CLIFTON PARK WATER AUTHORITY
BOARD MEETING

Tuesday, April 12, 2016
7:00 PM

AGENDA

Privilege of the Floor

Old Business

- Five-Year Capital Improvement Plan

New Business

- Amend Standard Specifications to Address Meter Location in Buildings

Other Business

- Approve Minutes of March 8, 2016 Meeting

Ground-Water Resources of the Clifton Park Area, Saratoga County, New York

USGS 2001

ABSTRACT

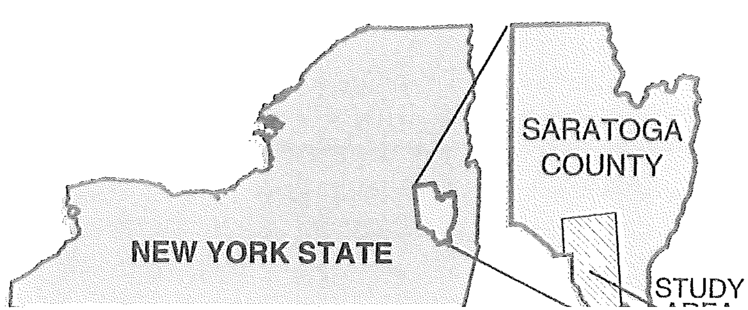
Ground water is the sole source of public water supply for Clifton Park, a growing suburban community north of Albany, New York. Increasing water demand, coupled with concerns over ground-water quantity and quality, led the Clifton Park Water Authority in 1995 to initiate a cooperative study with the U.S. Geological Survey to update and refine the understanding of ground-water resources in the area.

Ground-water resources are largely associated with three aquifers in the eastern half of the area. These aquifers overlie or encompass the Colonie Channel, a north-south-oriented bedrock channel that is filled primarily with lacustrine glacial deposits. The three aquifers are: (1) an unconfined lacustrine sand aquifer, (2) the Colonie Channel aquifer, which is confined within the deepest parts of the channel and variably confined and unconfined within the shallower, peripheral channel areas, and (3) an unconfined alluvial aquifer beneath the Mohawk River flood plain, which represents the southern limit of the study area. The lacustrine sand aquifer has little potential for large-scale withdrawals because it is predominantly fine grained and is susceptible to contamination from human activities at land surface. Water from this aquifer can, however, recharge the underlying peripheral parts of the Colonie Channel aquifer where hydraulic connections are present. The Colonie Channel aquifer consists of thin sand and gravel and (or) shallow, fractured bedrock over much of the channel area; discontinuous deposits of thicker (more than 20 feet) sand and gravel are common in the peripheral channel areas. The deepest, or central, channel area of this aquifer is isolated from the overlying lacustrine sand aquifer by a continuous lacustrine silt and clay unit, which is the primary channel-fill deposit. The most productive areas of the Colonie Channel aquifer are typically the shallow peripheral areas, where conditions range from unconfined to confined. The most productive aquifer within the area is the alluvial aquifer, which is sustained to an unknown extent by induced infiltration of Mohawk River water.

The chemical composition of ground water within the Clifton Park area varies widely in response to hydrogeologic setting, pumpage, and contamination from human activities. These chemical differences can be used to deduce ground-water flow paths within and between the unconfined and confined areas of the aquifer system. Six water types are defined; three are naturally occurring and three are the result of human activities.

Precipitation that infiltrates the land surface is the sole source of recharge to the lacustrine sand aquifer; precipitation also recharges the alluvial aquifer and unconfined parts of the Colonie Channel aquifer. Ground-water withdrawals from confined or unconfined peripheral areas of the Colonie Channel aquifer induce flow from recharge areas, from the underlying bedrock, or from other confined aquifer areas.

The rate of recharge to the confined central area of the Colonie Channel aquifer appears to be low. Potentiometric levels as much as 100 feet below water-table levels in the overlying lacustrine sand aquifer indicate two large depressions in the potentiometric surface; these depressions indicate that withdrawals from this aquifer have cumulatively exceeded the recharge rates. Localized recharge of the central channel area apparently occurs from two peripheral channel areas that are characterized by zones of elevated water levels and (or) by water chemistry that differs from those within the central channel area. Recharge from, or hydraulic connection with, adjoining segments of the Colonie Channel aquifer to the north and south is likely, but the potential for significant recharge is low because the aquifer is thin and poorly permeable.



August 2, 2010

Clifton Park Water Authority
Attn: Don Austin
661 Clifton Park Center Road
Clifton Park, NY 12065

Re: Berryfarm Well Report

Dear Mr. Austin,

Smith Well Drilling is providing this report and related recommendations in accordance with the recent cleaning and redevelopment of the Berryfarm 12" well. The work was performed between July 2 and July 15th, 2010. Work was postponed from the scheduled week of July 5 – July 12, 2010 due to high heat and excessive water consumption at the request of the Clifton Park Water Authority, so as to minimize any impact by having this well out of service during this higher than average peak demand period.

This well is a 12" diameter, naturally developed AWWA Type 4, screened public water supply well. It was constructed in April of 2005. The well screen intake area is from approximately 55 feet to 70 feet below ground level, and consists of multiple slot sizes. Although a well log was provided by the Authority, no determination of actual screen slot size or placement was provided, nor was any actual flow test data obtained to provide a basis of initial specific capacity of the well.

In accordance with conversations between Smith Well Drilling, Inc. and the original driller, Jeremy Baldwin of Hawk Well Drilling, it was determined that when the well was constructed, the formation consisted of poorly sorted angular, fine brown sand and mixed fine-to-medium sand and gravel with coarse grey sand with coarse gravel and cobbles. The well screen, as his memory recalled, consisted of several slot sizes from #10 slot up to #50 slot in size. The well is constructed in a narrow north/south oriented glacial outwash channel deposit, which is common throughout the Town of Clifton Park.

On July 7th, flow testing of the well indicated that the well was being pumped at its maximum flow capacity of 260 gpm and the pumping level was observed to be at the intake of the pump (52 feet), resulting in approximately 43 feet of drawdown and providing a specific capacity of 6.04 gpm/ft (gallons per minute per foot of drawdown). The results of said testing were relayed to the operator on duty and it was recommended that the flow be decreased to provide less drawdown and minimize air and cavitation to said pump.

Upon returning to the well location on July 12th, the well was found to be producing 230 gpm at a pumping level of 40.60 feet, and having a specific capacity of 7.41 gpm/ft/dd.

The well was taken off line and out of service utilizing standard lock/out tag/out procedures.

The Baker pitless unit was disassembled and the pitless, pump/motor and drop pipe were removed and inspected. The pump is a 40 hp 3 stage Gould Texas Turbine model 7CHC with a 5.0 impeller. The motor is a 40 hp 6" 3 phase 230 volt Franklin Electric. The pump/motor are operated using a variable frequency drive. Operational voltage was checked and found to be between 249 and 246 volts (phase-to-phase), and is acceptable for proper motor operation. The drop pipe consists of two (2) 4" x 21 feet T/C galvanized pipes. The intake is set at 52 feet bgl. The drop cable is a #6/3 Kalas brand and appears to be in good condition with no evidence of damage.

