WELL DECOMMISSIONING

CONSTRUCTION SPECIFICATION

1. SCOPE

The work shall consist of sealing and permanent closure of a well that is no longer in use.

2. MATERIALS

In addition to the requirements listed below, all sealing materials, including water used for mixing, shall conform to the characteristics of ASTM D5299, "*Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities*."

A. *Neat cement grout* shall consist of a mixture of cement and water in the proportion of one (1) bag of Portland cement (94 pounds, ASTM C 150, Type I or API-10A, Class A) per five (5) to six (6) gallons of clean water from a known safe and uncontaminated source. Powdered bentonite may be added up to a ratio of five (5) pounds per 94 pound bag of cement.

B. *Concrete (sand-cement) grout* shall consist of a mixture of cement, sand, and water in the proportion of one (1) bag of Portland cement, (94 pounds, ASTM C 150, Type I or API-10A, Class A) and one (1) cubic foot of dry sand per five (5) to six (6) gallons of clean water from a known safe and uncontaminated source. The sand shall conform to ASTM C 33, fine aggregate for concrete.

C. *Sodium bentonite water slurry* (drilling mud and cuttings) shall have a mud weight of at least eleven (11) pounds per gallon and a sand content of ten (10) to twenty-five (25) percent by volume of the slurry. When a bentonite slurry is used to seal a well, the top five (5) feet of the well shall be filled with neat cement grout, concrete (sand-cement) grout, concrete, or approved bentonite chips.

D. *Clay slurry* is a fluid mixture of water, clean native or commercial clay and drill cuttings. The clay slurry shall have a mud weight of at least eleven (11) pounds per gallon.

E. *Bentonite chips* are irregularly shaped pieces of sodium bentonite that look very much like crushed limestone. The most current revision of the Wisconsin Department of Natural Resources publication PUBL-DG-016 contains a list of approved brands of bentonite chips that shall be used.

F. *Concrete* shall consist of a commercially prepared mixture of sand, gravel, Portland cement, and water. It shall contain at least 6 bags (94 pounds each) Portland cement per cubic yard and a maximum of 6 gallons of water per bag of cement. The maximum gravel size shall not exceed 1/3 of the inside diameter of the conductor pipe used to place the material.

G. *Conductor (tremie) pipe* shall be:

a) Metal pipe,
b) rubber-covered hose reinforced with braided fiber or steel with a minimum rating of 300 psi, or
c) thermoplastic pipe with a minimum rating of 100 psi. Thermoplastics include PVC, CPVC, PE, PB, or ABS and shall not be used for depths greater than 100 feet.

H. *Aggregates* can consist of sand, crushed stone or similar materials and must be uncontaminated and consistent in size to minimize bridging during placement.

I. *A bridge seal* consists of installing an expandable plug made of wood, neoprene, or other mechanical packer.

3. DECOMMISIONING PROCEDURES

All decommissioning procedures, and fill and sealing materials need to be selected with due consideration of the site-specific geological, biological, physical and climatic conditions, the chemical composition of the surrounding soil, rock and ground water at the well site, and the well's construction practices.

Unless otherwise set forth in Section 6, the following shall apply to this work:

Well preparation. Clear the well of all pumping equipment, valves, pipelines, grease, oil, scum, debris, and other foreign material. To the extent practicable, remove all casings, liners, and screens. Remove casing by either pulling or overdrilling (over-reaming) in accordance with guidance in ASTM D5299.

If some or all of the casing resists removal by pulling or overdrilling, it must be ripped, perforated, or cut off below the ground surface. For the cut-off depth, use the greater of two feet, the maximum potential depth for frost penetration, or the depth of any other near-surface soil fracturing process (such as desiccation).

Fill (plugging) materials. Select fill materials that are free of clay, silt, and organic and foreign matter. Select a soil gradation and a filling process that will not cause bridging during installation. If allowed by State regulations, fill materials, such as sand, pea gravel, sand-gravel mix, crushed rock, or agricultural lime, can be used to fill the well provided that the zones of sealing material conform to requirements in ASTM D5299.

