

M E M O R A N D U M

TO: Ralph Huddleston, Jr. Chairman & Planning Board

FROM: Dennis G. Lindsay, PE, Town Engineer, &
Sean T. Hoffman, PE, Planning Board Consultant

SUBJECT: Young’s Grove Subdivision (Regier Homes)
Pump Test Program Review
File No. 12-2-40; Memo No. 83-12-018

DATE: May 11, 2012

CC: Neal Halloran, Building Inspector, Broderick Knoell, Highway Superintendent,
Richard Golden, Esq., Ed Garling, AICP, William Canavan, CPG, PG
Steve Esposito, RLA (for applicant))

The following are our comments regarding the Pump Test Program for the Young’s Grove Subdivision.

Background – The applicant submitted a proposed Well Testing Application (Test Plan) under their October 26, 2006 cover. This plan was reviewed by the Town’s consultant, Stantec Engineering, who provided written comments dated March 5, 2007. In response to the Town’s comments, a revised Test Plan was submitted under the applicant’s April 5, 2007 cover and the applicant indicates verbal permission to proceed was received April 12, 2007. The pump testing program was begun with step-drawdown tests of Young’s Grove Well Nos. 1, 2 and 5 between May 21, 2007 and May 23, 2007. The Step-drawdown testing was performed to determine the relationship between the test yield and drawdown. Aquifer Testing (72-Hour Pumping) of Young’s Grove Well Nos. 1, 2 and 5 was performed between June 4, 2007 and June 14, 2007. The DEIS was accepted during the Board’s December 3, 2009 meeting and the public hearing was held between January and April 2010. The applicant submitted the FEIS in February 2012 and during your March 15, 2012 meeting you considered the FEIS for completeness. At that time, the applicant requested consideration of the 2007 well testing protocols.

General – This matter was last discussed during your April 19, 2012 meeting. At that time, the Board determined the Pump Test Program should be reviewed in accordance with the Town’s protocol for community water supplies (2007) which was in effect prior to the February 2009 adoption of the protocol for private (individual) well supplies. During the May 3, 2012 staff meeting we discussed our initial findings with the applicant and requested raw test data so protocol compliance could be confirmed. We received this afternoon, a CD ROM with the raw test data and have structured our comments accordingly.

HydroEnvironmental Solutions, Inc (HES), the Town’s groundwater hydrogeologist, has reviewed these materials and will address issues related to hydrogeology. Our comments pertain to compliance with the 2007 community protocols, or approved variations, where evident from materials submitted with the DEIS or FEIS. The appended comments are formatted to follow the water testing protocols. We believe this will make it easier to follow and for tracking responses.

“B. Protocols for Well Installation, Testing and Reporting – Community Water Supplies.

Purpose

The purpose of this document is to provide guidance to landowners who are planning to install water production wells in the Town of Goshen to serve new residential or commercial development. These protocols are intended for use as prescribed in § 97-27 of the Town of Goshen Zoning law for applicants seeking densities higher than those otherwise permitted by the AQ Overlay Zone. By following these procedures, the Town and the owner can:

- Ensure that the new well(s) can provide enough water for the proposed development.
- Ensure that the new well(s) will not adversely affect existing wells in the vicinity of the proposed wells.

These guidelines are based upon established principles and practices of hydrogeology. A licensed Professional Engineer must certify the work performed is as required herein.

Water Supply Capacity Determination – Procedures

The following items must be completed.

Determine Demand for Groundwater

Establish water demand using New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH) or Orange County Health Department requirements, whichever is more stringent. Fire protection must meet at least the minimum requirements of the National Fire Protection Association (NFPA) for building interior fire protection and/or Insurance Services Office (ISO) for exterior fire protection. The building inspector shall be consulted to ensure enough water is available for fire protection needs.

Contact Town of Goshen

Notify the Town Building Inspector of intent to propose additional lots through this procedure. Complete a “Preliminary Application Form” as seen in Attachment 1.

Test and Observation Well Location and Design

The Aquifer Test shall be conducted using one or more appropriately sized wells as the pumping wells (test wells) with at least four observation wells located at optimal locations. The test and observation wells shall be designed and located so as to provide sufficient data for the landowner to adequately assess the groundwater system capabilities, limitations and capacity.

The following information will assist in the well site location and design. A well location map shall be prepared identifying all of the well sites and observation well sites.

1. Identify Potential Well Site(s)

Conduct an initial investigation to select a desirable site based on the following:

- Reasonably uniform geology.
- Likelihood that groundwater contamination is low.
- Depletion of nearby streams and wetlands is unlikely.
- Interference with nearby wells is unlikely.

