


Memo

To: City Council
From: Amy E. Gilson, P.E., Director of Public Works
Date: December 9, 2015
Re: Water Disinfection Equipment



In your packet you will find a resolution for the purchase of equipment to provide disinfection for our drinking water as mandated by the MDEQ. Attached to this memo is a general timeline of events related to the well fields. It was through the chain of events of the Groundwater Under Direct Influence (GWUDI) debate that the MDEQ figured out the City's chemical storage at the wells was not in compliance.

Please let me know prior to the council meeting if you have any questions.

Chronological Summary of GWUDI Issue

1990	<p>A Water Quality Study Report was completed by Jones & Henry for the City of Charlotte. The study was conducted to address the following problems: service lines corrosion, dirty water complaints and total coliform positives.</p> <p>Jones & Henry recommended the following at the end of their study:</p> <ol style="list-style-type: none">1. Continue City's program to reduce water low velocity in affected area, by increasing water main and service line sizes.2. Use polyphosphate to sequester iron and manganese.3. Provide iron & manganese removal for permanent remedy of iron & manganese related problems.4. Replace Well No. 1. <p>Positive coliform bacteria were reported from Well No. 1 during times of high flows in the Battle Creek River. Since positive total coliform results occur only during high water conditions, these positive results indicate surface water intrusion. Surface water may be entering the well by short circuiting through the aquifer or through a structural failure in the casing. Repairs were made to the casing in 1987, therefore, structural problems are less likely.</p> <p>MDEQ concluded that the study provided the City of Charlotte with a basis for conducting a more in-depth evaluation of the City's long-term water supply need. It discussed that the division was on the process of developing an evaluation criteria to aid in determining if a groundwater is under the direct influence of surface water. It also discussed that the proximity of Well No. 1 to the river, the hydrogeological conditions and demonstration of microbiological degradation during high flow events all seem to indicate susceptibility to surface water intrusion.</p>
May 15, 1991	Permit for the polyphosphate feed system was issued.
August 10, 1992	A Water System Evaluation was sent to the City of Charlotte, which included a recommendation to hire a consultant to update its water system Reliability Study and to determine if the city's well field is under the direct influence of surface water.
June 15, 1993	A proposal from the City of Charlotte to conduct a study to determine if the City's Well No. 1 is under the direct influence of surface water was received by MDEQ. Weekly monitoring of Well No. 1 and Battle Creek River for turbidity, conductivity, temperature, pH and total coliform were proposed for a period of one year.

July 19, 1993	MDEQ approved the City's proposal and suggested additional monitoring for hardness, sodium, chloride, nitrate, iron and fluoride from both sampling sites.
September 2, 1993	MDEQ sent a letter to the City confirming that the Battle Creek River weekly total coliform samples for the study to determine the direct influence of surface water to Charlotte's well is redundant. MDEQ made the assumption that water from the river is always total coliform positive, weekly sampling from the river is not necessary.
November 8, 1994	MDEQ provided the City with a copy of report generated by LBWL, which examined the possible influence of surface water on one of LBWL well fields, to use as a guide in making Charlotte's report.
May 16, 1995	The City sent a letter to MDEQ reporting the conclusion of its study on whether the city's wells are under the direct influence of surface water. The City reported that its well field is not under the direct influence of the Battle Creek River, based on sample results collected over a one year period.
September 17, 2001	Test well approval was issued to the City to replace Well No. 1.
November 8, 2001	A permit for converting Well No. 1A to production well, and installation of well house plumbing, valves, pressure switch, pump-to-waste and sampling taps was issued.
February 26, 2002	An Aquifer Analysis for Test Well 1A was forwarded to MDEQ.
April 8, 2002	An internal MDEQ memo on the Aquifer Test Review indicated that the proposed Well 1A should be able to provide at least 1500 gpm, which the City is proposing. The review also indicated that the area geology and aquifer response indicates the aquifer should be considered sensitive (vulnerable) to potential sources of contamination.
April 23, 2002	MDEQ issues a permit for Well 1A equipment (1600 gpm)
September 10, 2003	DEQ evaluation of the water system highlighted the City's bacteriological history evaluation. An unacceptable number of total coliform test results showed up in samples collected from Well No. 1A. Well No. 3 had several instances of historical positive total coliform (1998 and 2001 in particular). Well No. 5 had at least one coliform positive test result. The positives were in the raw water, not the treated water.
October 29, 2003	<p>The City sent a letter to MDEQ detailing their plans resulting from meeting with MDEQ staff and the Water System evaluation.</p> <ol style="list-style-type: none"> 1. Will rehabilitate Well 3 and extend the 26" casing to the well top. 2. Exploratory trenching from Well 1A to 200 feet southwest adjacent to the Battle Creek River was completed on Oct. 28, 2003. Ten different discharge pipes from the old water plant were found with diameters from 1 to 8 inches. All pipes were cut off and plugged with concrete.