Once the pump was removed, the well was left to sit so as to provide settling of any elevated levels of turbidity. Subsequently, two (2) video scenarios were made, utilizing our underwater color video camera. Review of the casing/screen area showed no signs of physical damage, and the screen was found to be whole and intact. However, the entire surface area of the well screen and casing below the static level was found to be covered with a poly saccride iron bacterial slime. The bulk of the plugging was observed to occur in the upper 2/3 of the well screen area. Further observation indicated the bulk of the water was being transmitted through the bottom third (1/3) of the screen.

A 12 inch diameter steel brush was run into the well and repeatedly run up and down to remove the superficial deposits, which had accumulated on the face of the screen and walls of the casing. At the conclusion of the brushing, a string of 2" pipe was run into the well to reverse circulate the accumulated silt and debris off the bottom of the well.

A 12" double disc surge with an eductor was then assembled and installed into the bottom of the well, and the well was surged lightly for 3-5 minutes, at which point the water became extremely turbid and the discharge consisted of heavy fine brown sand.

This condition is not normal and proper well screen selection should allow for the passage of some sand/silt, but should also allow suitable sand retainage during the course of well redevelopment. Realizing that the well screen intake area was unstable and subject to potential collapse or channeling, it was determined to proceed with extreme caution and to minimize the amount of surging.

Subsequently, during the course of the next two (2) days, two applications of an NSF (National Sanitation Foundation) approved well cleaning acid with Nu-Well 310 bio-dispersant were applied to the well and air surged, to achieve proper displacement throughout the well screen and adjacent formation. The acid and bio-dispersant were allowed to stand in the well overnight and then pumped off and neutralized into a portable containment pond which was discharged to natural drainage.

Throughout the course of the redevelopment, short pumping tests were conducted to gauge the progress of the redevelopment. Significant improvement in flow and/or specific capacity were *not* observed.

In further conversation with the original drilling contractor, they stated that when they originally started development of the well they could not get it to stop pumping sand while surging and airlift pumping, and that they installed a submersible pump and pumped the well for several days to achieve stabilization of the screen area. This condition indicates to us, based upon our experience designing high capacity screen wells, that the selection of the slot size is on the low side of the retainage curve and is likely too aggressive a slot size for the actual formation.

In designing wells which derive their source of supply from a non-homogeneous aquifer, it is important to understand that the slot size of the coarse material should only be 2 times greater in size than the overlying fine material. (1)

It is possible that with a reported 4-5 different slot openings in the 15-foot screen intake area, that the finer formation has migrated throughout the formation, although our post video survey shows proper bridging and stabilization at the conclusion of the redevelopment.

Based upon review of the daily operations log in the pump house, it appears that in the past two (2) years of reporting, the well has not been pumped in excess of 260 gpm. By not having the original flow test data, discharge flow rate or size of pump used during the course of the test, it is impossible to speculate that the well would have had an initial specific capacity of 30 gpm/ft/dd, , and then only run and perform over the next 3-4 years at a rate of 6-8 gpm/ft/dd of specific capacity.

It would be our recommendation to continue to pump the well in the 210-230 gpm range and closely monitor the pumping level and specific capacity. Due to the prolonged dry period from May 10th to August 10th, it may be possible some loss of capacity has occurred due to lack of recharge from precipitation events.

It would also be our recommendation that the Clifton Park Water Authority give consideration to drilling a 6" exploratory test hole in an area accessible and under the Authority's control. The test hole should be drilled and sampled by cable-tool methods *only*, and sampling and construction should be overseen with someone who has extensive experience in drilling and sampling of high capacity screened wells.

Based upon the results of the test drilling and sampling, a screen sieve analysis should be performed to properly ascertain the proper screen slot size as it relates to the stratification of the formation in the area. If it is determined that the material is very stratified and non-homogenous, then it might require the construction of an artificial gravel-packed

(1) *"Groundwater and Wells"* Johnson, 1st Edition

well. An AGPW would be constructed to AWWA Type 2 standards and would allow for the placement of specifically graded, well-rounded silica well gravel to be placed between the screen and the formation. This method of construction provides for greater transmitting capacity and higher specific capacities, due to the enhanced permeability of the filter pack and larger screen open area.

Proper construction and sampling of a 6" test well will allow for a conclusive determination to be made as to the availability of a sustained higher capacity of flow being derived from this well location and formation.

In summary, we do not feel that a flow rate of greater than 230 gpm should be continuously pumped from the well at this time. The well only saw a modest increase in specific capacity at the conclusion of the redevelopment and more aggressive redevelopment methodologies may have resulted in failure of the well and/or screen entirely, given the limited timeframe to conduct said redevelopment. Close monitoring of flow and pumping level should be conducted and a determination of specific capacity made at the conclusion of any significant recharge event to gauge any improvement to flow or efficiency.

We have enclosed a copy of our invoice for your review an, and trust you will find it in order and acceptable for payment. We have also enclosed copies of our water quality and flow test data for your records.

Sincerely,

Jeffrey A. Smith, Pres.
MGWC

Enc.

Smith Well Drilling
Water Well Contractors
• WELL DRILLING • TEST DRILLING • WELL & PUMP REPAIRS • PUMP INSTALLATION •
• GROUND WATER INVESTIGATIONS • HYDRO-FRACTURING •
• INDUSTRIAL AND MUNICIPAL WATER SUPPLY CONTRACTORS •
NYS DEC #10001

August 2, 2010

PUMP INSTALLATION REPORT

Owner: Clifton Park Water Authority
Location: Berryfarm Well, off Vischer;s Ferry Road, Well #1

PUMP:

Type: Submersible Turbine Make: Gould Model: 7CHC
Discharge: 4” Number of Stages: 3 Imp: 5.0 Bronze
HP: 40

MOTOR:

Make: Franklin Volts: 230 Phase: 3
HP: 40 Amperes: variable RPM: variable
Wire:: #6 Kalas Voltage on site: AB-249 BC-246 AC-245

WELL:

12” diameter AWWA - Type 4
Capacity: reported 525/400/now 260 gpm
Static: 9 ft
Depth: 70.5 feet

Screen: Stainless Steel
Screen setting: 55-70
Screen Slot - varies

smithwelldrilling.com
PO BOX 585, NIVERVILLE, NY 12130 • 518-758-6142 • FAX 518-784-2765

January 30, 2016

Clifton Park Water Authority
661 Clifton Park Center Road
Clifton Park, NY 12065
Attn: Ron Marshall

Re: 2015 Boyack Well #5
Well Redevelopment

Dear Ron,

I am writing you to document and report our latest findings regarding Boyack Well #5, and the subsequent loss of specific capacity and flow of Well #5 over the last five (5) years.

Our firm performed the latest redevelopment procedures between 11/13/15 and 11/18/15. As was previously proposed, the method of redevelopment was changed from surge/pumping techniques with air lift, to incorporate high velocity water jetting with air lift pumping. This more aggressive method allows for the most effective energy to be transmitted further into the adjacent formation, in an attempt to remove any accumulated silt, sediment and mineral deposition which is deposited in the adjacent area between the well screen and the formation. To date, we have not been able to review any of the original construction details of the well, such as the original screen design and size, sample analysis or flow test data. We have reached out and contacted your engineering firm, C.T. Male, on 1/5/16 and the offices of Layne-Christensen, who acquired the records of Catoh, Inc., who it is thought originally drilled the well, but to date have not been able to secure these records.

