
- These solid metal forms can then be filtered and removed from the water.

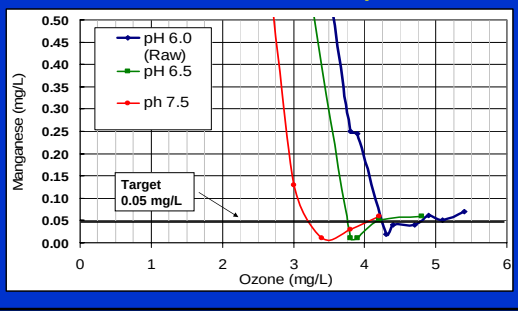
Pilot Testing Results
Oxidation

Ozone Pilot Plant Layout



Pilot Testing Results
Oxidation

Oxidation with Ozone – Effect of pH and Dose



Pilot Testing Results
Oxidation

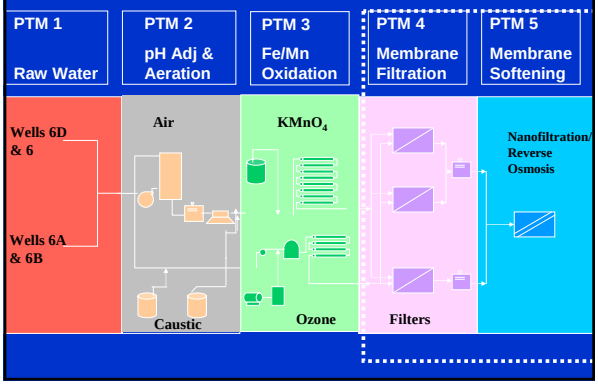
Oxidation with Ozone – Overall Summary

		Results of Testing
Proposed Operating Conditions	Optimal Dose	2.5
	pH	6.2
	Contact time, min	<5
Raw Water Quality	Iron, mg/L	4
	Manganese, mg/L	0.8
Treated Water Target	Iron, mg/L	<0.05
	Manganese, mg/L	<0.05

Summary of Findings

- Ozone is the preferred option.
- Advantages:
  - Eliminates need for caustic addition for pH adjustment
  - Minimizes overall chemical usage
- Ozone is highly effective in removing iron and manganese from solution.

What's Next?



Attachment D

BQA BUILDING CONCEPTS

The man-made machine cleaning water from the aquifers.....but, in addition, the building demonstrates an even more basic lesson by showing "this is how nature takes water from the ground, and this is how man takes water from the ground"

The building is also expressive of what lies beneath the site and is tied to images of water and its location on Long Island

The sail-like pavilions reduce the scale of the project thereby respecting adjacent structures

There is a constant change of forms and visual offerings that will be enjoyable to live near

Sleek, clean forms and materials keep the eye moving and expresses the soul of the project which is "water cleaning technology is at work to safeguard community health"