

Frequently Asked Questions

Base of Groundwater Protection

April 2016

Q1. What information does the AER's [Base of Groundwater Protection Query Tool](#) provide?

A1. The online tool relays the base of groundwater protection information that was historically contained within *ST55: Alberta's Usable Groundwater Base of Groundwater Protection Information*. The base of groundwater protection (BGWP) is the best estimate of the elevation of the base of the formation in which nonsaline groundwater occurs at that location. However, local variations in geology and topography are typical, so the actual elevation of the base of the designated formation can often vary from what is provided in the BGWP tool.

Q2. In Alberta, what is the definition of nonsaline groundwater?

A2. The Alberta *Water Act Water (Ministerial) Regulation* defines saline groundwater as water with total dissolved solids (TDS) content exceeding 4000 milligrams per litre (mg/L). Although not explicitly defined, as stated in the AER's [Bulletin 2007-10](#), the AER considers aquifers with TDS content less than 4000 mg/L as nonsaline and may be contained in sandstones, siltstones, coals, or fractured shales.

Q3. What was the methodology used in creating ST55?

A3. The principles, methodology, and criteria to determine BGWP are jointly determined by the AER and Alberta Environment and Parks (EP). The selection of the BGWP formations designated as protected was based on geological and hydrogeological evidence and is considered a policy determination by EP. The governing principle of BGWP is to protect regional, hydraulically continuous geological formations that host nonsaline groundwater in aquifer-quality zones from the inadvertent introduction of drilling or produced fluids. Protection is assured down to a maximum of 600 metres below ground, a depth below which nonsaline water-supply wells are rarely completed by non-industrial users.

The practical implementation of this principle was achieved by identifying these regional geological formations that host nonsaline groundwater, as set out in the BGWP policy guidance, and mapping the geological top of the next deepest regional formation not likely to host nonsaline groundwater or significant aquifer-quality geological bodies. The depth to the top of these formations, known as regional aquitards, plus a standard depth buffer, then becomes the designated regional BGWP.

Maps of the BGWP were prepared using a geostatistical mapping process. Additional details on the process of mapping the BGWP are found in the Alberta Geological Survey's [Open File Report 2009-04: Description of the Process for Defining the Base of Groundwater Protection](#).

The geology of Alberta's regional aquitards and aquifers is such that there are jump discontinuities in the BGWP where nonsaline groundwater resources are encountered in more than one stacked geological formation. These transitions between protected formations were selected based on the understanding of where formations are likely to contain nonsaline groundwater, the depth of the formations, and the likely maximum completion depths in the region. While these jump discontinuities may be puzzling at first glance, their presence assures that nonsaline groundwater is being protected in a geologically fit-for-purpose manner.

Q4. Will the AER be frequently updating BGWP data and the associated tool?

- A4. When the BGWP data was last updated in 2007, it was known that updates to the database may be needed. The AER reviews its instruments to assure alignment with Government of Alberta policy and new geological data. The BGWP tool has gone through several updates since its inception, and in April 2016, the AER released minor updates to BGWP depths within Township 076, Ranges 12 and 13, West of the Sixth Meridian.

The selection of the BGWP formations designated as protected was based on geological and hydrogeological evidence and is considered a policy determination by EP. Therefore, the AER will not review alternatives to the selected protected formations.

Q5. What if the designated BGWP formation is encountered at a different depth during well drilling operations?

- A5. If during drilling operations the actual BGWP formation depth (as determined from subregional information, well logs, or other valid geological information) is different than what was identified in the BGWP tool, the actual BGWP must be defined as 15 vertical metres below the base of the designated protected geological unit at the well where drilling is being conducted. This applies where the encountered depth is deeper or shallower than that estimated by the BGWP tool to a maximum depth of 600 metres below ground at that location.

Q6. Does the AER require notification when the encountered BGWP formation depth is different than the estimate in the BGWP tool?

- A6. If the difference in either case described in Q5 is greater than 50 metres, the operator may proceed with their modified operations, and the AER requests that information related to the difference be forwarded to AGS-Info@aer.ca. This information may indicate that an update to the BGWP database is needed in that township. If the difference is less than 50 metres, the operator may proceed without notifying the AER.

Q7. What if the BGWP is deeper than 600 metres below ground level?

A7. The BGWP can be defaulted to 600 metres below ground. Notwithstanding the default, operators may choose to protect to the base of the designated formation if its base is deeper than 600 metres.

Q8. Does [Directive 008: Surface Casing Depth Requirements](#) require surface casing to be set to the BGWP in every well?

A8. No. [Directive 008](#) is intended to ensure appropriate design and depths of surface casing to assist with well control and groundwater protection. This is largely dependent on drilling operations, wellbore configuration, drilling depth, and pressure gradients.

The surface casing depth calculation form enclosed within *Directive 008* must be used to determine the minimum amount of surface casing required and any applicable reductions.

Q9. Does the surface casing need to be cemented full length?

A9. According to section 6.080(4) of the *Oil and Gas Conservation Rules*, either the surface casing must be cemented full length or, where the surface casing setting depth is less than 180 metres or the BGWP depth, the casing string next to the surface casing must be cemented full length.

For clarification, in accordance with [Directive 009: Casing Cementing Minimum Requirements](#), the AER requires cemented casing from the BGWP to surface. If surface casing is not set to the BGWP, the next casing string must be cemented full length.