Based upon the information we have, the well was drilled in the early 1990's or late 1980's. The well is a 12" diameter naturally developed, AWWA Type 5 screened well. The well screen is a stainless steel 12" telescopic, and is approximately 30' in length. Based upon our video survey, the screen appears to be a 20 to 25 slot size. Based upon the transmitting capacity at 0.1 FPS entrance velocity, would therefore provide a theoretical maximum flow of 600-720 gpm. Reportedly, the well was originally pumped at 600 gpm. However, the well has been pumped at approximately 400 gpm over the past 2-3 years. Previous to the redevelopment the well had not been extensively pumped since April 2014, and was only put back in line towards the end of summer in 2015.

Since the well had not been in service, static measurements were taken by CPWA staff and are reported below:

<u>Boyack Well #5 Static Water Levels</u>

Date	Static Level (ft)	Notations
1983	46	As measured top of casing (TOC)
1989	49	
3/25/10	66.05	
4/14	63.65	Well was idle-not pumping. Reading taken per transducer
9/14	55.0	Customer's transducer is set 93.75' TOC
12/14	52.42	
4/15	53.75	
11/13/15	63.35	
11/18/15	62.80	

On 11/13/15, prior to redevelopment, the static level was recorded and found to be 63.35' as measured from the top of the casing (TOC). The well pump was then started and pumped through the meter in the vault at 335 gpm; and after 30 minutes of pumping, the water level was checked and found to be at 84.70', as measured from the top of the 14" casing. This would indicate a specific capacity of 15.69 gpm/ft/dd. This is *down* from 18.66 gpm/ft/dd when the well was put back in service in March 2014, and represents a 16% *loss* of specific capacity from that time.

Boyack Well #5 Pre-treatment Flow Test

Date/Time	Static Water Level (ft)	Notation
11/13/15 9:00 am	63.35	Pump on at 9:30. Static immediately dropped in two (2) minutes to 84.70' and held at that point for 30 minutes. The drawdown at this point is 21.35' and provides an initial specific capacity of 15.69 gpm/ft/dd.

The pump motor and drop pipe were then pulled and inspected and appeared to be in good condition, and deemed adequate for re-installation. The well was then measured and found to be 128.5' in depth and indicates a sand/sediment in the bottom 12"-18" of the well.

A high velocity jetting tool was then run to the bottom of the well and the 4" educator was set above the jetting tools. Water was obtained from the nearest fire hydrant (1,000') and was run to supercharge the high pressure jetting pump, which is capable of providing a flow rate of 80 gpm at 300 psi. The well was then lightly jetted and educator pumped to remove any superficial deposits before the placement of the acid and bio-dispersant. This resulted in slight discoloration of the water, with fine sediment only.

A prepared solution of 300 gallons of Nu-Well 100 well acid and Nu-Well 310 bio-dispersant were then placed into the well via a tremie pipe and the well was allowed to sit over the weekend to allow for effective penetration into the screen and adjacent formation.

Upon commencement of work activities on Monday, November 16^{th}, the static level was found to be 62.95', which represents a gain of .40' in static level from Friday. The jetting process was carried out from the bottom to top, and then from the top to bottom of the well, repeatedly. The discharged water was immediately observed to be highly turbid, with a high degree of fine sand and black silty deposits, which smeared and appeared to consist of manganese and sulfide deposits. The bottom 10' of the screen did not display as much discoloration, or produce significant fine sand, as was observed in the top 20' of the screen. However, it was noted that an accumulation of silt and sediment had settled to the bottom of the well; and upon removal, it was noted that heavy mineral scale was removed from the bottom 18" of screen.

Seeing the stabilization of the formation by educator pumping, it was decided to pull the development tools, shock chlorinate the well and allow the well to sit overnight and then install the customer's pump and re-flow test the well.

The following morning (November 17th), the static was recorded and found to be at 62.78', an increase of .20' from the day before. The well was initially pumped with the air lift educator and was found to be clear of sediment and silt. The well was then repeatedly surged to rile up the formation and to check for stability in the formation. It was observed that in less than ten (10) minutes after each surging of the formation, the well was producing sand-free water. During the course of the air lift pumping, the well was video surveyed and the screen observed to be remarkably clean and free of obstructions and mineral scale. It was then decided to pull the jetting and educator tools and re-set the customer's pump back in the well and re-flow test the well as the screen and adjacent gravel were clear.

On November 18th, the pump was wired and a 6"x4" orifice was installed on the discharge piping. The pump was started and the discharge valve set at approximately 100 gpm. The static was recorded and found to be at 62.80', prior to turning the pump on. The pump was started at 9:56 am, and after 24 minutes of pumping, a "pop" was heard and the pump stopped. At this point, a small wisp of smoke was observed rising out of the underground 2" conduit.

It appears that the wires may be pinched down approximately 4'-5', and the insulation may be compromised. This condition could possibly be causing the corrosion and pitting on the Baker pitless spool. We promptly notified Corey, who also observed the overload condition at the VFD drive, as it faulted out. The drive was re-set and the pump was then observed to run at normal amperage and flow rate, as documented in our flow test pump report, for an additional three (3) hours at which point, as we were concluding our flow test, we again moved the wires, which caused the pump to kick out on overload. This prematurely terminated our flow test, and in the time it took to contact Ron Marshall, the well recovered to static of 63.20'– *in less than 5 minutes.*

During the course of the flow test, we took readings from the 6" test/observation well to determine the area of extent and efficiency of the pumped well. By dividing the drawdown of the observation well by the drawdown of the pumped well, we found this well to be 76% efficient, thereby confirming our findings that the well was successfully redeveloped. It is very rare to obtain 100% efficiency in a screen well. Common targets for well efficiency are 80% for new well efficiency. The efficiency measures well loss and that is due to loss of flow through the native formation, the gravel pack and well screen. Due to the nature of wells and their construction, no well is 100% efficient.

Since we have witnessed a slow decline, in both specific capacity and static water level, leads us to believe that the overall recharge area has been partially dewatered. This increases the amount of available drawdown, resulting in a lower yield due to the fact that there is less head (pressure) to push the water towards the well screen intake area and less water to supply the well from the above formation.

One must remember that when you rehabilitate high capacity wells, if you do not have as high a static level as originally, you ***cannot*** expect the well to come back to its original specific capacity. It appears that since the well is efficient, the screen and adjacent area of the screen are clear of obstruction, the only other variable is a loss of static head. Unfortunately, there is no absolute calculation that can be made to determine the percentage of lost capacity due to plugging of the formation versus the percentage of lost capacity due to dewatering of the aquifer. This is why it is so important to review any data pertinent to the original construction and flow testing of this well.

Boyack Well #5 Post Treatment Flow Test

Date: 11/18/15 Static water level at 62.80'

Time	Water Level (ft)	Drawdown (ft)	Flow Rate (gpm)	Level 6" Observation Well 10' From Pumped Well (ft)
8:35	62.80	0	0	62.60
9:56 pump on	67.10	4.3	111	62.60
10:02	67.0	4.2	111	62.60
10:20	68.7	5.9	111	62.60

Pump Stopped

10.32	68.7	5.9	111	62.60
10.36	68.7	5.9	111	62.60

10:39 – Increased Flow Rate to 201 gpm

10:40			201	72.10
10:41	73.7	10.9	201	72.10
10:46	73.7	10.9	201	72.10
10:55	73.7	10.9	201	72.10
11:02	73.7	10.9	201	72.10
11:12	73.7	10.9	201	72.10
11:20	73.7	10.9	201	72.10

11:45 – Increased flow to 312 gpm

11:47	79.4	16.6	312	75.50
12:39	79.3	16.5	312	75.46

12:41 – Increased flow to 350 gpm

12:43	81.60	18.80	350	77.00
12:58	81.65	18.85	350	77.00
1:10	81.65	18.85	350	77.00

1:14 – Increased flow to 400 gpm

1:15	84.70	21.90	400	79.20
1:20	84.70	21.90	400	79.20
1:25	84.65	21.85	400	79.20
1:30	84.65	21.85	400	79.20

Pump kicked out due to movement of wires.
Motor amperage Black – 43.8 amps Red – 42.6 amps Yellow – 42.0 - OK

12" well recovered to 63.20' in five (5) minutes.
6" well recovered to 62.60' in five (5) minutes.

Since determining the correct and specific data related to this well is so important, and since I had not yet garnered a response from your engineering firm, I took the liberty to reach out to the NYSDEC Division of Water on January 21, 2016. I spoke to Jim Garry, who was able to find the data applicable to the construction and testing of Boyack Well #5. It was actually drilled in 1983, for Crescent Estates Water Company by Dick Ferraioli, Inc. of Altamont, New York. However, due to the high levels of Iron and manganese, it was not ever put into service until 2002, whereby the well was already 19 years old. Accordingly, within three (3) years after being put into production, the well started to experience a decline in flow by January of 2005, as indicated in correspondence documented by C.T Male, indicating the well had dropped to 420 gpm with 45' of drawdown, resulting in a specific capacity of just 9.3' gpm/ft/dd. The well originally had a specific capacity of 35.08 gpm/ft/dd!

The most important data we reviewed is the fact that the static level in 1983 is recorded at 46' in the 12" Boyack #5 and 43' in the 6" test well. However, by 1989, the static level in Boyack #5 had dropped to 49'. This would indicate to me that dewatering of the aquifer was already taking place. During this time period, Boyack #3 and 4A were online, however based upon the data for transmissivity, their impact should not have been an issue, as they were over 600' away, and were reported to not have an impact by the reviewing hydrologist. It was further noted in the report that although the specific capacity of the well was 35.08 gpm/ft/dd, the well field was only considered to have a transmissivity capacity of 17.4 gpm/ft/dd. These documents will need to be reviewed by your hydrologist, as he will have a better understanding of the methods associated with determining transmissivity and sustainability of the aquifer.

In summary, it has been observed and documented that we have lost 18.2' of the available drawdown of the well, since the well was put in service 14 years ago. By utilizing the most recent recorded specific capacity of 18.26 gpm/ft/dd, recorded on November 18, 2015, while pumping the well at 400 gpm, and then multiplying the specific capacity by 18.2' of drawdown, results in a loss of flow of 333 gpm! This is most likely why the well is not capable of achieving the original flow of 600 gpm.

It would be my recommendation to immediately decrease the pumping rate of all wells in the Boyack field and closely monitor the static level, pumping level, flow rate and specific capacity at a minimum of every week. Reducing flow rates will result in minimizing drawdown of the wells, as well as conserving the head of water available to pump.

It may be advantageous to investigate the feasibility of implementing some type of aquifer storage and recovery program to re-claim and re-charge the aquifer if no other aquifer pumping impacts can be identified.

The pitless unit corrosion issue:

As you are aware, we have continued to witness the slow degradation of the spool on the Baker 5PS1214WBWE0886 1412 pitless unit. We had previously written to Baker Manufacturing in 2014 alluding to our concerns. I spoke to their factory representative, Seth Schultz, on December 29, 1025, and provided him with pictures of the spool, which were taken on November 16, 2015. He arranged a meeting with an electrical engineer and then shared those pictures, as well as our previous correspondence, and discussed this issue with him. I met with Mr. Schultz on January 20, 2016 in Rome, New York, and discussed these findings and opinions.

Baker Manufacturing presently has only one other customer who had had a similar type condition. They feel that this deterioration of only the spool area is likely a result of stray voltage. Since the unit appears to be properly bonded and grounded, with the proper anode protection in place, they feel stray current is migrating towards the well from an unidentified source. It is possible this source could be the underground wires, which we observed "popping" and causing the intermittent tripping of the pump during the flow test of November 18th. Upon his return to Wisconsin and the submittal of the report by his engineer, he stated he would forward the report, with recommendations, for testing to me and I will share them with you.

In Closing, I am confident we have been able to identify the cause of the decline in specific capacity and yield of Boyack Well #5. Now we have to determine why we're de-watering the aquifer, and how can we work to minimize this condition or identify a solution to correct it. I stand ready to assist and meet with your engineering and hydrogeology representatives to discuss possible approaches and solutions to this problem. I ask that you feel free to contact me and to discuss any questions you may have after reviewing this report. If you would like, we can schedule to meet at your office or at your engineer's office to go over our findings.

Respectfully submitted,

Jeffrey A. Smith, Pres.
MGWC

"Engineering with Distinction"
ECI ELECTRICAL CONSULTANTS, INC.
MADISON OFFICE: 2800 ROYAL, Suite 300, MADISON, WI 53713 • PHONE: 608-240-9933 • FAX: 608-240-1579

January 11, 2016

Baker Manufacturing
133 Enterprise Street
Evansville, WI 53536

Re: Well Casing Degradation Investigation

Representatives of Baker Manufacturing presented a failed steel casting from a well casing system to members of the ECI team. The damage was consistent with previous cases investigated by ECI of damaged well casings related to stray current (current from a source other than the service panel of the facility under investigation).

In order to test the hypothesis that stray current may have caused the damage to the casting, ECI requests that current measurements be made on the well casing and that the phase voltages and currents be observed.

A current measurement on the well casing will require an electrician to isolate the ground tie of the well casing to a solitary ground cable to the panel ground. Ideally, a grounding cable between the well casing and the panel ground should have no measurable current on the cable. In a situation where steel water pipes are failed due to stray current, it should be possible to measure the current passing to the ground bus in the service panel from the well casing. If the current is from a source other than your service panel, the current will remain after service is terminated at the main service panel breaker. A near zero value of current will disprove ECI's hypothesis that stray ground currents exist and are damaging the casting. A non-zero current value indicates the well case is carrying stray current. The value of the current will indicate the magnitude of the problem. Significant stray current observations indicate a problem that must be resolved immediately.

Treatment of stray current is possible and entails ensuring that the stray current is relocated to a desired current path by means of increasing impedance in the unwanted current path. There are many ways of achieving this end. The best solution is always situational and must be based on site data.

To that end please see the following data requests.

1. Please provide a single line of the building. This will provide data describing the electrical system in the building.
2. Provide the configuration of the transformer serving the facility. Is there a path from the load side neutral to the supply side neutral? - 3 phase 4 wire versus 3 phase three wire service.
3. Observed test values of the current on the well casing both while the building electrical system is energized and when the building electrical system is de-energized.
4. Observed test values of the current on the well casing when the pump is operating and when the pump is off.
5. Observed values of phase currents and voltages at the service panel.

