

Accessing Groundwater Resources on the Central Coast

Frequently Asked Questions

March 2007

Q1. What is groundwater and where does it come from?

A: Groundwater or bore water as it is also called is naturally occurring water found below the ground that is stored in fractured rock (generally confined aquifers) or alluvium based or sand (unconfined) aquifers.

Groundwater is an integral part of the natural water cycle as rainfall and other types of surface water infiltrate below the ground to recharge existing aquifers.

The quality of the groundwater that is extracted varies from bottled spring water quality to poor quality water which is too salty or high in other contaminants such as iron and manganese metals for use as drinking water without extensive treatment.

The particular geology of an aquifer impacts:

- The volume of water that can be stored
- The rate of water extraction; and
- The rate of water movement through the aquifer,

The quality of the water found in an aquifer depends on:

- The original source of the water and chemical make- up of the rock and sediments
- The time the water has been held underground
- The structure of the aquifer and,
- The quality of water entering the aquifer from the surface,

The majority of groundwater in Australia, including NSW, is used for agricultural purposes such as irrigation of crops. In the urban environment, groundwater has tended to be used for non-drinking purposes such as irrigation of sports ground and flushing of toilets at public amenities.

Q2: Where else around the world, in Australia and across NSW do they use groundwater for drinking water?

A: Around the world, groundwater is a major source of fresh water, for example in Australia it accounts for around 20% of the country's total water use.

Groundwater is also a vital resource for NSW. The volume of groundwater in the State is estimated to be 5 billion megalitres (million litres) which is more than 200 times the storage capacity of all water supply dams in the State and enough to fill Sydney Harbour 10 times over.

In NSW, approximately 200,000 people across 130 communities rely on groundwater for their drinking supply according to the 1995 NSW State of Environment Report.

Q3: Who is responsible for managing the Central Coast's groundwater resources and thus deciding where and how much water is extracted?

A: All groundwater resources in Australia are State controlled. This means that in NSW, groundwater is managed and controlled by the NSW Department of Natural Resources (DNR).

It is the DNR that is responsible for setting overall policy and issuing of all commercial licences for groundwater extraction. The DNR's Newcastle office oversees groundwater resources on the Central Coast.

Q4: What groundwater resources do we currently have on the Central Coast?

A: There are currently five borefields on the central coast producing water that is used for drinking purposes at Braithwaite Park, Mangrove Creek Weir, Mardi, Ourimbah and Somersby Water Treatment Plant. Between them, these borefields are currently producing around 3 million litres of water a day from 19 individual bores.

Two more borefields, at Narara and Woy Way, are due to come on line in April/May 2007 and will boost the amount of groundwater being produced to 9 million liters a day. Between them these two bore fields will have 17 individual bores.

Around the Central Coast there are a further 27 bores where the water was not suitable for drinking but which is being used to irrigate sporting fields and flush toilets at public amenity blocks.

There are also numerous monitoring bores across the region which plays an important role in the management of the Central Coast's groundwater resources.

Q5: Who made the decision to allow the Councils to access groundwater on the Central Coast as well as deciding how much water can be extracted?

A: The DNR has allowed Gosford City and Wyong Shire Councils to access groundwater as part of our drought contingency plans. To date the Somersby, Mardi and Braithwaite Park bore fields have been issued with annual water extraction allocations by the DNR. The Ourimbah and Mangrove Weir bore fields are currently being assessed by the DNR.

In establishing its groundwater bore fields, the Councils have also been granted a 12 month Test Pump Licence for individual bore fields at Ourimbah, Mangrove Weir and Woy Woy.

During the period of this licence, the Councils have to collect a vast array of data including everything from environmental impacts through to detailed hydrogeological information which is then supplied to the DNR for analysis.

A key requirement of the Test Pump Licence is for the DNR to assess this data every 3 months or as requested. At any time, the DNR can direct the Councils to alter or increase its bore monitoring systems or pumping regimes. It can also request the shut down of individual bores or entire borefields. The DNR will use this data to determine appropriate annual groundwater extraction and allocation levels for each groundwater bore that has been established on the Central Coast.

