

**HENDLER PROJECT
AQUIFER TEST PLAN PROPOSAL OUTLINE**

Project Overview

The Hendler Project includes the development of a planned adult community and a single family subdivision on a 91 acres tract encompassing three parcels identified as Section, Block and Lots 10-1-56.2, 56.3 and 56.4 in the Town of Goshen. The adult community is comprised of 167, two bedroom senior town homes and flats as well as a clubhouse facility and pool. The subdivision includes seven lots ranging in size from 0.52 acres to 1.04 acres containing four-bedroom single family homes. In addition an office building component is included in this study since the alternatives section in the Final Scoping Document requests a discussion of a partial site commercial use. See Figures 1 and 2 in Appendix A for a street map and tax map location plan.

Assuming individual metered service connections the estimated water demand for the planned adult community, single family homes, clubhouse pool and office buildings is shown in the table below.

Use	Unit	Demand rate per unit (gpd)	Estimated Average Daily Water Demand (gpd)	Estimated Average Daily Water Demand (gpm)
7 Single Family Homes (4 bedroom)	5 persons	75 per person	2,100	1.82
167 Town homes	2.5 persons	75 per person	31,313	21.74
Clubhouse Pool	30 swimmers	10 per swimmer	300	0.21
Office Buildings	30,000 SF	0.1 per SF	3,000	2.08
		TOTAL	36,713	25.85

The New York State Department of Health (NYSDOH) requires that the water supply must be equal to or greater than the design maximum daily demand which is calculated as twice the average daily water demand for residential uses plus the average daily demand for non-residential uses. Thus the proposed water supply must have the ability to produce 70,126 gpd or 48.70 gpm. NYSDOH also requires a minimum of two groundwater sources for a water supply system which meets the maximum daily demand with the best well out of service.

1.0 Site data

1.1 Location of all wells (Proposed Well Location Plan)

The site is located at the intersection of Cheechunk Road and 6 ½ Station Road. There are currently three existing onsite wells, which were drilled in the late 1980's, located adjacent to a gravel road

which runs through the northwest portion of the site. Figure 4 in Appendix A shows the existing conditions on the site as well as the existing well locations. At this time no additional wells are proposed.

1.2 Location of pertinent features

The site is bisected by a ridge that runs generally southwest to northeast. Significant wetlands are located at the most southeastern portion of the site as well as the most northwestern portion. A tributary of the Wallkill River runs along the southwestern property line and then through the center of the northernmost parcel.

1.3 Maps at appropriate scales (USGS topographic map, detailed site map at 1:6,000 or larger)

Maps of the project are included in Appendix A. Figures include

Figure	Description
1	Street Map
2	Tax Map
3	USGS Map
4	Well Location Plan

2.0 Hydrogeologic data

2.1 Estimates of transmissivity, storage, and other aquifer hydraulic characteristics from nearby wells or from published data

The Groundwater Resource Evaluation conducted by Wehran Engineering in August 1988 (attached as Appendix B) on the onsite wells estimated the following hydraulic characteristics

	Well 1	Well 3
Transmissivity (ft ² /day)	228.96	137.81
Storativity	1.96 x 10 ⁻⁵	3.59 x 10 ⁻⁴

Site-specific aquifer parameters will be calculated again from the proposed pumping test results.

2.2 Hydrogeologic setting of area

The site is located in the Wallkill River Drainage Basin. Previous site drilling operations indicated that the wells are located in Normanskill Formation bedrock which was mantled by glacial till deposits. Under static conditions the bedrock is a confined aquifer system. The local recharge area for the site is assumed to correspond to the Rio Grande/Cheechunk Creek basin; since the

bedrock is in a confined aquifer system. However it is believed that the recharge area actually includes most of the Walkill River valley upstream of the site. The previous groundwater evaluation indicated that seasonal trends are not significant on this site.

2.3 Local recharge/discharge estimates

In Orange County, the average precipitation is 43 inches per year (LBG, 2003). About half this amount is lost to evaporation and transpiration processes. The remainder is available to become surface-water and ground-water runoff. Ground-water recharge is derived from the portion of total rainfall and snowmelt that infiltrates the soil and overburden materials.

Based on local studies (Snively, 1980) the estimated recharge to till-covered metasedimentary bedrock is approximately 400,000 gpd/sq. mi. or 8.4 inches annually. This equates to 19.5 percent of the average annual local precipitation. Therefore, recharge directly to the 91 acre site would indicate recharge to the bedrock aquifer to be approximately 56,900 gpd.

Local discharge estimates resulting from the site via the unnamed tributary, wetland features and underflow from the site would be extremely difficult to estimate.

2.4 Nearby wells and their pumpage within 2,500 feet of well

There are no public ground water supply wells located within 2,500 feet of the project site currently being utilized. There are a few individual homeowner wells located within this distance.