Plugging and sealing procedures. Do not place sealing and fill materials until after completion of the disinfection process, if conducted.

The first layer of fill material will be placed in the bottom of the well and will extend upward to a point that is no less than one foot above the top of the lowest water-bearing zone.

Place sealing material in a layer no less than one-foot thick above the top of the first layer of fill material. Sealing materials are used to restrict vertical movement of water and to prevent comingling of waters from different production zones. Install an alternating sequence of one-foot of sealing material and a maximum of 10 feet of fill material throughout the remaining well column. If another water-bearing zone is encountered, adjust the spacing of the fill layers so that the zone is sealed. Fill the borehole to a point that is two feet from the ground surface or to the top of the cutoff casing, whichever is greater. The last layer must be a sealing layer.

Use installation methods that avoid segregation, dilution, or bridging of the fill or sealing material.

For wells greater than 30 inches in diameter, place and compact backfill in a manner that minimizes segregation and bulking and prevents surface subsidence.

Casings grouted-in-place. Use a pressurized grouting procedure that will completely fill and seal all open spaces in the annulus. Acceptable grout sealant includes a combination of cement, sand, or bentonite that conforms to guidance provided in ASTM D5299.

If casings are within a collapsing formation, conduct the grouting procedures concurrently with removal of the casing so that the bottom of the casing remains submerged in the grout.

Well-head seal. If required in Section 6, before sealing the well, bring the entire column of well water to an available chlorine concentration of no less than 50 ppm, or use the greatest concentration specified by state/local regulations. Agitate the well water and keep the solution undisturbed for no less than 12 hours to assure complete disinfection.

Seal the interval between the ground surface and the top of the cut-off casing or last sealed layer with materials that conform to guidance in ASTM D5299. These materials may be an extension of the sealing materials used below this depth.

Mound the well-head seal about the ground surface. The soil material or sealing materials shall achieve an in-place hydraulic conductivity equivalent to or less than the surface soil surrounding the well. Grade the ground surface at the well-head in a manner that prevents ponding of surface water at the well-head.

Control of artesian pressure. If a well is under artesian pressure (flowing or not flowing), maintain a sufficiently high grout pressure to

counteract the artesian pressure until initial grout set occurs. Use procedures for balancing pressures during grouting operations given in ASTM D5299.

4. MARINGS AND CERTIFICATIONS

Markings on material identifying the manufacture and indicating compliance with appropriate specification(s) can be accepted as evidence that the material meets the requirements of this specification. If the material does not bear these markings, the manufacturer must certify that it complies with the requirements of this specification.

If required in Section 6, place a metal "target" to the top 3 inches of well-head seal so that the decommissioned well may be easily located with a metal detector.

5. REPORTING

The owner or his/her agent shall notify PA DCNR Bureau of Topographic and Geological Survey of their intent to decommission a well at least 10 days before the well is to be sealed or filled.

As part of this process, they will fill out the "Well Abandonment Form" as found in the most current "*Ground Water Monitoring Guidance Manuel"* by PA-DEP in Chapter 7, Well Abandonment Procedures.

The contactor shall certify his work upon completion of the project for certification to PA-DCNR.

The contractor shall maintain records to include:

- Location of the decommissioned well by Global Positioning System (GPS), latitude/longitude, township/range, or other georeferencing convention, of such precision that allows the ready location of the site
- Date of completion of well decommissioning
- Name of landowner
- Name, title, and address of person responsible for well decommissioning
- Well diagram, showing depths, diameters, metal target for future location if applicable, perforations, etc.
- Length of casing prior to decommissioning
- Length of casing removed or length of casing cut off below ground level
- Lengths of casing ripped or perforated and the method used
- Type or schedule of casing material (e.g., standard weight steel, or PVC Sch-80)
- Static water level measured from ground surface prior to decommissioning
- Photographs before and after decommissioning
- Types of materials used for filling and sealing, quantities used, depth intervals for installation of each type of material, and the placement method used
- Detailed documentation of all other information pertinent to site conditions and other problems encountered during decommissioning.

6. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE: