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Mr. Robert Schnitzler
Pennsylvania American Water Company
105 Sodom Road
Milton, PA 17847

Re: Comments on Proposed Changes to PADEP Chapter 78 Oil and Gas Wells Well Casing and Cementing Regulations

Dear Bob:

The purpose of this letter is to present *Meiser & Earl, Inc.'s* (M&E's) comments regarding the proposed changes to PADEP Chapter 78 Oil and Gas Wells – Well Casing and Cementing regulations. The language from the portion of the regulation being commented on has also been included for the readers benefit. The language utilized in this letter is from the IRRC's version of the Chapter 78 changes provided by Pennsylvania American Water Company (PAWC).

Casing and Cementing

§78.82 Use of the conductor pipe.

If the operator installs conductor pipe in the well, the [operator may not remove the pipe] following provisions shall apply:

(2) Conductor pipe shall be installed in a manner that prevents infiltration of surface water or fluids from the operation into groundwater.

Comment: The conductor pipe should have a cemented or otherwise sealed annulus.

§ 78.83 Surface and coal protective casing and cementing procedures.

[(a)] (b) If the well is to be equipped with threaded and coupled casing, the operator shall drill a hole so that the diameter is at least 1 inch greater than the outside diameter of the casing collar to be installed. If the well is to be equipped with plain-end welded casing, the operator shall drill a hole so that the diameter is at least 1 inch greater than the outside diameter of the [casing tube] centralizer band.

Comment: For a public water supply well, the grouted surface casing annulus is meant to protect the fresh groundwater from surface water infiltration as well as other contaminants that could migrate down the annulus. The oil/gas well surface protective casing cemented annulus is meant to do the same thing with the

additional task of protecting the fresh groundwater from contaminants that could migrate up the annulus. Therefore, operators should provide the same level of protection with the oil/gas well surface protective casing annulus by requiring the same minimum 1.5-inch cemented annulus that is required in a public water supply well.

78.83 [(b)] (c) [Except as provided in subsection (c), t] The operator shall drill to approximately 50 feet below the deepest fresh groundwater or at least 50 feet into consolidated rock, whichever is deeper, and immediately set and permanently cement a string of surface casing to that depth. The surface hole shall be drilled using air, freshwater, or freshwater based drilling fluid. The surface casing seat shall be set in consolidated rock. When drilling a new well or redrilling an existing well, the operator shall install at least one centralizer within 50 feet of the casing seat and then install a centralizer in intervals no greater than every 150 feet above the first centralizer.

Comment: Operators should be required to determine, through a test well, the depth of "deepest fresh groundwater" for a given area. How else would an operator know the depth of the deepest fresh groundwater in a particular area?

The definition of fresh groundwater should include some reference to potability e.g. total dissolved solids less than 500 mg/l.

§ 78.83 (f) If additional fresh groundwater is encountered in drilling below the permanently cemented surface casing, the operator shall protect the additional fresh groundwater by installing and cementing a subsequent string of casing or other procedures approved by the Department to completely isolate and protect fresh groundwater. The string of casing may also penetrate zones bearing salty or brackish water with cement in the annular space being used to segregate the various zones. Sufficient cement shall be used to cement the casing at least 20 feet into the permanently cement surface casing.

Comment: See comment for (c) above.

78.83 (h) Unless an alternative method has been approved by the Department in accordance with §78.75 (relating to Alternative methods), [W]when a well is drilled through a coal seam at a location where the coal has been removed or when a well is drilled through a coal pillar, the operator shall drill to a depth of at least 30 feet but no more than 50 feet deeper than the bottom of the coal seam. The operator shall set and cement a coal protection string of casing to this depth. The operator shall equip the casing with a cement basket or other similar device above and as close to the top of the coal seam as practical. The bottom of the casing shall be equipped with an appropriate device designed to prevent deformation of the bottom of the casing. The interval from the bottom of the casing to the bottom of the coal seam shall be filled with cement either by the balance method or by the displacement method. Cement shall be placed on top of the basket between the wall of the hole and the outside of the casing by pumping from the surface. If the operator penetrates more than one coal seam from which the coal has been removed, the operator shall protect each seam with a separate string of casing that is set and cemented or with a single string of casing which is stage cemented so that each coal seam is protected as described in this subsection. The operator shall cement the well to isolate workable coal seams from each other.

Comment: How will an operator distinguish between a location where the coal has not been removed and a coal pillar?

§ 78.83 (j) If it is anticipated that cement used to permanently cement the surface casing can not be circulated to the surface a cement basket may be installed immediately above the depth of the anticipated [last] lost circulation zone. The casing shall be permanently cemented by the displacement method. Additional cement may be added above the cement basket, if necessary, by pumping through a pour string from the surface to fill the annular space.

Comment: If cement is not circulated to the surface, the operator should be required to demonstrate that the annulus is properly cemented by logging or other suitable method.

§78.83a. Casing and cementing plan.

(a) The operator shall prepare and maintain a casing and cement plan showing how the well will be drilled and completed. The plan must demonstrate compliance with this subchapter and include the following information:

(1) The anticipated depth and thickness of any producing formation, expected pressures, and anticipated fresh groundwater zones;

(2) Diameter of the well bore;

(3) Casing type, whether the casing is new or used, depth, diameter, wall thickness and burst pressure rating;

(4) Cement type, yield, additives, and estimated amount;

(5) Estimated location of centralizers;

(6) Alternative methods or materials as required by the Department as a condition of the well permit.

