

Item 4 – Proposed Water Level Measurement Protocol

The Appointed Subcommittee tasked with reviewing proposed water level measurement protocol and taking comments from the public met on May 3rd at the District Office. Draft documents of proposed water level measurement protocol when using air line, e-line, steel tape, and pressure transducers was provided by John Seifert. Those attending the meeting were asked if they had any comments regarding protocol. Cathy Lazarus was not able to attend but provided information for the committee to consider. Lengthy discussion occurred relating to all aspects of the water level measuring program and protocol to be used.

Following is the protocol (by measuring method category) approved by the subcommittee for consideration by the Board of Directors.

Those in attendance at the subcommittee meeting were:

Pete Brien – Chairman
David Stratta – Subcommittee Member
Bill Harris – Board Member
Jim Mathews – Representing City of Bryan
Jayson Barfknecht – Representing City of Bryan
Mike Sutherland – Representing City of Bryan
David Coleman – Representing City of College Station
John Seifert – Hydrologist for BVGCD
Erin Atkinson – Representing Halff Associates
Alan Day – General Manager

**Brazos Valley GCD
Airline Measuring Procedure**

1. The well should be as close to a stable water-level condition as possible when taking a static water-level measurement. The well where the static water level is to be measured should not be pumped for a minimum of 24 hours prior to taking the static water-level measurements, if possible. If the well has been pumped less than 24 hours prior to taking the water-level measurement, record how long the pump has been off prior to taking the measurement. Also record if any wells within ½-mile that screen the same aquifer are pumping and could influence the water level when taking the measurement. This is mainly a concern in well field areas.
2. Prior to taking the water-level measurement, review previous water-level measurements to get an idea of how deep the water level may be encountered and records showing the depth setting of the airline.
3. Measure the height of the pressure gauge above ground level as this is typically where the airline setting depth is measured from.
4. Check and record depth of airline setting below ground level.
5. If the well equipped with a submersible pump, check whether the pump is in operation (if there is any vibration of the pump discharge pipe, the pump is in operation).
6. Use an air or nitrogen source with adequate pressure to blow air out the bottom of the airline.
7. Open the valve on the air supply.
8. Attached the air hose nozzle to the valve on the airline.
9. The needle on the pressure gauge should rise to the approximate pressure of air supply or pressure at bottom of airline as the water has been purged from the bottom of the airline.
10. Remove the air hose nozzle and the needle on the pressure gauge will slowly descend and stabilize at the static water-level pressure. If this does not occur, have a spare, quality pressure gauge available that can be installed and used on a temporary basis.
11. Record the measurement from the pressure gauge. The pressure gauge may provide readings of pressure in pounds per square inch (psi), feet of water or both. The recorded measurement should be in feet of water. If the pressure gauge only has psi readings, multiply the psi reading by 2.31 to convert the reading to feet of water.
12. The recorded measurement in Item 10. is how many feet of water is above the bottom of the airline. Subtract the measurement from the depth setting of the airline to convert the



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measurement to depth to water from land surface. (Example: If airline is installed to a depth of 400 feet and the pressure gauge reading is 150 feet above the bottom of the air line, the depth to water from land surface is $= 400' - 150' = 250'$ below land surface.

13. Repeat steps in Items 6.-11. to ensure an accurate measurement has been obtained.
14. Compare the reading with previous water-level measurements and verify a reasonable measurement has been obtained.
15. Record date and time of measurement, pumping conditions (Item 1.) and measuring point height above ground level (Item 3.).



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**Brazos Valley GCD
E-line Measuring Procedure**

1. The well should be as close to a stable water-level condition as possible when taking a static water-level measurement. The well where the static water level is to be measured should not be pumped for 24 hours prior to taking the static water-level measurements, if possible. If the well has been pumped less than 24 hours prior to taking the water-level measurement, record of how long the pump has been off prior to taking the measurement. Also record if any wells within ½-mile that screen the same aquifer are pumping and could influence the water level in the well when taking the measurement. This is mainly a concern in well field areas.
2. Identify a port or opening in the pump discharge head or in the pump foundation (surface casing vent pipe) that provides access for the e-line to the annulus between the surface casing and the pump column assembly.
3. Measure and record the height of the opening above ground level and this will become the measuring point. If possible, this measuring point should be used each time the water level is measured for consistency of measurements. If a different measuring point is used, record its height above ground level.
4. Prior to taking the water-level measurement, review previous water-level measurements to get an idea of how deep the water level may be encountered.
5. Lower the e-line into the annulus between the pump column and casing until the e-line signals it has encountered the water level in the well. Retract the e-line about one foot above where the e-line signaled and slowly lower again until the water level is encountered again.
6. Mark the wire on the e-line at the opening and measure the water-level depth on the e-line wire to the nearest 0.01-foot.
7. Retract the e-line about 5 feet, wait five minutes and repeat the process to ensure an accurate reading has been made. If both measurements are not within 0.05-foot of each other, record both.
8. Compare the reading with previous water-level measurements and verify a reasonable measurement has been obtained.
9. Record date and time of measurement, pumping conditions (Item 1.) and measurement point height above ground level (Item 3.).
10. Retract the e-line from the well and clean the lower 20 feet with Clorox wipes prior to measuring the water level in the next well.
11. Replace cap on port in discharge head or any other openings used to gain access to the well.

