Operations Geology Technical Division Webinar

The Role of Geoscience in Evolving Regulatory Requirements for Commingled Abandonment

Presenter: Dan Palombi
Location: GoToWebinar

Wednesday, 24 November, 2021
12:00pm - 1:00pm, MDT

DISCIPLINE TAGS: Hydrogeology, Petroleum Hydrodynamics

ABSTRACT

Commingled hydrocarbon production occurs when oil or gas from more than one geologically distinct zone is produced in an unsegregated manner within a single borehole. Over 73,000 wells are producing oil or natural gas in a commingled manner across Alberta, all of which will eventually require abandonment. When operators abandon these wells, they are required to follow AER's technical requirements detailed in *Directive 020 – Well Abandonment*. The intent of these requirements is to prevent environmental impacts through gas or fluid migration, and to ensure resource equity and conservation is achieved amongst current and future operators. *Directive 020* allows operators to submit non-routine requests to seek variance from the abandonment requirements for commingled zones in a well when there is demonstrated low risk from unsegregated abandonment. Estimated cost savings of such variances could be substantial to Alberta's oil and gas industry, potentially enabling a large opportunity for AER and industry to increase the number of inactive wells that are abandoned and overall reduce liability. Hence, the AER/AGS embarked on a multi-year project to: 1) derive a risk-based methodology applicable across the province; and 2) conduct a detailed case study in southeastern Alberta to evaluate if the region has no intolerable increase in risk from allowing widespread commingled abandonment across the gas field.

One of our project objectives was to devise an approach by which AER and industry could quickly ascertain the level of subsurface risk and concerns associated with potential commingled abandonment of various pools throughout the province. A risk-ranking screening tool was developed using the Alberta Table of Formations to qualitatively display the relative probability of risk and consequence from commingled zonal abandonments in wells. This derivation uses knowledge of the regional geology and hydrogeology of the Alberta sedimentary basin to provide a stratigraphic zonation of groups and formations. The risk rankings can guide a commingled well operator on where variances from abandonment requirements are more favourable for certain geological units, and it can be used by the regulator to guide the operator through the variance request process and potential requirements for supplemental data. The different risk categories can be used to inform what is required to substantiate the application and satisfy the AER's requirements in achieving its regulatory outcomes.

A second project objective was to evaluate a large number of commingled gas wells within the Southeastern Alberta Order area (Commingling Order No. MU 7490). In this region, the Medicine Hat Member of the Upper Cretaceous Niobrara Formation and the Alderson Member of the Upper Cretaceous Lea Park Formation have been producing for over 100 years and many existing wells are nearing the end of their commercial life. Our risk-ranking screening tool identified this southeastern Alberta gas field as potentially having high probability and consequences of concern from commingled abandonment due to the geological setting and hydrogeological conditions. In addition, the AER was receiving high volumes of variance requests for *Directive 020* for wells in this field. Detailed geological, hydrogeological, and petrophysical mapping and modelling was completed to understand the extent and properties of the gas-bearing and water-bearing units. These results were used for numerical modelling of groundwater flow and groundwater-gas migration to understand the consequences of allowing widespread commingled well abandonments. We learned from this project that gas migration did not travel into areas of potential concern during commingled zonal abandonment conditions for the majority of our simulations, presenting a low-risk scenario to AER outcomes. Therefore, early in 2021 the AER updated *Directive 020: Well Abandonment* to allow for routine commingled abandonment in southeastern Alberta which may increase the abandonment of gas wells in this region (Figure 1). The changes also allow operators to abandon wells in pre-approved pools, enabling them to plan abandonment work more efficiently and reduce the review and administrative process meanwhile maintaining public safety and environmental protection. Figure 2 illustrates the changes made to *Directive 020* for specific routine commingled abandonment regions.

The AER/AGS continues to conduct geoscience studies to determine if commingled abandonment is possible in other regions including where additional data collection and environmental monitoring is required to ensure that the AER’s outcomes are satisfied.

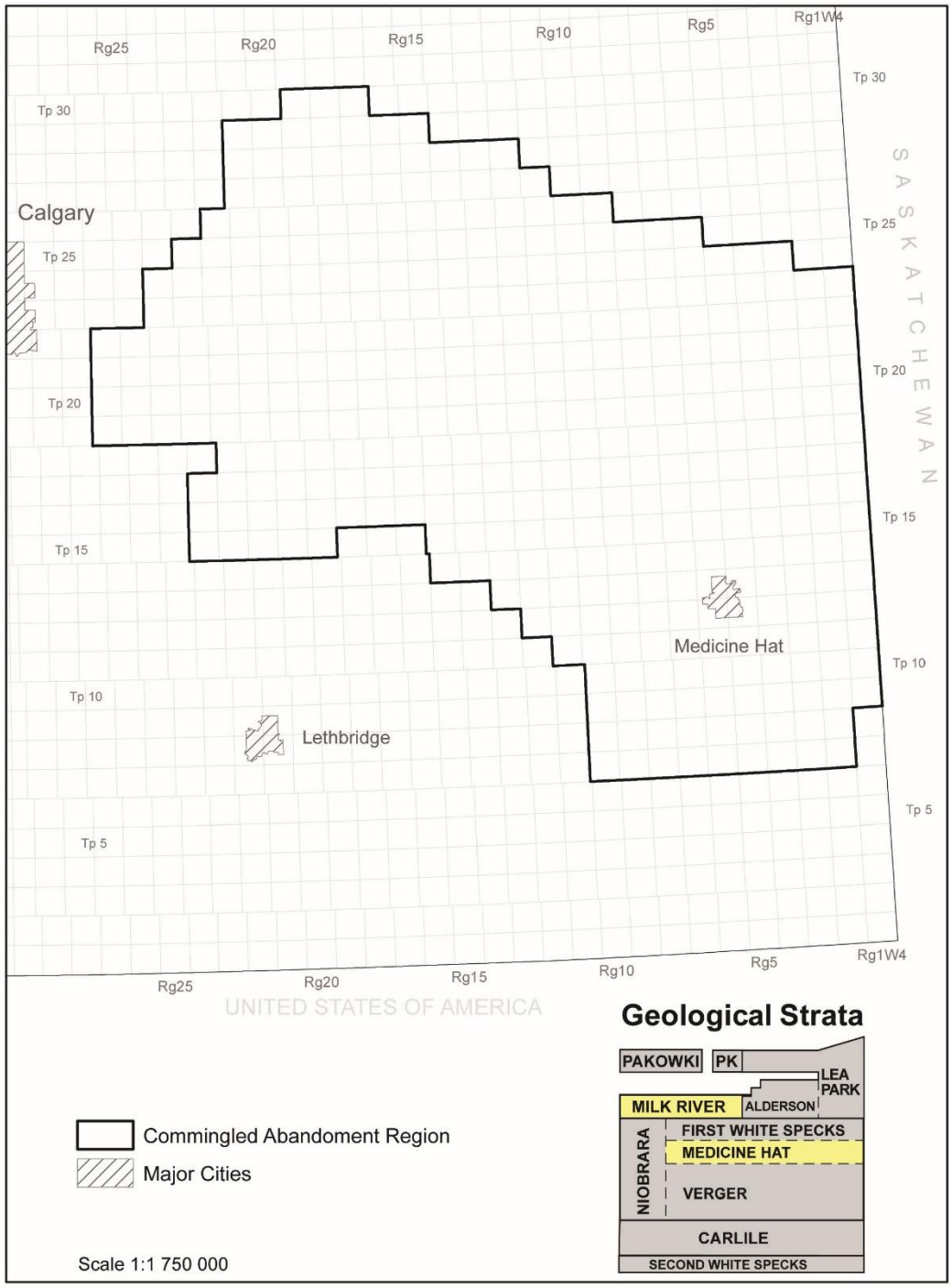

Figure 1: Routine commingled abandonment region and associated subsurface geological strata in southeastern Alberta. The table of geological strata has been modified from the *Alberta Table of Formations* (https://ags.aer.ca/publications/Table_of_Formations_2019.html).

