Amuri Basin Future Farming

Catchment Hydrology Overview February 2023

AMURI IRRIGATION COMPANY

An Amuri Irrigation Project

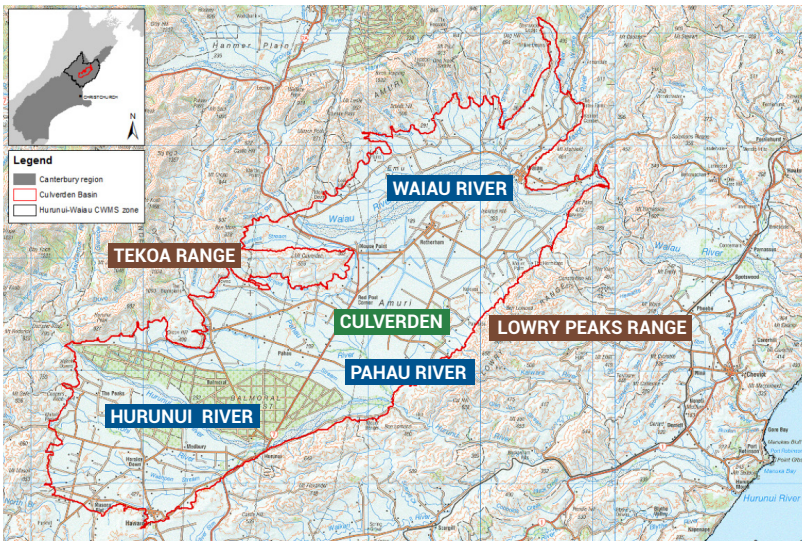
Geology of the Basin

The Amuri Basin is a large inland Basin formed through extensive folding and faulting of the underlying basement rocks between opposing sets of fault lines running along the western and eastern margins of the basin.

While the Basin appears relatively flat, this folding and faulting has created a complex geological environment under the Basin floor. In some places (e.g., Isolated Hill, Culverden and St Leonard Mounds) greywacke basement or older sedimentary rocks have been lifted to the surface.

In other areas these rocks have been folded downwards and the basins infilled with alluvial sediment from the Waiau and Hurunui Rivers. These basins contain most of the (usable) groundwater resource.

These materials were deposited during successive glacial cycles over the past 250,000 years and show moderate to low permeability reflecting the significant amounts of fine-grained material (sand and silt) in the gravel matrix.



Location of the Amuri Basin within the Hurunui-Waiau Canterbury Water Management Strategy Zone

Hydrology of the Basin

The Basin contains an extensive drainage network conveying groundwater to the surface or moving surface runoff into larger surface water bodies such as St Leonards Drain (which discharges to the Hurunui River) or the Lowry Drain (which discharges into the Waiau Uwha River).

However, in places, these gravels have been reworked removing much of the fine materials which increases aquifer permeability. Groundwater moves faster through more permeable gravels creating channelised flow within the aquifer system. When the scheme was developed these drainage networks were modified to address the rising water table and complex drainage issues at the eastern end of the Basin resulting from flood irrigation.

As a result, many smaller waterways have limited natural characteristics than would have existed prior to the irrigation development. Historically there would have been wetlands that helped filter and dissipate the higher flows coming from the Basin at the bottom end of these catchments and to a lesser extent along the natural drainage channels. The Basin has two distinct groundwater systems, Balmoral and Waiau.

Hydrogeology of the Basin

Current information indicates the groundwater system in Balmoral can be differentiated from northern areas of the Basin due to spatial variations in the subsurface geology. The approximate division of groundwater between the Hurunui and Waiau catchments crosses the Basin in a south-easterly direction close to the Culverden township.

