GROUNDWATER AVAILABILITY IN THE NAMOI RIVER BASIN.

Groundwater availability data for the Namoi River basin has been limited to Departmental bore data as well as 1:250 000 Hydrogeology Maps of the Liverpool Plains Catchment (Broughton, 1994) and the Narrabri and Moree 1:250 000 sheets (DWR, 1988). These maps have provided the basis for the development of the Basin wide groundwater availability map.

The following discussion of groundwater characteristics of the Namoi River Basin is based on information contained in “Groundwater in New South Wales” (DWR, 1984), as well as departmental bore data, hydrogeologic experience, pre-existing reports and the abovementioned hydrogeology maps.

Unconsolidated Sediments

The alluvial aquifers of the Namoi River Basin are the primary source of groundwater within the Basin supplying both irrigation and town water supplies. These aquifers are usually associated with the major river systems such as the Namoi and Peel Rivers and Cox's and Quirindi creeks.

The alluvium of the Namoi River Basin is by far the most important in the State in terms of groundwater use and accounts for approximately one third of the low salinity water used for irrigation and urban supply from high yielding aquifers. The Basin contains over 13 000 registered bores with many more unregistered. These bores provide water for many households and stock as well as the irrigation, industry and town water supplies.

A major fault zone crossing the Namoi River near its junction with the Peel River, marks the western margin of an uplifted area into which the upper Namoi, Manilla, Peel and Cockburn Rivers as well as other tributaries have developed. In the east alluvial depths are shallow (usually less than 15 m) and widths limited. The alluvium of the Peel Valley is the most productive of these relatively younger river systems, sustaining yields as high as 40 L/s although the majority of irrigation bores yield between 10 and 20 L/s. In the other valleys in the uplifted block, irrigation by groundwater is limited, though household and stock supplies are usually available.

West of the fault zone (trending north-northwest), the topography is maturer and the alluvium is extensive and deep, with large groundwater reserves.

Upstream of Narrabri the alluvium tends to be restricted in width and groundwater conditions are somewhat irregular, although, many irrigation bores and wells exist.

At Narrabri, the Namoi River enters the extensive riverine plains. Here, a fan shaped area of some 4000 square kilometres extending beyond Burren Junction, is the most intensely developed groundwater system in the State. The alluvium is up to 120m thick, with some bore yields in excess of 200 L/s, although most are less than 150 L/s. So many wells and bores are in use, that the groundwater is abstracted from the aquifer at a larger rate than it can be naturally recharged. In essence the groundwater is being mined and will continue to be unless groundwater management restrictions are imposed.

Outside this area, groundwater in the alluvium of the lower reaches is normally suitable only for stock with much lower yields. Further west towards the Darling River at Walgett, groundwater quality is at best brackish and sometimes too saline for stock.

Porous Rocks

The porous rock aquifers of the Namoi River Basin occur primarily in the Great Artesian Basin (GAB) and the Oxley Basin.

Great Artesian Basin

The sedimentary rocks of the Great Artesian Basin (GAB) essentially underlie the thick alluvial sequences (commonly 60 to 90m) around and west of Narrabri. The eastern margins of the GAB represent the main aquifer intake zones where rainfall is relatively higher than in the west. This infiltrating rainwater is transported through the porous sediments to areas where rainfall is much lower and unreliable further inland. The most important aquifers occur in the Pilliga Sandstone of Jurassic age (180 million years ago) and in the Bungil and Orallo Formations and the Mooga Sandstone of Early Cretaceous age (135 million years ago). The overlying confining layer is also of Early Cretaceous age and comprises mainly a of a thick shale sequence, commonly more than 600m thick, referred to as the Rolling Downs Group. Bores drilled to penetrate the GAB must be pressure cemented to avoid potentially saline waters from the overlying unconsolidated and shale sequences, from contaminating the fresher artesian waters as well as corroding the bore casing.

Over the years the development and groundwater abstraction from the Great Artesian Basin has resulted in a gradual decline in the spatial distribution of areas from which artesian conditions can be found. Numerous bores in the river basin still flow freely into unlined drains (95% of which evaporates). Current GAB management practices require the installation of controlled headwork and distribution via a sealed pipe network.

Water quality in the Pilliga Sandstone is suitable for irrigation with some sub-artesian bores yielding up to 40 L/s. However, with distance into the Basin the proportion of alkali salts in the water increases making it unsuitable for irrigation although remaining useable for urban water supply. Even, so the main use of groundwater from the basin is for stock watering. Without this water source the pastoral industry would be impracticable over most of northwestern NSW.

Oxley Basin

The northern portion of the Oxley Basin occupies a relatively small area of the southern Namoi River Basin. It consists mainly of northwesterly dipping sandstone and shale sequences of Triassic and Jurassic age. These rocks inturn are overlain by a considerable thickness of Tertiary basalt forming the Liverpool Range, part of the Great Dividing Range located at the southern boundary.

The most productive formation of the Oxley Basin is the Jurassic aged Pilliga Sandstone (also a major aquifer of the Great Artesian Basin). Bores depths range up to 160m and produce yields generally less than 1.5 L/s, however, yields as high as 45 L/s of low salinity groundwater have been obtained from bores at depths of 90m. As previously mentioned, along the south-eastern margin of the River Basin, these sedimentary rocks are overlain by large expanses of Tertiary basalt forming the northern side of the Liverpool Plains. Therefore access to the groundwater resources of the Pilliga Sandstone becomes uneconomic, as deep drilling is required. Consequently, bores tapping the Pilliga Sandstone are restricted to the lower slopes of the Plains.

Fractured Rocks

There are two main types of fractured rock aquifers within the Namoi River Basin, these being, the Tertiary basalt, and the rocks associated with the New England Fold Belt.

The Tertiary basalt flows of the Namoi River Basin are primarily located in the southeastern corner overlying the Pilliga Sandstone of the Oxley Basin as well as scattered flows around Gunnedah and east of Narrabri. These basalt flows provide groundwater from bores and occasional springs. Bore depths range up to 90m and produce relatively small yields generally less than 1.5 L/s with occasional failures more so in periods of drought. The salinity is generally low, however the water is usually hard, typical of basaltic groundwater.

The rocks associated with the New England Fold Belt are located along the eastern quarter of the Namoi River Basin and generally form the topographic highs of the Basin. These include:

- The New England Batholith predominate around the Moonbi region which has limited supplies with yields mostly between 0.1 and 0.5 L/s, and bore depths between 25 and 60m.
- Metamorphosed sedimentary rocks of Palaeozoic age. These rocks vary greatly in their groundwater potential. Depending on topography and metamorphic rock type, bore depths may vary from 15 to 90m, and yields from 0.2 to less than 5 L/s although failure can occur. The water is considered marginal to good stock quality, total salts ranging up to about 3000 milligrams per litre (mg/L) but typically 501 - 1500 mg/L.

Potential for Land Salinisation

There is the potential for land salinisation to occur in areas of the Namoi River Basin. Land salinisation occurs when groundwater rises to or near the ground surface. The rise of groundwater is caused by the modification of native vegetation by activities such as clearing, grazing, or by cropping and irrigating vegetation that uses much less water than the natural vegetation. This results in a more significant amount of surface water recharge to the groundwater. As the water table rises due to excessive recharge, it dissolves and accumulates naturally occurring salts in the soil and brings them towards the surface where the salt is concentrated by soil moisture evaporation. This concentration causes devegetation of the land of all but the most salt resistant plants.

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