Use published geological maps to assist in choosing well location.

2. Observation wells.

All wells within 500 feet of the proposed well shall be monitored. If existing wells cannot be monitored, then observation wells must be installed to identify any impact. At least four monitoring wells are required for all hydrogeologic tests. The impact of all existing wells located along key fracture trends between 500 and 2,500 feet from the test well shall also be determined. Observation wells shall be shown on the well location plan.

Comment [s1]: Note Fracture Trace in FEIS Figure VI-7 [Informrational].

In addition, observation wells shall be situated and installed in the following manner:

Observation Well No.	Distance from pumping well	Vertical placement of screen opening
1	Ideally 1.5x saturated aquifer thickness; in any case, > 50 feet away and < 200 feet away	In aquifer being pumped
2	Ideally 5x saturated aquifer thickness; in any case < 1,000 feet away	In aquifer being pumped
3	Within 10 feet of pumping well	Shallower than pumping well to estimate vertical leakage from above
4	Within 10 feet of pumping well	Deeper than pumping well to estimate vertical leakage from below
5*	Same distance as first	In aquifer being pumped but perpendicular to a line drawn between the pumping well and the first observation well
6	As needed to investigate any hydrogeologic boundaries	Where needed
* Well five is mandatory if test well is a rock well		

Comment [s2]: Provide information to confirm compliance or explain non-compliance.

Aquifer Test Plan Proposal

Prepare and submit an Aquifer Test Plan Proposal to the Town of Goshen. The aquifer test shall be conducted at the proposed maximum withdrawal rate. An outline of the mandatory items for the Aquifer Test Plan proposal is included in Attachment 2.

The Town may approve, reject or request more information within 45 days of receipt of Aquifer Test Plan.

Obtain Permits

Prior to installing test wells and conducting any hydrogeologic tests, the following permits must be obtained, if and when applicable:

- Well drilling permit for each test and observation well (with Well Completion report in compliance with New York State Department of Environmental Conservation (NYSDEC) regulations, Environmental Conservation Law (ECL) section 15-1525);
- Discharge permit;
- Wetlands permit; and
- Other permits as may be necessary in accordance with Federal, State and Local regulations.

Install Wells

Install one appropriately sized test well based on water demands and hydrogeologic conditions at the location selected. Install an appropriate number of observation wells (but not less than four) to adequately characterize site hydrogeologic conditions. Well(s) shall not be installed until the Town of Goshen has approved the aquifer test plan.

Review the geologic log and yield during drilling to determine if the well(s) will be suitable for further investigation. Record field data during drilling, particularly fissure location, to facilitate analyses. Complete and file a Well Completion Report in compliance with NYSDEC.

Conduct Hydrogeologic Tests

The hydrogeologic tests that must be completed include a step-drawdown test and an aquifer test and/or the multiple-well (stress-test). A description of how to conduct these tests and what information must be recorded is included below.

1.0 Determine all External Influences and Methods for Observation

There are several external influences that must be monitored during background, testing and recovery. The following influences must be observed. A description of the method to monitor each of these influences is described below.

1.1 Test Well(s) Pumping Rate

Measure the pumping rate via flow using an automatic data recorder (ADR). Manually monitored data shall be collected for backup. The discharge flow rate shall be monitored and recorded manually at least once every 10 minutes during the first hour of the test and every 60 minutes thereafter.

Comment [s3]: Provide information to confirm compliance or explain non-compliance.

1.2 Test Well(s) Drawdown

Measure the test well drawdown using an automatic data recorder (ADR). Levels must be measured in decimal feet with an accuracy of 0.05 foot. Use the same reference point (relative to mean sea level) for each measurement. Backup manually monitored data shall be collected as well.

Comment [s4]: BTOC measurements to be converted to elevation or explain why not completed.

Water level measurements during the hydrogeologic tests shall be taken as follows:

Time Since Pumping Began	Time Between Measurements:
0 – 2 minutes	30 seconds
2 – 5 minutes	30 seconds
5 – 15 minutes	1 minute
15 minutes – 1 hour	5 minutes
1 – 2 hours	10 minutes
2 – 8 hours	30 minutes
8 – 24 hours	1 hour
24 – 72 hours	2 hours

Comment [s5]: Appears to have been taken every 1 minute; if so, explain reason.

Comment [s6]: Appears to have been taken every 1 hour; if so, explain reason.

Comment [s7]: Appears to have been taken every 1 hour; if so, explain reason.

