COLORADO
Division of Water Resources
Department of Natural Resources
Board of Examiners of Water Well Construction
and Pump Installation Contractors

November 5, 2018

POLICY 2018-2

CLARIFICATION OF RULE 16.2, GROUTING REQUIREMENT FOR TYPE I AQUIFER WELL ABANDONMENT

INTRODUCTION

Rule 16.2 addresses the grouting requirements for proper abandonment of wells completed in Type I (confined) aquifers. This rule is inclusive of both single and multiple confining layer Type I aquifers:

> **16.2 Abandonment of Wells or Boreholes in Type I Aquifers (confined aquifers)**
> Wells which were constructed through more than one aquifer must be plugged and sealed by placing a cement grout plug at the confining layer above each aquifer. If well construction records do not show that the casing opposite each confining layer was grouted when originally installed, the casing must be either completely removed from the hole, or perforated or ripped opposite such layer prior to placing the grout plug. Plugs must be no less than sixty (60) feet in length and must be designed to withstand the maximum potential hydrostatic pressure differential between the aquifers. The well casing, except for the grout plug intervals, must be completely filled to the land surface with clean native clays, cement, or high-solid bentonite grout. A watertight cover must be permanently welded or attached to the top of the casing.

In the event that a Type I well is to be abandoned and does not have a construction record documenting the placement of cement grout adjacent to a confining layer in the annular space between the borehole and plain well casing, the rule states "...the casing must be either completely removed from the hole, or perforated or ripped opposite such layer prior to placing the grout plug." A question has arisen regarding whether the term "...perforated or ripped opposite such layer..." means the casing must be perforated or ripped

a) opposite the entire confining layer, or
b) opposite a grout plug interval "...no less than sixty (60) feet in length...".

DISCUSSION

During abandonment of Type I aquifer wells that do not have any cement grout in the annular space adjacent to a confining layer, it is necessary to rip or perforate casing adjacent to confining layers and force grout into the annular space for two reasons: to maintain the natural

separation between aquifers and to eliminate a source of contamination to the aquifers. The hydraulic separation of aquifers can generally be accomplished by means of a minimum 60-foot grout plug adjacent to the confining layer. On the other hand, eliminating a source of contamination to a well from a specific stratigraphic zone penetrated by the well, may require isolation of an interval much larger than 60 feet.

An obvious example is found in the confining Laramie Formation shale interval of the Denver Basin that is often 300 feet thick or more and contains zones of poor water quality associated with coal, carbonaceous shale, and sulfide minerals. To protect the water quality of the Arapahoe aquifer above this shale interval and the Laramie-Fox Hills aquifer below, it is necessary to rip or perforate casing and pressure grout adjacent to the full Laramie Formation shale interval. This practice conforms with Rule 10.4.8 concerning the grouting of wells completed in the Laramie-Fox Hills aquifer.

Furthermore, the language used in Rule 16.2, "...perforated or ripped opposite such layer prior to placing the grout plug", implies that when abandoning a Type I well, the casing should be perforated or ripped opposite the whole confining layer. The only limitation put on the grouting of confining layers is a minimum grout interval of "...no less than sixty (60) feet in length...", not a maximum grout interval limitation. This part of the rule addresses the situation of confining layers less than 60 feet in thickness such that they will be sealed with at least 60 feet of grout in the annular space.

POLICY

During the abandonment of Type I wells, if

1) well construction records do not show the casing opposite each confining layer was grouted when originally installed and
2) the well casing is not completely removed from the borehole,

the Board of Examiners requires the well casing to be perforated or ripped opposite the entire borehole length of the confining layer prior to placing any grout plugs inside the well casing.

Dated this 5 day of November, 2018

Octave George Blouin, Chairperson
Board of Examiners of Water Well Construction and Pump Installation Contractors