

Hydrogeology of the Post-Lea Park Upper Cretaceous-Tertiary Succession in the Alberta Basin

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The Upper Cretaceous-Tertiary post-Lea Park succession in the Alberta Basin comprises several major cycles from coarse clastics derived from the Cordillera, to shales deposited during major sea rises. Continuous layers of coarse clastics that form regional-scale aquifers are: Basal Belly River, Upper Belly River, Horseshoe Canyon-Upper Wapiti, and Scollard-Paskapoo, separated by the silty and shaly intervening aquitards: Middle Belly River, Bearpaw and Battle. All the units in this succession subcrop from west to east with increasing age under a thin veneer of pre- and glacial unconsolidated sediments. As a result of its position at the top of the bedrock, the post-Lea Park sedimentary succession is being recharged by meteoric water, as indicated by a relatively high HCO_3 content. The salinity of formation waters increases with depth from <3000 mg/l in the top Scollard-Paskapoo aquifer to up to 20,000 mg/l in the Basal Belly River aquifer. The flow in the north in all aquifers is driven by regional scale topography from recharge areas along the foothills in the southwest to discharge in the northeast. Local-scale flow systems are present particularly in the Swan Hills area and along major river valleys. In the southern part of the area, the deeper Basal and Upper Belly River aquifers and zones in the Horseshoe Canyon-Upper Wapiti aquifer are significantly underpressured due to erosional rebound in the intervening shale aquitards, driving formation water flow southwestward, from outcrop toward the deformation front. Understanding the hydrogeology of this succession is critical to establish coalbed methane producibility from major coal seams present throughout.