	<ol style="list-style-type: none"> 3. The gates to the dam located east of Cochran Avenue were opened on October 23, 2003 to reduce the water level. The intent was to leave them open indefinitely to determine if it has any effect on the bacteriological contamination of the aquifer. 4. An in-line chlorine analyzer will be installed by 11/30/2003 at the wastewater treatment plant to monitor the chlorine residual within the water system. 5. Chlorine fee room modifications at Wells 1A and 5 will be completed by 11/30/2003. 6. Contingency Plan submitted with letter. 7. Water System Vulnerability Assessment was contracted with Capital Consultants for completion by 12/30/2003.
December 4, 2003	Permit was issued for the rehabilitation of Well 3 by extending the 25-inch casing to the well top and cleaning the well screen.
November, 2006	<p>Malcolm Pirnie conducted analytical testing on Well 1A and from standing water in the well casing of Well 1A, in response to recurring bacti positives in the raw water. Test results collected exhibited characteristics that are favorable for bacteriological growth, which include the following:</p> <ol style="list-style-type: none"> 1. High TOC content 2. Highly anoxic, creating a favorable environment for anaerobic bacteria. 3. Iron, manganese, sulfate and hardness concentrations are unusually high. 4. Protozoa were observed in the Microscopic Particulate Analysis (MPA). 5. Adenosine triphosphate (ADT) concentrations were relatively high for groundwater. ATP concentration of the well casing water sample was 3-4 times higher than the aquifer sample, suggestion robust biological activity. 6. Pollen and spores were also detected from Well 1A <p>Malcolm Pirnie recommended additional sampling on a weekly basis for 12 consecutive weeks.</p>
January, 2009	Updated Water Reliability Study submitted to MDEQ.
May 5, 2009	<p>MDEQ sent a letter to the City discussing the 1993 Groundwater Under the Direct Influence (GWUDI) of the Battle Creek River Study, among other things. A more in-depth study was recommended. The City was asked to submit a monitoring plan for MDEQ's review and approval.</p> <p>The letter also discussed an option for the City to consider a new well field, and mentioned that Well 1A has been off-line for more than 2-1/2 years due to periodic bacteriological contamination.</p>

Summer, 2009	Well 1A was cleaned and videotaped. The videotape showed 80-90% of the 30 foot well screen was clogged with cement grout from its construction. Due to high velocities created by the plugged screen, screen openings at the top of the screen were enlarged. Repairs could not be made and Well 1A had to be replaced.
July 29, 2009	MDEQ issued permit for new screen and casing liner on Well 5.
January 28, 2010	BCI Engineers and Scientists (BCI) submitted a report on its review of Charlotte's historical well field data, hydrogeologic assessment and recommendations for future activities. The work was primarily completed to assess if surface water may be infiltrating in sufficient volume to consider the water supply GWUDI.
October 28, 2010	BCI Engineers & Scientists Water Quality Study was received by the MDEQ. Algae, pollen, free-living protozoa, spores and vegetative debris were identified at low levels in samples collected from Wells 3 & 5.
February 18, 2011	<p>MDEQ staff met internally to discuss the Water Quality Report completed by BCI. The report summarizes a study to determine if the groundwater is under the direct influence of surface water. BCI's study concluded that the groundwater was not under the direct influence.</p> <p>MDEQ staff disagreed with BCI's conclusion based on the presence of algae, pollen, spores, vegetative debris, and free living protozoa reported in the groundwater. Tannin and lignin were also reported in one of the wells. Giardia and Cryptosporidium were not detected in the groundwater.</p> <p>MDEQ determined that the City's wells were GWUDI and will require the City to meet Surface Water Treatment Rules. This will require complete treatment including coagulation, sedimentation, filtration, and disinfection.</p>
March 18, 2011	City and BCI meet with MDEQ team to try to educate and reason with them regarding the non-GWUDI determination.
March 24, 2011	MDEQ sends letter to City indicating they disagree with the BCI report and the wells are GWUDI. Complete treatment is required and must be completed within 18 months or face enforcement action.
April 18, 2011	City responds to MDEQ indicating disagreement with their determination citing several points. Additional testing is proposed to convince the MDEQ that the wells are not GWUDI.
May 12, 2011	MDEQ responds to the City and denies the request saying additional information will not change their determination. The complete treatment plant (a \$20 million dollar project) must be constructed and operational by September 24, 2012 or enforcement action will be taken.
February 22, 2012	City attorney sends letter to MDEQ requesting reconsideration of the GWUDI determination. A yearlong sampling and analysis plan that was prepared by AMEC-BCI was submitted with the letter.

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