(b) The plan must be available at the well site for review by the Department.

(c) Upon request, the operator shall provide a copy of the well specific casing and cementing plan to the Department for review and approval.

(d) Any revisions to the plan made as a result of on-site modification shall be documented in the plan by the operator and be available for review by the Department.

Comment: The casing and cementing plan should include size of the proposed annulus for all protective casings that are to be cemented in place. The annulus for protective casings that are to be cemented in place should be a minimum of 1.5 inches.

§78.83b. Casing and cementing – lost circulation.

(a) If cement used to permanently cement the surface or coal protective casing is not circulated to the surface despite pumping a volume of cement equal to or greater than 120% of the calculated annular space, the operator shall notify the Department and meet one of the following requirements:

(1) Run an additional string of casing at least 50 feet deeper than the surface casing and cement the second string of casing back to the seat of the surface or coal protective casing and vent the annulus of the additional casing string to the atmosphere at all times unless closed for well testing or maintenance. Shut-in pressure on the casing seat of the second string of casing must not exceed the requirements of section 78.73 (c).

(2) If the additional string of casing is the production casing, the operator shall set the production casing on a packer in a competent formation below the surface casing seat, and vent the annulus of the production casing to the atmosphere at all times unless closed for well testing or maintenance.

(3) Run production casing at least to the top of the formation that is being produced and cement the production casing to the surface.

(4) Produce oil but not gas and leave the annulus between the surface casing and the production pipe open.

(b) If cement used to permanently cement the surface or coal protective casing is not circulated to the surface, the Department may require the operator to determine the amount of casing that was cemented by logging or other suitable method.

Comment: If cement used to permanently cement the surface or coal protective casing is not circulated to the surface, the Department will require the operator to determine the amount of casing that was cemented by logging or other suitable method.

§78.83c. Intermediate and production casing.

(a) Except as provided in §78.72 (relating to Use of safety devices – blow-out prevention equipment), intermediate and production casing must be cemented according to this section.

(b) If the well is to be equipped with an intermediate casing, the casing must be cemented from the casing seat to a point at least 500 feet above the seat. If any producing horizon is open to the well bore above the casing seat, the casing must be cemented from the casing seat up to a point at least 500 feet above the top of the shallowest productive horizon, or to a point at least 200 feet above the shoe of the next shallower casing string that was set and cemented in the well. The intermediate casing may be perforated to produce gas or oil a shoe test demonstrates a pressure gradient greater than 0.465 psi/ft multiplied by casing length in feet.

(c) Except as provided for in §78.83 (relating to surface and coal protective casing and cementing procedures), each well must be equipped with production casing. The production string may be set on a packer or cemented in place. If the production casing is cemented in place, cement must be placed by the displacement method with sufficient cement to fill the annular space to the surface or to a point at least 500 feet above the production casing seat.

Comment: The minimum cement thicknesses should be verified by logging or other suitable method, e.g., ". . . , the casing must be cemented from the casing seat up to a point at least 500 feet above the seat."

§78.85. Cement standards.

(a) When cementing surface casing, coal protective casing and intermediate casing when the intermediate casing is used in conjunction with the surface casing to isolate fresh groundwater. [T] the operator shall use cement that [will resist degradation by chemical and physical conditions in the well.] meets or exceeds the ASTM International C 150, Type I, II or III Standard or API Specification 10. The cement must also:

(1) Secure the casing in the well bore;

(2) Isolate the well bore from fresh groundwater;

(3) Contain any pressure from drilling, completion and production;

(4) Protect the casing from corrosion;

(5) Resist degradation by the chemical and physical conditions in the well;

(6) Prevent gas flow in the annulus.

(b) [The operator shall permit the cement to set to a minimum compressive strength of 350 pounds per square inch (psi) in accordance with the American Petroleum Institute's API Specification 10. The operator shall permit the cement to set for a minimum period of 8 hours prior to the resumption of actual drilling.] After the casing cement is placed behind surface casing and intermediate casing when the intermediate casing is used in conjunction with the surface casing to isolate fresh groundwater, the operator shall permit the cement to set to a minimum designed compressive strength of 350 pounds per square inch (psi) at the casing seat.

(c) After the casing cement is placed and cementing operations are complete, the casing may not be disturbed for a minimum of eight (8) hours by:

(1) Releasing pressure on the cement head, if float equipment check valves did not hold or float equipment was not equipped with check valves;

(2) Nippling up on or in conjunction to the casing;

(3) Slacking off by the rig supporting the casing in the cement sheath; or

(4) Running drill pipe, wireline, or other mechanical devices into or out of the wellbore.

[(c)] (d) Where special cement or additives are used, the operator may request approval from the Department to reduce the cement setting time specified in the subsection [(b)] (d).

(e) The operator shall notify the Department a minimum of one day before cementing of the surface casing begins, unless the cementing operation begins within 72 hours of commencement of drilling.

(f) A copy of the cement job log must be available at the well site for inspection by the Department during drilling operations. The cement job log shall be maintained by the operator after drilling operations for at least five years and be made available to the Department upon request.

Comment: Will the Department allow the use of cement additives within the fresh groundwater zone in the vicinity of drinking water wells? If so, what additives will be allowed and will they meet NSF Standard 60 referenced by the Safe Drinking Water Act?

The type of cement, additives and temperature should be considered when determining the minimum cure time.

Sincerely,

Jay F. Lynch, P.G.
Principal Hydrogeologist

JFL/mlr/mma