CORPORATE OFFICE:
3521 GABEL ROAD
BILLINGS, MT 59102
PHONE: 406-259-9933
FAX: 406-259-1164
EMAIL: contact-us@ecibillings.com

SALT LAKE CITY OFFICE:
660 WEST 700 SOUTH
WOODS CROSS, UT 84087
PHONE: 801-292-9954
FAX: 801-292-9177
EMAIL: contact-us@ecisle.com

TUCSON OFFICE.
6740 NORTH ORACLE RD, #100
TUCSON, AZ 85704
PHONE: 520-219-9933
FAX: 520-219-9949
EMAIL: contact-us@ecituc.com

MADISON OFFICE:
2800 ROYAL AVENUE, #300
MADISON, WI 53713
PHONE: 608-240-9933
FAX: 608-240-1579
EMAIL: contact-us@ecimadison.com

This data will allow us to prove or disprove if stray current is responsible for the failure of the casting you presented us for examination. We welcome any questions you have and look forward to receiving the requested data for examination so that the root cause of the pipe failure can be determined and corrected.

Sincerely,

Dr. Robert Bischke, P.E.

Smith Well Drilling
Water Well Contractors
• WELL DRILLING • TEST DRILLING • WELL & PUMP REPAIRS • PUMP INSTALLATION •
• GROUND WATER INVESTIGATIONS • HYDRO-FRACTURING •
• INDUSTRIAL AND MUNICIPAL WATER SUPPLY CONTRACTORS •
NYS DEC #10001

March 24, 2016

Clifton Park Water Authority
Don Austin, Manager
661 Clifton Park Center Road
Clifton Park, NY 12065

Re: Berryfarm 12" Well
Declining Production Video Survey

Dear Mr. Austin,

On March 8, 2016, Smith Well Drilling, Inc. inspected and performed a video survey of the above referenced well. The yield/flow has reportedly been declining and has caused the meter to plug with iron deposits.

Upon arrival of our service personnel, we found the well to be producing a discharge rate of 160 gpm, with a 42.4' pumping level. The static level was recorded at 6.15', thereby affording a drawdown of 36.25'. The specific capacity was determined to be 4.4 gpm/ft/dd, which is down as compared to our test results of July 12, 2010, when the specific capacity was 7.4 gpm/ft/dd, and at a flow rate of 230 gpm with a 40.6' pumping level. These tests indicate a 40% loss of specific capacity and a 30% loss of flow rate.

The well was in use during the course of the video inspection, as the camera was able to fit down through the pitless spool. Approximately 60% of the screen was clean and is evident of a sand pumping condition. The remaining 40% showed evidence of iron bacteria and iron deposits. It was determined that the lower half of the screen was pumping fine sand. In review of the original well screen design, it indicates various slot sizes of between .060 -.120 slot in 15' of screen. It is obvious the screen selection is too coarse for the formation, and therefore the fine sand migrates into the well bore and the adjacent formation is, therefore, plugging off. A properly designed and installed screen would provide a maximum transmitting capacity at a low entrance velocity, and thereby allow the sand to bridge against the screen – not migrate through it.

smithwelldrilling.com
PO BOX 585, NIVERVILLE, NY 12130 • 518-758-6142 • FAX 518-784-2765

After completing the video survey, we discussed our findings with Mr. Albert Smith, Design Engineer at Bilfinger/Johnson Screens of Brighton, Minnesota. He is in agreement with us that the highly varied and coarse slot size has led to the surrounding formation plugging off due to fine sand migration, which has eroded and compromised the screen. This condition would cause redevelopment to be unlikely and that replacement of the well is warranted, and the most suitable option.

Prior to contemplating replacement, we would recommend that a 6" exploratory test well be drilled in close proximity to the Berryfarm well. This well should only be constructed utilizing cable tool methods with a competent operator. By utilizing a 6" test well, drilled by cable tool methods, a larger and more representative formation sample can be obtained. This method allows us the ability to advance the casing and eliminate the separation of the finer and coarser formation materials that occur when using rotary drilling techniques. The cable tool method results in a better determination of the stratification and grain size of the formation, as well as allowing for a more accurate screen design. If necessary or warranted, a well screen can be installed and the aquifer can be pump tested and a determination of anticipated drawdown, yield, specific capacity and efficiency can be determined prior to the construction of the production well.

Based upon the geological samples obtained from the 6" exploratory well, we would perform a sieve analysis to ascertain the proper size and type of screen, as well as determine and design the correct type of well. I have enclosed a copy of our previous correspondence, from August 2, 2010, which provides for further insight as well as reiterating our recommendation for replacement of this well.

The costs associated with the construction of one (1) 6" exploratory test/observation well, utilizing cable tool methods, are as follows:

Item Description	Est. Quantity	Unit Cost	Total Est. Cost
Mobilization/demobilization of NYSDEC licensed/certified crew and equipment	1	$1,200	$1,200
Drill rig/operator, per day	4	$ 500	$2,000
6" steel cased test drilling	70'	$ 40	$2,800
Sieve Analysis	4	$ 100	$ 400
Total Anticipated Cost			**$6,400**

The above costs do not reflect the installation of a test screen, as we don't feel a screen is necessary at this time.

I appreciate the opportunity to provide you with this analysis and recommendation for your existing production well. Please feel free to contact me with any questions you may have or if I can be of any further assistance.

Sincerely,

Jeffrey A. Smith, Pres.
MGWC

JAS:maw

Enc.

Smith Well Drilling
Water Well Contractors
• WELL DRILLING • TEST DRILLING • WELL & PUMP REPAIRS • PUMP INSTALLATION •
• GROUND WATER INVESTIGATIONS • HYDRO-FRACTURING •
• INDUSTRIAL AND MUNICIPAL WATER SUPPLY CONTRACTORS •

KNOWLEDGE EXPERIENCE ABILITY national ground water association CERTIFIED
NYS DEC #10001

March 24, 2016

Clifton Park Water Authority
Don Austin, Manager
661 Clifton Park Center Road
Clifton Park, NY 12065

Below is the information on the Shenendahowa School Well (Shen Well):

