What is groundwater?
Groundwater is the water contained within rocks and sediments below the ground’s surface in the saturated zone.

Groundwater occurs everywhere below the ground but the ability to get the water out of the ground (called ‘yield’) and the salinity of the water can vary widely depending on the geology and the amount of recharge a groundwater system receives. Recharge is the movement of water into a groundwater system from rainfall, overland flow, other groundwater sources, irrigation, streams or other sources.

What is a groundwater system?
A groundwater system is any type of saturated sequence of rocks or sediments that has similar hydrogeological characteristics and is in hydraulic connection. The characteristics can range from low yielding and high salinity water to high yielding and low salinity water.

What is an aquifer?
The term ‘aquifer’ is commonly understood to mean a groundwater system that can yield useful volumes of groundwater. This also implies that the water is of good enough quality to be used for purposes such as irrigating crops or for town or stock drinking water. Aquifers are not underground rivers or streams.

For the purposes of the Aquifer Interference Policy the term ‘aquifer’ has the same meaning as ‘groundwater system’ and includes low yielding and saline systems.

Why protect groundwater?
Groundwater is an important resource for many towns, industries and irrigators who rely on groundwater extraction to support their activities. Also, many landholders rely on groundwater for domestic and stock use. Groundwater is also important for the environment, as it supports some ecosystems and provides baseflow to rivers.

Over-extraction or contamination of groundwater can have serious, long-term and sometimes permanent impacts on the groundwater system. This may ultimately reduce the volume and quality of water available for the users and ecosystems that depend on this groundwater.

Groundwater is part of the water sharing plans
In New South Wales groundwater is managed at the ‘water source’ scale under the rules in a water sharing plan. Water sharing plans are being developed to apply to all of the water extracted in the State. Water sharing plans are created by the Water Management Act 2000 and at present 95% of NSW is covered by 70 water sharing plans (Figure 1). These plans manage both surface water and groundwater that is used by irrigators, the environment, industry, towns and communities. A groundwater source can include a number of aquifers and groundwater systems.
Water sharing plans aim to:
- clarify the rights of the environment, basic landholder rights users, town water suppliers and other licensed users
- define the long-term average annual extraction limit (LTAAEL) for water sources
- set rules to manage impacts of extraction
- facilitate the trading of water between users.

Figure 1  Water sharing plans that include groundwater

Note: this map only shows the uppermost water sharing plan in an area. Other water sharing plans underlie many of these. More information on all water sharing plans and their groundwater sources is available at www.water.nsw.gov.au under Water-management/Water-sharing-plans/Plans-commenced.

How is groundwater divided up and managed?

Groundwater sources are divided into four broad hydrogeological types:
- **alluvial** – unconsolidated sediments
- **coastal sand** – unconsolidated sediments
- **porous rock** – consolidated sedimentary rocks
- **fractured rock** – igneous and metamorphic rocks.

Each of these systems are hydrogeologically quite different from each other. For example, they have different rates of recharge, groundwater flow, yield and water quality.

For management purposes, geological sequences that are hydrogeologically similar may be grouped together and defined as a groundwater source (Figure 2). For example, all of the unconsolidated sediments in the Lower Namoi (Narrabri, Gunnedah and Cubbaroo Formations) are grouped into the Lower Namoi Groundwater Source.
Some parts of geological basins and provinces are divided into separate groundwater sources because they are hydrogeologically different. For example, the Young Granite forms part of the Lachlan Fold Belt but has been classed as a separate groundwater source because of its generally better water quality and higher yields (Figure 3).
In other cases, groundwater systems are divided by surface water catchment into separate groundwater sources for administrative purposes even though they belong to the same geological basin or province and are hydrogeologically very similar. For example, the Kanmantoo Fold Belt has been divided by the Murray-Darling Basin catchment boundary into the Kanmantoo Fold Belt North Western and Kanmantoo Fold Belt Murray-Darling Basin Groundwater Sources.

Where groundwater sources overlie one another causing part or all of a groundwater source to be buried (either horizontally or subvertically), they are termed ‘fully buried’ or ‘partly buried’. For example, the Gunnedah-Oxley Murray-Darling Basin Groundwater Source is a partly buried water source.

Water sharing plans can cover one or more of the groundwater sources in an area, and can also include the surface water in that area. For example, the Hunter Unregulated and Alluvial Water Sharing Plan covers, among others, the Hunter Regulated River Alluvial Water Source and the Merriwa River Water Source.

**Glossary**

**Alluvium** – sedimentary deposits made by rivers or streams or found on alluvial fans, floodplains etc that consist of gravel, sand, silt and clay.

**Brackish water** – water that has a salinity between 3000 and 7000mg/L total salts, but is not as salty as seawater.

**Consolidated sedimentary rock** – a rock formed by sediment deposited in layers then being consolidated for example sandstone and siltstone.

**Geological sequence** – a sequence of rocks or sediments occurring in chronological order.

**Hydraulic connection** – a path or conduit allowing fluids to be connected. The degree to which a groundwater system can respond hydrologically to changes in hydraulic head.

**Hydrogeology** – the study of underground water including the geology of water-bearing rocks, and the chemistry, physics and movement of groundwater.

**Igneous rock** – rocks which have solidified from a molten mass.

**Metamorphic rock** – consolidated rocks that have been altered from their original structure and composition by pressure and heat.

**Permeability** – the measure of the ability of earth materials to transmit a fluid.

**Recharge** – Infiltration of water from rainfall, overland flow, irrigation, streams or other sources into the groundwater system.

**Saturated zone** – area below the water table where all soil spaces, pores, fractures and voids are filled with water.

**Sedimentary rock** – rock formed by layers of sediment.

**Unconsolidated sediment** – particles of gravel, sand, silt or clay size that are not bound or hardened by mineral cement, pressure, or thermal alteration of the grains.

**Water sharing plan** – a plan made under the Water Management Act 2000. These plans set out the rules for sharing water between the environment and water users within whole or part of a water management area or water source (taken from Macro water sharing plans – the approach for groundwater published by NSW Office of Water).

**Water table** – the depth at which soil spaces, pores, fractures and voids in rock become completely saturated with water.

**More information**