3.0 Well data (pumping and observation wells)

3.1 Permit number

It is believed that Wells 1, 2 and 3 were drilled prior to the 1988 New York State Department of Environmental Conservation regulation requiring a permit number and therefore do not have a permit number.

The Town of Goshen Hydrogeologic Testing & Reporting Preliminary Application Form is attached as Appendix C.

3.2 Construction details

Since the wells are already installed no construction details have been included in this Test Plan.

3.3 Screened intervals and formation(s) tapped

The test wells are completed in bedrock with open bore holes.

3.4 *Well logs*

The well logs are attached as Appendix D.

4.0 **Test Description**

4.1 *Step-drawdown*

In our experience step-drawdown pumping tests do not offer any technically significant data in bedrock wells due to the nature of the rock formations and are therefore not typically run in these cases. In addition, a previous step-drawdown test was performed on Well 2 as part of a previous Groundwater Resource Evaluation which has been included as Appendix B of this report. The previous evaluation selected a rate of 90 gpm based on the results of the step-drawdown test for their Long Term Aquifer Test.

Therefore this aquifer testing plan does not propose to perform an additional step-drawdown test as part of the water supply study.

4.2 *Aquifer*

The bedrock wells are located in a confined aquifer. The aquifer storativity and transmissivity will be calculated as plan of the final Hydrogeological Report.

4.3 *Multiple-well*

The aquifer testing program will begin with an individual 72 hour pumping test of Well 2 with a 10 hp pump at 52 gpm. The goal of the test is to demonstrate Well 2 can supply the maximum daily water demand as the main production well. The test duration will be a minimum of 72 hours and demonstrate 6 hours of stabilized yield and drawdown during the last 6 hours as regulated by NYSDEC.

Following the completion of the test on Well 2 an individual 72 hour pumping test of Well 1 with a 10 hp pump at 50 gpm will be performed. The goal of the test will be to prove Well 1 as a back up well also capable of supplying the maximum daily water demand. The test duration will be a minimum of 72 hours and demonstrate 6 hours of stabilized yield and drawdown during the last 6 hours as regulated by NYSDEC.

These pumping tests are tentatively scheduled for the second week in December. The flow rate of the pumping wells will be monitored with a flow meter. The flow rate of the meter will be confirmed and calibrated with a measured bucket and stop watch every hour during the first 12 hours of the test and every 4 hours thereafter during the pump test.

During the 72 hour individual pumping tests on Wells 1 and 2 the respective on site non-pumping wells will be used as monitoring wells. In addition during both pumping tests, adjacent individual homeowner wells within a 1,500 foot radius from the pumping well(s), subject to securing permission from the well owner, will also be monitored. A copy of the letter to be used to obtain permission from the well owner to monitor their well is attached in Appendix E.

In significant areas of concern additional homeowner wells may be considered for monitoring wells up to 2,500 feet from the pumping wells. After permission letter responses have been received, offsite monitoring wells will be chosen, in consultation with the Town of Goshen's hydrogeologist, based on the number of responses received, well location, type of well and ease of accessibility. All offsite wells will be monitored using dedicated pressure transducers to minimize disruption to the homeowner. At least 4 offsite wells will be monitored.

Prior to pump shutdown, water quality samples will be collected from the pumping wells and analyzed for all chemicals listed in the New York State Sanitary Code, Subpart 5-1.

Since the wells are located within 200 feet of a surface water body (wetland), a microparticulate analysis will be performed to determine if the wells are under direct influence of the surface water body (wetland) as required by regulatory agencies.

5.0 Identification of external influences

5.1 Precipitation

Precipitation data for background, test and recovery periods will be measured on site with an automated weather station. Precipitation shall be measured to the nearest 0.01 inch.

5.2 Barometric pressure

Barometric pressure for background, test and recovery periods will be measured on site with an automated weather station. Barometric Pressure will be measured to the nearest 0.01 in.

5.3 Tidal influences

Since the site is not located in a coastal area, tidal influences will not be measured.

5.4 External pumpages

Offsite public water supply wells are located more than 2,500 feet from the site and are not expected to influence study and therefore

will not be measured. Existing individual homeowner wells are also not proposed for measurement due to their relatively low ground water withdrawal rate.

5.5 *Surface waters*

It is unlikely that there is a direct hydraulic connection between the bedrock aquifer and the adjacent stream and wetland features. However fluctuations in the stage of the nearby stream will be monitored to the nearest 0.01 ft.

6.0 Monitoring schedule for pre-pumping (background) period

6.1 *Length of period*

Background data collection of external influences will begin a minimum of 72 hours prior to the start of the test.

6.2 *Monitoring of relevant external influences*

The external influences that will be measured are precipitation, barometric pressure and stream surface water stage.