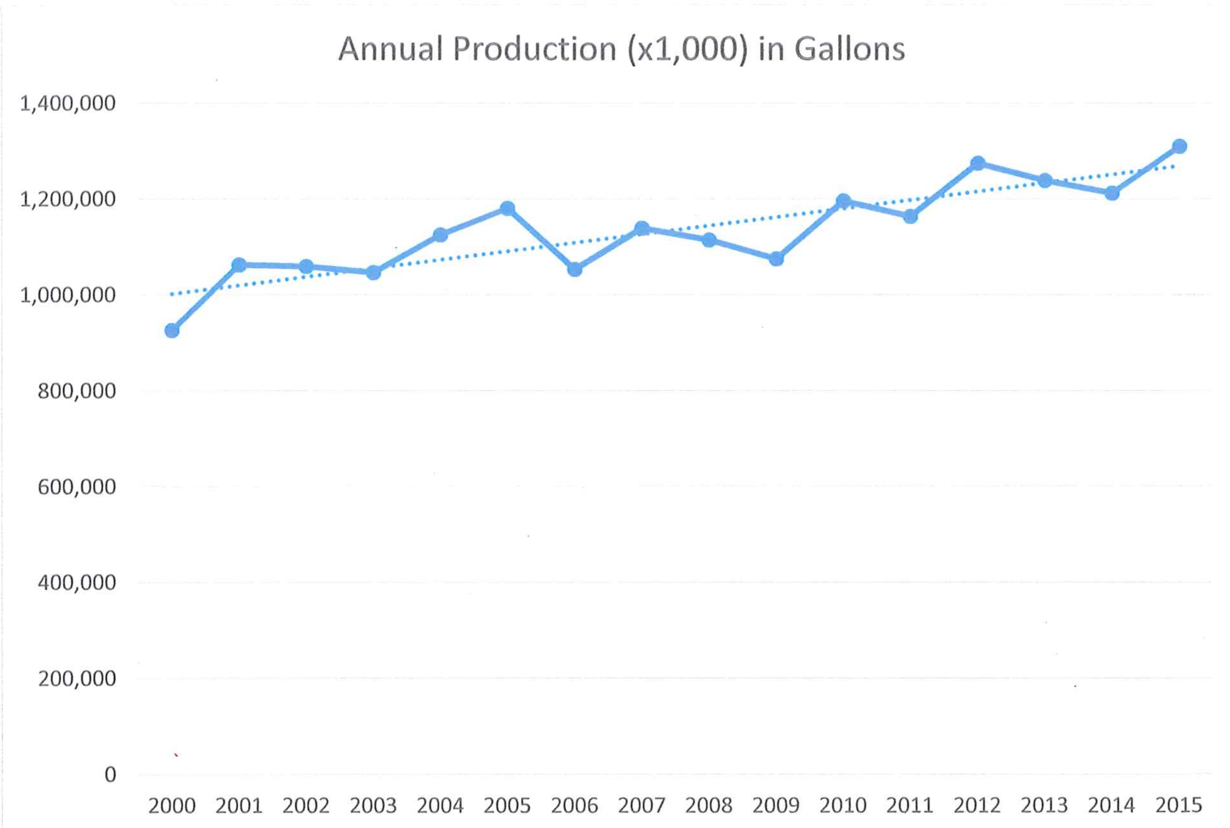
- Depth 48'
- Static Water Level 28.8'
- Well is 10" diameter with a screen at 40'
- Pump intake is approximately 35'
- Well reportedly pumping sand
- Remove flange and move pump to side; camera well
- No evidence of screen damage.
- Screen dirty, but not excessive
- Has never been cleaned before
- Served school only from mid 1960s to approximately 2010
- Review of readings shows consistent water level decline, as well as non-stop pumping for over 1 year straight at 80 gpm
- Well had sat for approximately 1 month – not running
- Found pumping level to be 31.5' @ 86 gpm; specific capacity = 31.85'
- Camera while pumping for approximately 1 hour showed no evidence of sand
- Continued pumping may have caused pumping level to decline and caused air to disturb the piping system, causing turbid water
- Advised Walt/Ron from CPWA to allow well to rest as much as possible to reduce dewatering