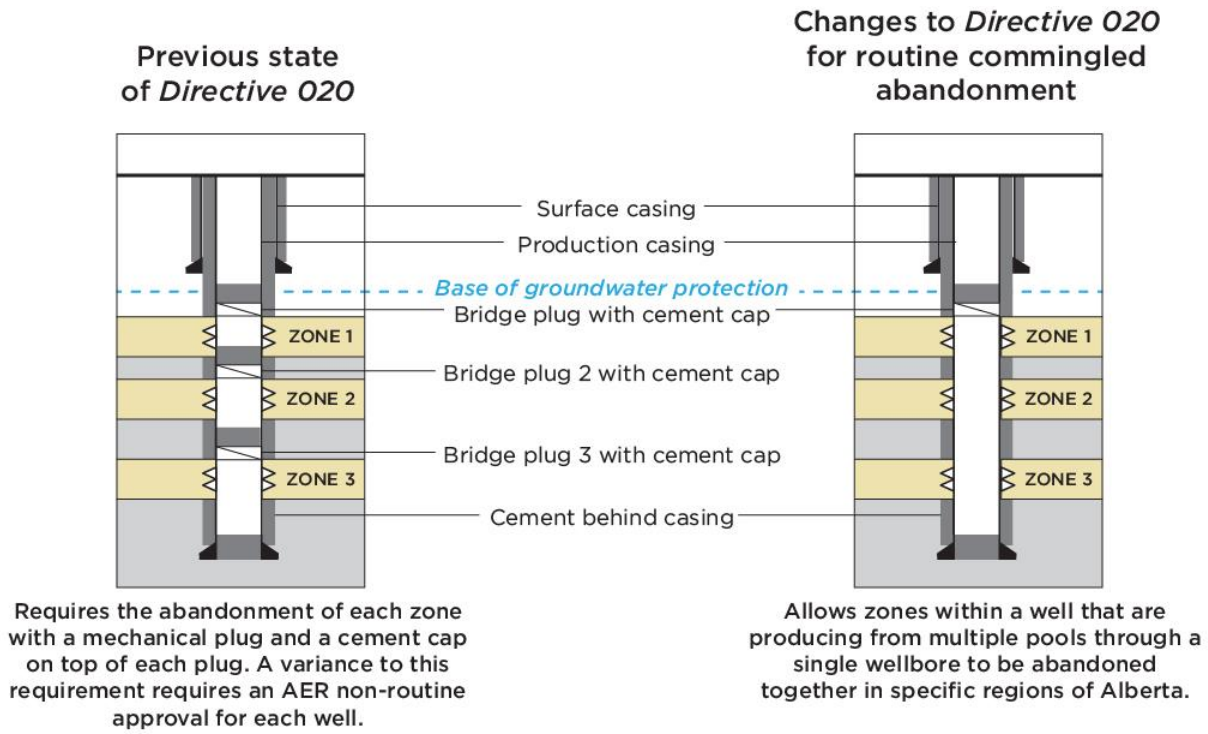

Figure 2: Comparison of zonal abandonment requirements in the previous state of Directive 020 (left) versus the changes made for routine commingled abandonment in select regions (right).

Biography

Dan Palombi joined the Alberta Geological Survey in 2010 as a hydrogeologist and currently is a Senior Advisor for Resource Geoscience. His role involves leading a provincial-scale program on the study, mapping, quantification, and reporting of Alberta's groundwater resources. Dan works with technical experts on designing and implementing applied research projects focused on achieving goals that are of high importance to regulators, policy-makers, and Albertans by providing relevant, impactful geoscience to support regulatory and environmental issues. Dan's background resides in regional and petroleum hydrogeology having spent over 10 years conducting regional-scale studies and mapping groundwater flow systems across the Western Canada Sedimentary Basin. The majority of this work applied regional groundwater flow principles and methods to CO_2 geological storage assessments, regional hydrogeological characterization, and geothermal resource potential studies. Dan received his B.Sc. in Geology and M.Sc. in Hydrogeology from the University of Alberta.