6.3 *Monitoring frequency*

External influences will be measured daily until the last 24 hours preceding the test when they will be measured at least every 12 hours with the last measurement immediately preceding the start of the test.

7.0 Monitoring schedule for observation wells

7.1 *Background, test and recovery-period monitoring schedules*

Water level readings in all monitoring wells will be conducted in accordance with New York State Department of Environmental Conservation Appendix 10, TOGS 3.2.1 which is attached as Appendix F.

Static water levels at the observation wells shall be measured every hour during the 24 hours prior to the start of the test.

The observation schedule during the test will generally follow the table below.

Time After Pumping Start (min)	Measurement Interval (min)
0-15	1
15-50	5
50-100	10
100-500	30
500-1000	60
1000-5000	240

The recovery readings will begin one minute prior to shutdown of the pumping well and will continue to be collected using the same procedure and time pattern followed during the test for at least 12 hours or extended until the water level in the pumping well has recovered to within 90 percent of the drawdown.

7.2 Monitoring techniques

Water level measurements shall be made to the nearest 0.01 foot. To obtain accurate data during the recovery period, a check valve will be installed at the base of the pump column pipe in the pumping well to eliminate backflow of water into the well.

8.0 Monitoring schedule for pumping well

8.1 Monitoring schedule

Water level readings in pumping wells will be conducted in accordance with New York State Department of Environmental Conservation Appendix 10, TOGS 3.2.1 which is attached as Appendix F.

Static water level in the pumping wells shall be measured each hour during 24 hours prior to the observation schedule prior to the test.

The observation schedule during the test will generally follow the table below.

Time After Pumping Start (min)	Measurement Interval (min)
0-15	1
15-50	5
50-100	10
100-500	30
500-1000	60
1000-5000	240

The recovery readings will begin one minute prior to shutdown of the pumping well and will continue to be collected using the same procedure and time pattern followed during the test for at least 12 hours or extended until the water level in the pumping well has recovered to within 90 percent of the drawdown.

8.2 Techniques for measuring water levels

The pumping well will be monitored using a dedicated pressure transducer with periodic manual readings collected as a back-up during the 72 hour testing program.

8.3 *Planned pumping rate*

The proposed pumping rates are as follows

Well Number	Pumping Rate (gpm)
1	50
2	52

8.4 *Discharge-measuring method and frequency*

The pumping rate for the wells will be measured using a flow meter. Manual back-up data will be collected periodically using a pre-measured bucket and stop watch. The discharge flow rate will be monitored and recorded manually at least every 15 minutes during the first hour the pump test and every 4 hours thereafter.

8.5 *Discharge locations and description*

Ground water discharge from the pumping wells will be discharged into the adjacent stream at a point close to Cheechunk Road downstream from the wells.

9.0 Monitoring schedule for relevant external influences and concerns

9.1 *Precipitation*

Precipitation data for background, test and recovery periods will be collected hourly using an on site automated weather station.

9.2 *Barometric pressure*

Barometric pressure for background, test and recovery periods will be collected hourly using an on site automated weather station

9.3 *Tidal influences*

Since the site is not located in a coastal area, tidal influences will not be measured.

9.4 *External pumpages*

Offsite public water supply wells are not expected to influence study since they are located more than 2,500 feet from the site and therefore will not be measured.

9.5 *Surface waters*

Fluctuations in the stage of the nearby stream will be read and recorded at least once daily for one week prior to the start of the test. During the test, readings will be taken twice per log cycle after the first ten minutes during the testing and recovery periods.

9.6 *Monitoring techniques*

Precipitation shall be measured to the nearest 0.01 inch. Barometric pressure will be measured to the nearest 0.01 inch. Precipitation and barometric pressure will be collected on site using an automated weather station.

Surface water stage shall be measured to the nearest 0.01 feet using a staff gauge (with stilling tube as necessary) or a nested piezometer. The horizontal distance between each observation point and the pumping wells will be measured to the nearest 0.1 foot. The vertical elevation of a fixed reference point on each observation point will be established to the nearest 0.01 foot and reported in standard USGS elevations.

10.0 Monitoring schedule for post-pumping (recovery period)

10.1 *Length of period*

The post pumping period will last a minimum of twelve hours after pumping ceases or until the water-level in the pumping well has recovered to within 90 percent of the drawdown.

10.2 *Monitoring of relevant external influences*

The external influences that will be measured are precipitation, barometric pressure and stream surface water stage.

10.3 *Monitoring frequency*

Water levels will be measured every hour for the first three hours and every 6 hour at a minimum thereafter. External influences will be measured as noted in section 9.0.

11.0 Applicable federal, state and local regulations and permits

11.1 *List of necessary permits*

New York State Department of Environmental Conservation- Water Supply Application.

11.2 *Status of permit applications*

The water supply taking permit from the New York State Department of Environmental will be applied for once the Town of Goshen grants preliminary approval for the project.

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