national ground water association

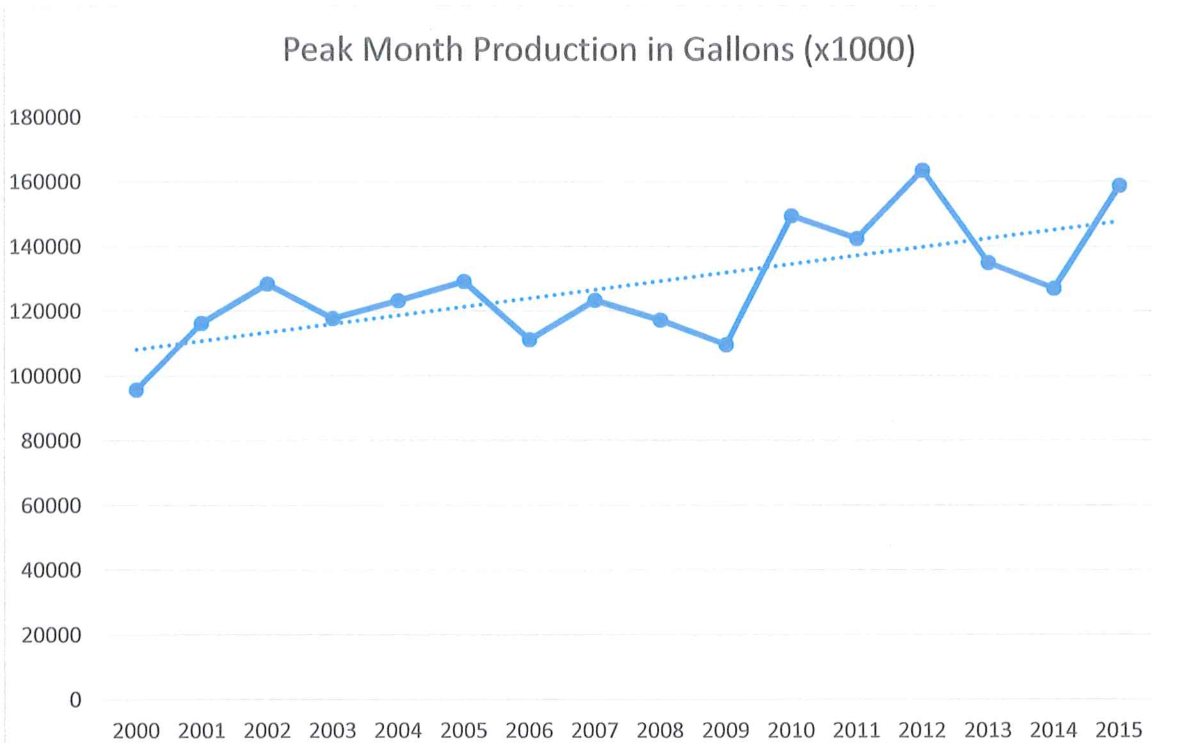
smithwelldrilling.com

PO BOX 585, NIVERVILLE, NY 12130 • 518-758-6142 • FAX 518-784-2765

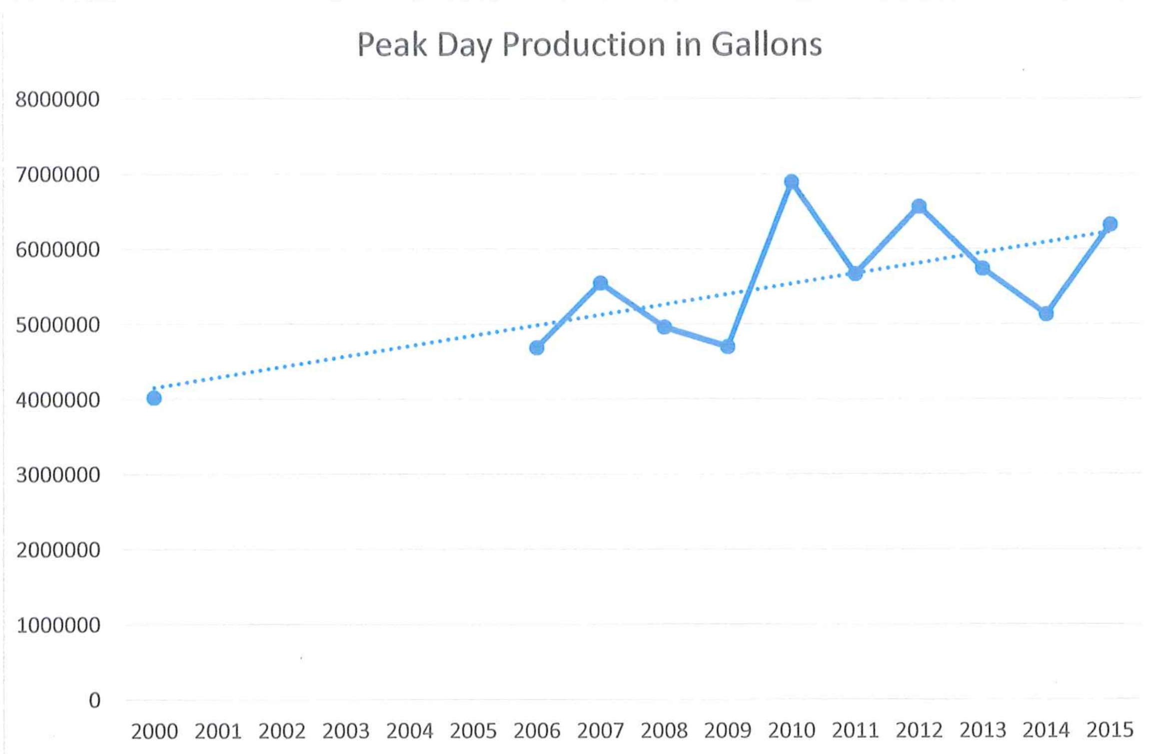
EMPIRE STATE WATER WELL DRILLERS ASSN., INC. MEMBER



Annual production numbers have steadily increased from 2000 to 2015, from 925,700,000 gallons in 2000 to 1,309,755,000 in 2015, an annual average increase of 25,604,000. While annual production increases don't necessarily show a need to increase pumping capabilities, as increases in peak day values would, they create a greater draw on seasonal sources that may not be able to sustain additional pumping over the long haul. The effects of this can be seen in recent well reports accompanying this analysis, showing a decline in the pumping yields of wells within the Colonie Channel Aquifer.



Peak month production numbers have also increased over the past 15 years, although they were somewhat stable from 2001 to 2009 before jumping a bit in 2010. From 2010 to 2015, the peak month amounts have been stable with weather-related (explainable) variances. Overall, the numbers have increased at a similar rate to the annual production numbers. Increases in peak month productions place great strain on production wells, as they are forced to pump continuously, with no opportunity for recharge.



Peak day values for 2001 – 2005 were not found, but available data shows a general upward trend over the past 15 years. Without placing further water restrictions on customers, peak day usage dictates required production capacities. Historically, the highest production day on record was just shy of 7 million gallons.

	2009	2010	2011	2012	2013	2014	2015	2016	
January	82,131	74,697	84,652	87,917	89,772	91,473	87,565	93,228	
February	69,097	67,424	74,291	77,949	79,212	81,371	78,278	84,029	
March	78,871	74,864	81,849	85,779	87,182	91,053	86,060	90,773	
April	88,792	83,983	85,511	98,556	93,680	87,744	94,179		
May	109,678	112,965	108,289	114,512	127,975	108,389	158,807		
June	105,236	105,425	125,046	132,100	113,318	117,806	116,464		
July	99,574	149,416	142,412	163,546	134,894	121,635	134,732		
August	101,810	133,585	118,473	134,255	131,868	127,083	147,217		
September	97,568	123,442	81,820	114,464	106,547	117,913	127,126		
October	82,679	94,713	91,173	92,229	98,088	98,261	100,334		
November	77,995	86,411	83,295	85,859	83,952	83,511	87,949		
December	81,644	88,819	87,289	87,778	91,939	86,384	91,044		
Yearly Total	**1,075,075**	**1,195,744**	**1,164,100**	**1,274,944**	**1,238,427**	**1,212,623**	**1,309,755**		
Monthly Avg	**89,589**	**99,645**	**97,008**	**106,245**	**103,202**	**101,052**	**109,146**		
Daily Avg	**2,945**	**3,276**	**3,189**	**3,493**	**3,393**	**3,322**	**3,588**		
		Peak Day	**Peak Day**	**Peak Day**	**Peak Day**	**Peak Day**	**Peak Day**		
	June 6th	July 5th	July 20th	July 12th	July 18th	July 21st	May 24th		
	4,699,000	6,893,300	5,665,900	6,564,100	5,739,100	5,132,400	6,321,000		

Maximum production capacity of the CPWA system, including purchased water from SCWA and Glenville, is approximately 6.78 MGD. I say approximately, as recent observations and reports on the capabilities of CPWA-owned water sources have shown a slow but steady decline in the production capabilities of the Colonie Channel Aquifer, especially in the southern end of the system, south of Route 146.

Adding to the need to increase capacity of the CPWA system is the addition of new customers. Currently, the CPWA has 13,295 customers. At present, there are a number of projects under construction that will add to the demand on the CPWA system. The following is a list of projects with water infrastructure installed, that are beginning to add homes to the system (or will begin to sometime in 2016), along with their respective number of residential lots:

Rolling Meadows	38
Maple Forest	16
Honey Hollow Farms	34
Heritage Pointe	103
Diamond Pointe	10
Mackey	9

In addition, there are two projects that are well into the planning process with the Town of Clifton Park that will likely receive final approval from the Town in 2016. They are:

Windhover Farms	25
Crescent Woods	62

The system will also add two more hotels this year, with the Courtyard Marriott on Plank Road and La Quinta on Route 9.

It is hard to accurately determine the peak day impact a new customer will have on the system, however, assuming that all new residential homes get automatic sprinkler systems added and all of them adhere to the odd/even watering restrictions and the average peak daily usage for a residential home is 600 gallons, the impact of these 297 new homes on the CPWA's peak day requirement would be 178,000 gallons per day. The impact of the two hotels would be about 20,000 gallons per day, bringing the total impact of these new projects to approximately 198,000 gallons per day.

In addition to the aforementioned projects, the CPWA continually adds new customers due to smaller subdivisions, individual homes built on vacant lots, existing homes deciding to connect and other commercial projects. We also have existing homes adding automatic sprinkler systems every year. In 2016, we had 46 existing customers add irrigation systems to their homes.

The following pages are an excerpt from the USGS's 2001 report entitled, "Ground-Water Resources of the Clifton Park Area, Saratoga County, NY", as well as recent well reports from Smith Well Drilling on the Boyack Well 5, Berryfarm and Shenendehowa sources.

Currently, the CPWA has the capacity to draw 1,565 gallons a minute from the Colonie Channel Aquifer, although the Moe Road source (130 gpm) has not been used in years due to substandard water quality. Other than the Plank Road source, the other wells that draw from this aquifer seem to be slowly declining in their yield. As such, and in addition to the continued growth in the system, the need to add source water is apparent.

Clifton Park Water Authority

Resolution # ______, 2016

Amending CPWA Standard Specifications for Water Distribution Systems

WHEREAS, the Clifton Park Water Authority has reviewed its Standard Specifications for Water Distribution Systems and wishes to amend the document to include requirements pertaining to the location of water meters within buildings, now therefore be it

RESOLVED, that the Clifton Park Water Authority Board of Directors hereby amends the Standard Specifications for Water Distribution Systems as attached.

Motion By: ________________________ Seconded By: ___________________________

Roll Call Vote

	Ayes	Noes
Mr. Gerstenberger	____	____
Mr. Ryan	____	____
Mr. Peterson	____	____
Mr. Taubkin	____	____
Mr. Butler	____	____

4 feet 8 1/2 inches, with matching stainless steel stationary rods and #88982 lids and plugs. As an alternate, curb boxes may be McDonald 5600, 4 1/2 feet to 5 1/2 feet adjustment, with matching stainless steel stationary rods and two (2)-hole covers. When installed in concrete or paved surfaces, these curb boxes do not require curb box sleeves.