1.3 Observation Wells Drawdown

Measure the observation well drawdown using an automatic data recorder (ADR). Levels must be measured in decimal feet with an accuracy of 0.05 foot. Use the same reference point (relative to mean sea level) for each measurement. Backup manually monitored data shall be collected as well.

Comment [s8]: Provide data so compliance may be confirmed; note any non-compliance and reason.

Water level measurements shall be taken as follows:

Comment [s9]: Appears generally to be taken every 1 minute or every 1 hour; if so explain reason.

Time Since Pumping Began	Time Between Measurements:
0 – 2 minutes	30 seconds
2 – 5 minutes	30 seconds
5 – 15 minutes	1 minute
15 minutes – 1 hour	5 minutes
1 – 2 hours	10 minutes

2 – 8 hours	30 minutes
8 – 24 hours	1 hour
24 – 72 hours	2 hours

1.4 Barometric Pressure

Measuring air pressure and correcting water level data for observed changes will increase the accuracy of the water-level data. Measure barometric pressure hourly during the hydrogeologic test and at four-hour intervals during the background and recovery period.

1.5 Precipitation

Manually record precipitation during the hydrogeologic test at one-hour intervals and provide local weather station precipitation data for the background, test and recovery periods.

1.6 Surface Waters

Two monitoring procedures can be used for wetland and surface water measurements for water bodies and wetlands within 500 feet of the test well.

The first method involves installing two very shallow well points, with short (< one foot) screens centered approximately three and six feet into the saturated zones, in or next to the surface water body. These well points shall be measured hourly during the test and at six-hour intervals during background and recovery.

The second method for standing bodies of water involves placing a staff gauge or measuring stake into the water and measuring the water height hourly during the test and at 6-hour intervals during the background and recovery period.

1.7 Streamflow

Streamflow measurements must be taken if the effect of the proposed diversion on nearby streamflow is of concern. Streams within 500 feet of the test well shall be evaluated.

The first method involves installing two very shallow well points, with short (< one foot) screens centered approximately three and six feet into the saturated zones, in or next to the streamflow. These well points shall be measured hourly during the test and at six-hour intervals during background and recovery.

The second method is performed by gauging streamflow. It is normally expected that the diversion's effect on streamflow will be such a small percentage of total streamflow that this method is likely inaccurate for measuring stream depletion.

1.8 External Pumpages

External Pumpages during background, testing and recovery shall be quantified.

2.0 Background Monitoring Period

All external influences shall be monitored at 6-hour intervals during a 48-hour background period just prior to the start of pumping.

Comment [s10]: Provide data so compliance can be confirmed; note any non-compliance and reason.

3.0 Hydrogeologic Tests

Once the approval is obtained to proceed with testing of the proposed production well, the step-drawdown test is done first, followed by the full-scale aquifer test or multiple-well test.

3.1 General Requirements for All Hydrogeologic Tests

The test well shall be pumped at the maximum anticipated withdrawal rate under normal operation. The pumpage rate shall not be allowed to vary by more than 10% from the initial rate (unless otherwise specified below). If the pump is turned off during the test, it must be restarted within 10 minutes. No more than one ten-minute break shall be allowed for every six hours of pumping. Because of the extreme importance of the early-time data for the analysis, the pump is NOT allowed to stop during the first two hours of an acceptable test. If the pump is stopped during this time, the test must be restarted after allowing for water levels in the test and observation wells to return to within 95% of pretest levels.

Comment [s11]: Applicant to confirm compliance without shutdowns (LBG provides 1 hour increments).

Water pumped from a well during any of the hydrogeologic tests shall be discharged to a point where it cannot infiltrate into the ground and flow back to the well during the test.

The pump test shall not be performed when the prior 30 days precipitation is greater than 3.7 inches. The precipitation shall be calculated based on the gauge at the Middletown, New York climate station.

Comment [s12]: Applicant addressed in FEIS. [Informational].

The test shall be designed to identify any impact to neighboring wells. It is the responsibility of the applicant to substantiate capacity through sufficient field data and hydrogeologic analyses.

3.2 Step-drawdown Test

A step-drawdown test is intended to provide information on the relationship between yield and drawdown in a well. A step-drawdown test involves increasing pumpage from a well in successive equal steps or stages. Pumping begins at a low rate then increases in successive steps. For wells in an unconsolidated formation the well shall be pumped at a minimum of five different rates or steps: 50%, 75%, 100%, 150% and

200%. At each step the pumpage rate is held constant for one hour or longer. If the highest pumping rate cannot be achieved, then a rate as high as possible shall be used.

