RECEIVED
IRRC

2015 MAY 22 AM 9: 05

Peter M Demicco, PG
310 Newark Road
Landenberg, PA 19350

Pdemicco@hotmail.com

Comments on CHAPTER 78a. UNCONVENTIONAL [OIL AND GAS] WELLS:

§ 78a.1. Definitions.

Fresh groundwater—*Water in that portion of the generally recognized hydrologic cycle which occupies the pore spaces and fractures of saturated subsurface materials.*

Comment – Typical definition of fresh water, brackish water, salt water and brines are based on specific total dissolved solid concentration and not generic as presented above. Hydrogeological systems that have brackish water are part of the hydrologic cycle and occupies the proe spaces and fractures of saturated subsurface materials. Please define freshwater based on less than 0.05 % salinity. (see below)

Water salinity based on dissolved salts			
Fresh water	**Brackish water**	**Saline water**	**Brine**
< 0.05%	**0.05–3%**	**3–5%**	**> 5%**

Nonporous material—*Nontoxic earthen mud, drill cuttings, fire clay, gel, cement or equivalent materials approved by the Department that will equally retard the movement of fluids.*

Comment – Typically drill cuttings are not considered to be a "nonporous material." Drill cuttings can be very permeable depending on the materials encountered during drilling, specifically sandstones and conglomerates. Drill Cuttings should be removed from the definition of "nonporous material."

Permanently cemented—*Surface casing or coal protective casing that is cemented until cement is circulated to the surface or is cemented with a calculated volume of cement necessary to fill the theoretical annular space plus 20% excess.*

Comment – permanently cemented should include not only the surface casing or coal protective casing, but also the intermediate casing and the production casing. Grouting of the well is discussed in detail below.

Regional groundwater table—
(i) The fluctuating upper water level surface of an unconfined or confined aquifer where the hydrostatic pressure is equal to the ambient atmospheric pressure.
(ii) The term does not include the perched water table or the seasonal high groundwater table.

Comment – 1.) The textbook definition of "unconfined" is where the upper ground water surface is equal to ambient atmospheric pressure. A "confined" aquifer is an aquifer where the water is under pressurized conditions such that the water level rises above the top of the confining unit. Confined aquifers are not subject to ambient atmospheric pressures and should be removed from the definition of regional groundwater table.
2.) By definition, the seasonal high groundwater level is part of the regional groundwater table during the wet portion of the year. Seasonal high groundwater levels are critical in the downward migration of ground water into the deeper portions of the aquifer during the spring season due to the additional head pressure that occurs during this time period. To equate seasonal high groundwater levels to perched ground water is technically incorrect based on mainstream hydrogeological textbooks.

As discussed below, draining of seasonal high ground water is damaging to the overall rates of recharge to the deeper rock aquifers and should not be allowed.

Seasonal high groundwater table—*The saturated condition in the soil profile during certain periods of the year. The condition can be caused by a slowly permeable layer within the soil profile and is commonly indicated by the presence of soil mottling.*

Comment – The definition of seasonal high groundwater table should not include any reference to slowly permeable layers within the soil profile. Seasonal high groundwater table is the increased water level and saturation zone in the upper part of the regional groundwater table and is not dependent on slowly permeable layers. Defining the seasonal high groundwater table in this manor is inappropriate as this definition allows for draining of this zone for impoundments. Low permeable zones belong only in the definition of perched groundwater. The seasonal high groundwater is critical in increasing ground water recharge into deeper portions of the regional water table aquifer by increasing, in a significant amount, the vertical head pressure in the primary recharge period of the year. Draining seasonal high recharge has detrimental impacts on the annual recharge to the water table aquifer and must be discouraged.

Water protection depth—*The depth to a point 50 feet below the surface casing seat.*

Comment – The definition of water protection depth is unclear. How can the protection depth be greater that the surface casing seat. The water protection depth should be less than or equal to the surface casing seat.

Water source—

(C) Mine pools and discharges.

(D) Any other waters that are used for drilling or completing a well in an unconventional formation.

Comment – water sources for drilling should be limited to potable water that is certified to be bacteria free to prevent contamination of the water table and shallow freshwater aquifers during drilling of conductor casings, surface casings, and intermediate casings.

[end of definition comments]

78a.51. Protection of water supplies.

(c) Within 10 **calendar** days of the receipt of the investigation request, the Department will investigate the claim and will, within 45 **calendar** days of receipt of the request, make a determination.

Comment – The time allotted for investigation and conclusion of 45 days is inadequate for a proper investigation. The time period of 45 calendar days barely allows time for obtaining and receipt of laboratory analytical results. In addition, water elevation data and pressure transducer data should be collected over a several week period to compare events at the gas well to the impacted well. A proper hydrologic evaluation will take a minimum of 45 days od data collection and then analysis. A 90 day time period is the minimum for an adequate investigation.

---

§ 78a.59b. Freshwater impoundments.

(d) Freshwater impoundments shall be constructed with a synthetic impervious liner.

Comment – Given the nature of the material stored and the expense associated with clean up, a double liner system with leak detection between layers must be considered. The leak detection system is the critical part of the double liner system.

---

§ 78a.59b. Freshwater impoundments.

*(f) The bottom of the impoundment shall be at least 20 inches above the seasonal high groundwater table. The applicant may maintain the required separation distance of 20 inches by PASSIVE artificial means such as an under-drain system throughout the lifetime of the impoundment. **In no case shall the regional groundwater table be affected.** The operator shall document the depth of the seasonal high groundwater table, the manner in which the depth of the seasonal high groundwater table was ascertained, the distance between the bottom of the impoundment and the seasonal high groundwater table, and the depth of the regional groundwater table if the separation between the impoundment bottom and seasonal high groundwater table is maintained by artificial means.*

Comment – The statement that "In no case shall the regional groundwater table be affected" is not possible if the seasonal high ground water table is being drained. The drained seasonal high groundwater is the recharge that eventually moves into and becomes the regional groundwater table. It is important to remember that the elevated seasonal high groundwater table provides the additional head level that promotes a higher rate of recharge in the late spring than at any other time of the year. To remove and drain the seasonal high groundwater is to remove the annual recharge reaching the aquifer and should not be allowed.

There appears to be some confusion as to the definition of seasonal high groundwater and perched groundwater tables both in this section and in the definition section. In either case, shallow ground waters should not be drained as these resources support wetland hydrology in the dry, hot summer months as well as baseflow and other features such as vernal pools.

---

§ 78a.68. Oil and gas gathering PIPELINES [lines].

Comment – The section should contain more detail on pipeline construction specifically installation of hydraulic dams to prevent the rapid dewatering of shallow ground water. The dewatering occurs through preferential migration of groundwater down the pipeline backfill resulting in lowered groundwater recharge and dewatering of shallow groundwater that supports upland wetlands, vernal pools and other shallow groundwater features.

---

§78a.69. Water management plans.

Comment – The section should contain more detail on restrictions on low flow stream conditions that must be avoided and could limit flow to relatively high flows such as 2Q30, (two year mean low flow with a 30 day reoccurrence interval). High flow storm water flow skimming should be encouraged and added to the regulations.

78a.71. Use of safety devices–well casing.

(b) The operator shall determine the amount and type of casing to be run and the amount and type of cement to be used in accordance with current prudent industry practices and engineering. In making the determinations, the operator shall consider the following:

(1) Successful local practices for similar wells.

(2) Maximum anticipated surface pressure.

Comment – The section should contain specific requirements on cement thickness, casing requirements, cement mixtures instead of relying on successful local practices for similar wells and suspected surface pressures. A strict requirement of 2 inches of cement grout, Type I or II Portland cement mixed to specific maximum strength requirements for each casing should be required.

§ 78a.72. Use of safety devices–blow-out prevention equipment.

(k) The minimum amount of intermediate casing that is cemented to the surface to which blowout prevention equipment may be attached, shall be in accordance with the following:

Proposed Total Vertical Depth (in feet)	*Minimum Cemented Casing Required (in feet of casing cemented)*
Up to 5,000	*400*
5,001 to 5,500	*500*
5,501 to 6,000	*600*
6,001 to 6,500	*700*
6,501 to 7,000	*800*
7,001 to 8,000	*1,000*
8,001 to 9,000	*1,200*
9,001 to 10,000	*1,400*

Comment – The section should be deleted as to prevent buildup of surface pressures the entire intermediate casing should be grouted into place. Several thousand feet of ungrouted borehole will allow for movement of gas and/or other contaminants from deep zones up to the surface casings seats. The surface casings will prevent further movement of up the borehole, but will not prevent migration of fugitive gas into shallow fractured rock. The overburden pressure at this depth is far less than from several thousand feet deep. The shallow rock may fracture further under the pressures from deep gas sources (shales above the Marcellus and shales in the Pennsylvanian Formations) moving and then migrate horizontally and vertically until the gas reaches shallow potable water zones. All well casings should be cemented into place as insurance against short term and long term migration of fugitive gases and other contaminants into shallow zones. The cost of the cement is relatively small compared to the expense of contamination of shallow ground water for hundreds, even thousands, of feet away from a well.

Proper grouting of the intermediate casing should prevent the following issues noted in the regulations from occurring:

[(c)] (e) *After a well has been completed, recompleted, reconditioned or altered the operator shall prevent surface shut-in pressure and surface producing back pressure* ***inside the surface casing or coal protective casing*** *from exceeding the following pressure: 80% multiplied by 0.433 psi per foot multiplied by the casing length (in feet) of the applicable casing.*

[(d)] (f) *After a well has been completed, recompleted, reconditioned or altered, if the surface shut-in pressure or surface producing back pressure exceeds the pressure as calculated in subsection* ***[(c)] (e), the operator shall take action to prevent the migration of gas and other fluids from lower formations into fresh groundwater. To meet this standard the operator may cement or install on a packer sufficient intermediate or production casing*** *or take other actions approved by the Department. This section does not apply during testing for mechanical integrity in accordance with State or Federal requirements.*

---

§ 78a.83. Surface and coal protective casing and cementing procedures.

(a) For wells drilled, altered, reconditioned or recompleted after February 5, 2011, surface casing or any casing functioning as a water protection casing may not be utilized as production casing unless one of the following applies:

(1) In oil wells where the operator does not produce any gas generated by the well and the annulus between the surface casing and the production pipe is left open.

(2) The operator demonstrates that the pressure in the well is no greater than the pressure permitted under § 78a.73(c) (relating to general provision for well construction and operation), demonstrates through a pressure test or other method approved by the Department that all gas and fluids will be contained within the well, and installs a working pressure gauge that can be inspected by the Department.

(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 coupling.

Comment – Under no circumstances should a surface casing or any casing functioning as a water protection casing be utilized as production casing. IN addition, 1 inch of grout is inadequate and should be increased to 2 inches.