D. Stainless steel stationary rods for all curb stop/curb box installations shall be ½" diameter minimum.

11. WATER METERS   * CURRENT SPECIFICATIONS *

A. Water service to all connections to the Authority's water system, whether such service be in public or private Ownership, shall be metered. Water meters for all water services must be purchased from the Authority.

B. All water meters one inch (1") or smaller shall be installed by the Authority.

C. All water meters larger than one inch (1") in size shall be supplied by the Authority, installed by the Owner and the installation shall be approved by the Authority. The Authority shall determine the type of meter (i.e. disc, turbine or compound) required for the proposed service. Installation details shall be reviewed and approved by the Authority before the work is done. All water meter installations larger than four inch (4") shall have a bypass line of equal size.

All water meters shall be accessible to the Authority for inspection and reading.

12. INSTALLATION OF WATER SYSTEMS

A. In addition to the various miscellaneous installation requirements given in preceding sections of this specification, all water distribution system installation shall be done in accordance with ANSI/AWWA C600 recommendations. Also, all work shall be done in accordance with the requirements of the Authority.

B. Trenches shall be open cut from the surface deep enough to provide a minimum of five feet (5') of cover over the barrel of the pipe from finished grade. Trenches should be wide enough to provide at least six inches (6") of clearance on each side of the bell of the pipe. The maximum trench width at the top of the pipe shall be no greater than the nominal pipe size or diameter plus twenty-four inches (24"). Refer to Sheet 2 of the Standard Detail Sheets for standard trench details.

11. <u>WATER METERS</u>

A. Water service to all connections to the Authority's water system, whether such service be in public or private Ownership, shall be metered. Water meters for all water services must be purchased from the Authority.

B. All water meters <u>one inch (1") or smaller</u> shall be installed by the Authority.

C. All water meters <u>larger than one inch (1")</u> in size shall be supplied by the Authority, installed by the Owner and the installation shall be approved by the Authority. The Authority shall determine the type of meter (i.e. disc, turbine or compound) required for the proposed service. Installation details shall be reviewed and approved by the Authority before the work is done. All water meter installations larger than four inch (4") shall have a bypass line of equal size.

* D. Water meters shall be located in the basement or mechanical/utility room if one is available. The water meter shall be placed where the water service line comes through the basement wall or basement floor. Where no basement is provided, the meter shall be placed where the service line comes through the wall or floor of the mechanical/utility room. All water meters installed within buildings shall be in a horizontal position, a minimum of 18 inches, but no more than 42 inches, from where the water service first penetrates the floor or wall of the structure. The base of a single water meter shall be set at a height of not less than 12 inches, and not more than 42 inches above the floor surface. Meters shall be indoors and protected from freezing and other damage. No meters shall be installed in a crawl space under a residence. A meter pit may be installed outside the residence if the meter cannot be installed in the basement or mechanical/utility room. All meters shall be accessible to the Authority for inspection and reading.

* ADDITION TO SPECIFICATIONS

2015 Capital Budget Report

2015 Capital Budget Items Completed in 2015

Item	Estimated Cost	Actual Cost	Differential
Brass Goods	$25,000	$23,446	$1,554
Yearly Water Meter Purchases	$140,000	$188,475	($48,475)
Fire Hydrants (3)	$12,000	$6,867	$5,133
Van	$28,000	$23,499	$4,501
36-inch Lawn Mower	$4,000	$3,392	$608
Pressure Wash Blue Spruce Tank	$15,000	$15,329	($329)
Well Redevelopment	$15,000	$12,800	$2,200
New Mower Deck for Ford Tractor	$2,900	$2,745	$155
VFDs for Boyack Well, Backwash and Pressure Pump	$7,000	$6,499	$501
Color Analyzer for Boyack	$4,200	$5,763	($1,563)
Dehumidifier for Boyack	$3,800	$3,529	$271
Total	**$256,900**	**$292,344**	**($35,444)**

2015 Capital Budget Items Still In Progress as of 12/31/15

Item	Estimated Cost	Cost-To-Date	Differential
Upgrade Elements Software	**$6,800**	**$0**	**$6,800**
Total	**$6,800**	**$0**	**$6,800**

2013/2014 Capital Budget Items Completed in 2015

Item	Estimated Cost	Cost-To-Date	Differential
Boyack Well 5 Redevelopment (2014)	**$25,800**	**$14,315**	**$11,485**
Boyack WTP Upgrades (2013)			
* Koester Pilot Study ($3,900) plus 6 additional cartridges ($200/each)	$3,900	$5,100	($1,200)
* Design	$68,800	$68,000	$800
* Bid	$3,900	$3,900	$0
* Construction Administration	$24,500	$24,500	$0
* Reimbursable Expenses Estimated	$4,000	$1,819	$2,181
* Special Inspections Estimated	$5,000	$0	$5,000
* Construction Observation (320 hrs x $85/hr) Estimated	$27,200	$10,994	$16,206
* Contractor Bid - OCS Industries, Inc.	$720,725	$720,725	$0
* Filter Trak 660 Laser Nephelometer	$3,879	$3,879	$0
Total	**$861,904**	**$838,917**	**$22,987**
Total	**$887,704**	**$853,232**	**$34,472**

2015 Capital Budget Report

2015 Capital Budget Items Completed in 2015

Item	Estimated Cost	Actual Cost	Differential
Brass Goods	$25,000	$23,446	$1,554
Yearly Water Meter Purchases	$140,000	$188,475	($48,475)
Fire Hydrants (3)	$12,000	$6,867	$5,133
Van	$28,000	$23,499	$4,501
36-inch Lawn Mower	$4,000	$3,392	$608
Pressure Wash Blue Spruce Tank	$15,000	$15,329	($329)
Well Redevelopment	$15,000	$12,800	$2,200
New Mower Deck for Ford Tractor	$2,900	$2,745	$155
VFDs for Boyack Well, Backwash and Pressure Pump	$7,000	$6,499	$501
Color Analyzer for Boyack	$4,200	$5,763	($1,563)
Dehumidifier for Boyack	$3,800	$3,529	$271
Total	**$256,900**	**$292,344**	($35,444)

2015 Capital Budget Items Still In Progress as of 12/31/15

Item	Estimated Cost	Cost-To-Date	Differential
Upgrade Elements Software	$6,800	$0	$6,800
Total	**$6,800**	**$0**	**$6,800**

2013/2014 Capital Budget Items Completed in 2015

Item	Estimated Cost	Cost-To-Date	Differential
Boyack Well 5 Redevelopment (2014)	**$25,800**	**$14,315**	**$11,485**
Boyack WTP Upgrades (2013)			
* Koester Pilot Study ($3,900) plus 6 additional cartridges ($200/each)	$3,900	$5,100	($1,200)
* Design	$68,800	$68,000	$800
* Bid	$3,900	$3,900	$0
* Construction Administration	$24,500	$24,500	$0
* Reimbursable Expenses Estimated	$4,000	$1,819	$2,181
* Special Inspections Estimated	$5,000	$0	$5,000
* Construction Observation (320 hrs x $85/hr) Estimated	$27,200	$10,994	$16,206
* Contractor Bid - OCS Industries, Inc.	$720,725	$720,725	$0
* Filter Trak 660 Laser Nephelometer	$3,879	$3,879	$0
Total	**$861,904**	**$838,917**	**$22,987**
Total	$887,704	$853,232	$34,472