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**Brazos Valley GCD
Steel Tape Measuring Procedure**

1. The well should be as close to a stable water-level condition as possible when taking a static water-level measurement. The well where the static water level is to be measured should not be pumped for 24 hours prior to taking the static water-level measurements, if possible. If the well has been pumped less than 24 hours prior to taking the water-level measurement, record how long the pump has been off prior to taking the measurement. Also record if any wells within ½-mile that screen the same aquifer are pumping and could influence the water level in the well when taking the measurement. This is mainly a concern in well field areas.
2. Identify a port or opening in the pump discharge head or casing or in the pump foundation (surface casing vent pipe) that provides access for the steel tape to the annulus between the surface casing and the pump column assembly.
3. Measure and record the height of the opening above ground level and this will become the measuring point. If possible, this measuring point should be used each time the water level is measured for consistency of measurements. If not possible, record the height of the measuring point above land surface each time the static water level is measured.
4. Prior to taking the water-level measurement, review previous water-level measurements to get an idea of at what depth the water level may be encountered.
5. Use carpenter's chalk to coat the lowest 30 feet of the steel tape.
6. Lower the steel tape in the annulus between the pump column and casing or down a water-level measuring pipe until the depth of the tape is 10 feet lower than the last recorded static water level. Record the length of tape installed in the well with the footage marker exactly at the measuring point. Refer to this length as the "hold". Retract the steel tape and record the length of the tape to the nearest hundredth of a foot that is wet. This measurement is called the "cut". Record both measurements. Remove the wet chalk on the tape and rechalk the tape.
7. Wait 5 minutes and lower the tape one foot deeper than the hold depth on the previous measurement. Retract the tape and record the cut length. Subtract the cut length from the hold length to calculate the depth to water. The difference between the two measurements should be no greater than 0.02 feet. If the difference in depth to water is greater than 0.02 feet, repeat the procedure until two measurements are obtained that are within 0.02 of a foot of each other.
8. Compare the static water level measured during this visit to the well with the static water level measured during the last visit to the well to verify a reasonable measurement has been obtained.



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9. Record date and time of measurement, pumping conditions and measuring point height above ground level.
10. Remove the chalk from the steel tape and clean the lowest 30 feet with Clorox wipes before measuring the water level in another well.
11. Replace cap on port in discharge head or any other openings used to gain access to the well, if possible. If the well has a pump resting on top of the casing with space between the pump discharge head and casing, leave in same condition as found.

Brazos Valley GCD Pressure Transducer Utilization Protocol

Pressure transducers are utilized to measure and record accurate water levels in wells. The transducer measures pressure of the water column above the unit and is placed at a known depth in the well and a conversion of pressure from water above transducer to feet of water column is made. If a pump is already installed in the well, then the transducers is often installed just above the installed depth of the pump. If the well is open, then the transducer should be installed a minimum of about 50 feet below the deepest water level expected. Once feet of water above transducer are known, the pressure data is converted to feet of water above transducer. Many models of transducers allow you to program that level into the data set so that it records either depth to water or water-level elevation. Transducers are generally rated by the maximum pressure in pounds per square inch (psi) that the units will accurately measure. The model and pressure rating of transducers can be matched to the depth of well and expected depth of water above transducer. Many units operate best at about 10- to 90-percent of their full pressure rating. So for example, if a unit is rated at 100 psi, then it operates best at 10 to 90 psi (23 to 208 feet submergence). Additionally, many of the models will record and operate at pressures above their maximum pressure rating. Check the specifications on your selected model of transducer. The following are some general guidelines for transducers:

- 1) Select and purchase all equipment best suited for monitoring needs (static water level and well depth). Generally, the equipment needed for the transducer includes pressure transducer, cable, adapters for computer and software. Other optional equipment also is available from the vendor.
- 2) Install software to computer(s) that will be used to interface with the transducers. Manufacturer provides you with software to run equipment along with installation instructions.
- 3) Install transducer onto cable making sure to follow manufactures instructions. The transducers are waterproof if properly installed.
- 4) Connect cable to computer allowing software to establish signal to transducer.
- 5) Input correct settings for data recording task at hand. Determine how often water level will be recorded. Many models allow for recording to range from seconds to days.
- 6) Measure the static water level from ground surface with calibrated electric line to get baseline information.
- 7) Install transducer into well at a depth deemed suitable to capture all anticipated water levels.
- 8) Secure transducer and cable that is installed in the well to keep unit stable. Each manufacturer has different protocol for securing all equipment in well hole for monitoring long periods of time. Follow manufactures instruction for this step.
- 9) After transducer has been recording water levels for some period, days to potentially a month, download data. Depending on data storage capacity of transducer and frequency of measurements, time between advisable data downloads will vary. Follow Step 4 above and manufactures guidelines for downloading the data.
- 10) Disconnect cable and repeat Steps 5 thru 9 when the transducer is installed in another well.