Water levels in the pumping well shall be measured as frequently as necessary to observe significant changes in water levels. At a minimum, they shall be monitored every five minutes.

If the aquifer test is run immediately after the step-drawdown test, the water levels must be allowed to fully recover after the first test before running the second. The aquifer test may not be a continuation of the last pumping step of the step-drawdown test.

3.3 Aquifer Test

An aquifer test is designed to yield information on the hydrogeologic parameters of the ground-water system. Water is withdrawn from one well and drawdown is measured in several observation wells, including the pumping well. Measurements shall be taken for all of the observation points before the test (background), during the test, and during the recovery period. Wells shall be pumped at 100% of the maximum rate demand.

This test shall last for a minimum of 72 hours. At the end of 72 hours, the data shall be analyzed to determine if the well has stabilized at an equilibrium-type situation (this is less than 0.25 feet of drawdown between observations). If not, the test shall be extended.

Comment [s13]: Provide information to demonstrate compliance with code or approved protocol (LBG 4/6/07 (page 7)) or describe any deviation and relevance.

A full-scale aquifer test requires careful planning. Field personnel must install, service, and monitor all observation devices during the background, testing, and recovery periods. Backup equipment may be needed to insure an uninterrupted test. Planning for adverse weather conditions and mid-test interruptions is advised.

3.4 Multiple-well (aquifer-stress) Test

The purpose of a multiple-well test is to determine the effect of the proposed withdrawals when more than one well is being proposed for a site. The goal of the multiple-well test is to determine groundwater levels under multiple well pumping conditions and to examine its impact.

Background monitoring as described in Section 2 shall be conducted. After the background period, the proposed wells will be pumped at their maximum allowable pumpage rate for 72 hours for the 'stress' period. After the 'stress' period, the proposed well is shut off and allowed to recover. During this recovery, measurements are taken at all points every two hours.

4.0 Recovery Monitoring Period

Water level recovery in the pumping and observation wells must be measured. Unless otherwise specified, the recovery-monitoring period must last a minimum of eight hours and up until water levels have recovered to within 90% of drawdown. Recovery shall be monitored intensely immediately after the test well pump has been turned off. All observation points shall be observed at six-hour intervals or shorter where appropriate.

Comment [s14]: Provide data to demonstrate compliance with recovery or explain reason test was abbreviated prior to 90% recovery.

Water Quality Testing

A water quality sample shall be taken within the last two hours of the hydrogeologic testing for contaminants in the water. The contaminants to be tested shall be in compliance with Federal, State and Local requirements for potable water use. Consideration shall be given to incorporate additional contaminants in locations where a known contamination site exists proximate to the property boundaries.

Perform Hydrogeologic Analysis

After the hydrogeologic tests have been completed, the results must be analyzed. A description of information needed in the analysis is located below.

1. Step-drawdown Analysis

The results of the step-drawdown test shall be analyzed to compute the well-loss coefficient and the well efficiency. The well efficiency is the ratio between the theoretical and actual specific capacity of the well.

Comment [s15]: Applicant to calculate and provide.

2. Aquifer Test Analysis

Aquifers can generally be grouped as the following types:

- Confined (artesian)
- Unconfined (water table)
- Semiconfined (leaky artesian)

Aquifer tests are divided into unsteady-state (before drawdown has stabilized) and steady-state (after drawdown has stabilized). Analytical techniques exist to analyze this data based on the prevailing hydrogeologic conditions.

The aquifer storativity and transmissivity shall be calculated using Aqtesolv or a similar program.

3. Multiple-well Test Analysis

A multiple-well test analysis is conducted by evaluating the total drawdown at the observation points to determine the drawdown attributable to the proposed pumpage from multiple withdrawal points. A radius of influence shall be calculated using the data collected from this test.

Comment [s16]: Applicant to calculate and provide.

Hydrogeologic Report

A hydrogeologic report prepared by a licensed Professional Engineer according to the outline in Attachment 3 shall be submitted to the Town. The hydrogeologic report shall be certified by the landowner to be a complete analysis and an accurate representation of the hydrogeologic condition. The report, data and certification shall be submitted to the Town of Goshen for review. The raw test data shall be submitted in Excel or text format electronically on either a 3.5" diskette or CDROM. The test or observation wells may be converted to production wells for the proposed development provided they were properly constructed and meet NYSDEC requirements. The well location plan shall be included.

Comment [s17]: Report filed by CPG. [Informational].

Comment [s18]: Provide certification