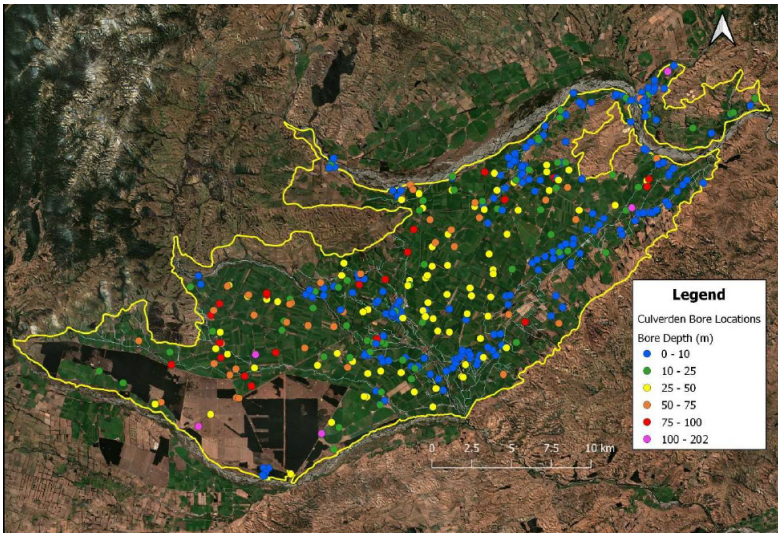
Balmoral has two hydraulically separate water-bearing layers at different depths, whereas the Waiau acts as a single (albeit layered) aquifer system. Bores are located close to the river and drainage margins with a few near in the middle of the Basin. Bores are generally installed to shallow depths with 58% of bores screened less than 20m. A limited number of bores screened at greater than 50m are generally located toward the western side of the Basin within the Balmoral area. Due to the low to moderate permeability of the alluvial materials, groundwater abstraction is modest and used for domestic, stock water and dairy shed supply.

Sufficient yields are typically obtainable from less than 30 metres depths, limiting the requirement to drill deeper bores. Gravels of sufficient permeability to support large-scale abstraction (e.g., irrigation) are generally only present along the margins of the Hurunui and Waiau Rivers.

Groundwater Quality

Groundwater quality in the Basin is generally high with groundwater typically containing low concentrations of dissolved ions.

Nitrate Nitrogen is the exception and has been increasing since irrigation development began. Detections of E. Coli in bores and wells is higher than the Canterbury average, likely a result of poor borehead security and shallow bore depths and a high groundwater table.



Wells recorded in the AIC Command Area

New monitoring bore installation by AIC

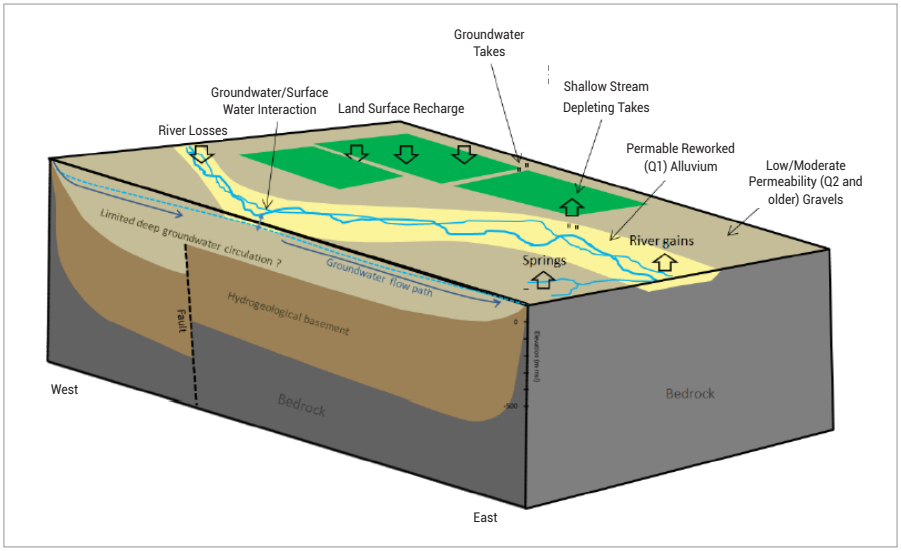
Surface Water Quality

The water quality of the braided rivers (Hurunui, Waiau and Pahau) is generally good largely due to the flows and low nutrient water from the alpine headwaters.

The drainage network across the Basin is more challenging as the drains that do not receive any recharge from the braided rivers and base flows are maintained by groundwater recharge supplemented by overland flow from adjacent land after rainfall events.

In the central part of the Basin the hydrology is influenced only by rainfall and land surface recharge. As the catchment hydrology is very channelised, any drainage from the land makes its way to one of the drainage networks and appears in surface water.

Surface water quality therefore reflects adjacent groundwater quality.



Simplified Schematic illustrating the Likely Groundwater Flow Dynamic in the Amuri Basin (not to scale)

More Information

Our project website, aicprojects.nz will be where we release regular project updates. In time, farmers will also be able to download catchment-specific material via a login members only area. If you have any queries or feedback about the project, please contact either Lucy Johnson or Jennifer Mathieson.

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