Q6: Why is groundwater only now being extracted?

A: The extraction of groundwater on the Central Coast is part of the Councils drought contingency measures to supplement significantly reduced stream flows used for drinking water.

It is a short to medium term contingency measure which will require regular reviews as further environmental and hydro geological data is collected and total drinking water storage levels recover from the current drought over time.

Q7. Do domestic users of groundwater on the Central Coast, that is people with bores or spear points on their properties, have to obtain a licence from the DNR?

A: The whole purpose of the DNR's licensing/registration program is to help sustain the State's groundwater resources by managing them effectively. Groundwater must be properly managed if we are to reduce the risk of overuse, contamination or long-term environmental damage.

As part of this program, the DNR requires that the installation of all domestic bores must be carried out by experienced installers that hold a current driller's licence issued by the DNR.

All domestic bore users should also register their details with the DNR to help prevent inappropriate installation and use of bores as well as provide protection for all groundwater users on the Central Coast.

Registration with the DNR is currently free of charge. For more information contact the DNR's Newcastle office on 02 4904 2500.

The Councils are aware that the majority of private household bores in the Peninsula area are unregistered. For example, based on the house-to-house

survey of all residences within up to a 50 metre radius of the Woy Woy production bores, only 6% of residences with domestic bores were registered while a further 56% were not aware they had to register their bore or spear point.

Q8: What does the DNR do with all this information about registered bores?

A: The DNR maintains a groundwater database of registered bores in NSW so they can collect valuable information that will benefit all groundwater users in the State. This information includes details of things such as; the depth of existing bores and the amount/quality of water being extracted.

Q9: If I licence/register my bore with the DNR will I have to pay for my groundwater?

A: Presently a State Government charge for the use of bore water only applies to commercial users. The commercial users' fee is paid annually and is based on how much water is being extracted.

There is no charge for domestic water usage at present as long as the property or residence is not located within areas administered under the Water Management Act 2000. At present, these areas on the Central Coast are in the Kulnura-Mangrove Mountain region.

Q10: How much groundwater is available on the Central Coast?

A: To gauge how much groundwater is available is a complex process. As with other areas in NSW, groundwater on the Central Coast is available in varying degrees of quantity, quality and depth.

That is why extensive modelling has been undertaken and investigations continue to be undertaken to estimate how much groundwater is available, particularly in relation to the aquifer on the Peninsula and the Woy Woy borefield.

Key factors taken into account as part of this modelling include:

- depth of the water table
- water quality
- geology
- geomorphology (examines the formation and structure of the surface ground)
- rainfall data
- relationship between groundwater and surface water

The important thing to know is that only a very small amount of the total estimated amount of groundwater available on the Central Coast is being extracted as a drought contingency measure to boost our drinking water supplies.

Q11: Why is some groundwater being used for non-drinking purposes such as watering sporting grounds and so forth?

A: Most of the water that is being used for non-drinking purposes was tested and found not to be of a high enough quantity or quality for treatment to drinking water quality.

Generally these waters are too salty for use as drinking water but can be used for irrigation of sporting fields. Other bores that were originally investigated were abandoned due to their risk to sensitive ecosystems.

Q12: How is the groundwater extracted?

A: To extract groundwater, bores are drilled deep into hard rock aquifers or nearer to the surface for sand-based aquifers. The accessible water is then pumped to the surface for collection, treatment and distribution.

Q13: What tests are conducted to make sure the extracted groundwater is safe to drink?

A: Extracted groundwater is treated to the same high degree as all other forms of raw water that make up the Central Coast's water supply system

In addition, detailed monitoring systems for all bores on the Central Coast have been established so the Councils and the DNR can gain a clear picture of the chemical and mineral composition of the region's groundwater resources.

Where extracted groundwater is blended with the other raw water supplies, such as at Narara, Mardi and Braithwaite Park, this water is then subject to the existing well established and proven water treatment processes undertaken at the Mardi and Somersby Water Treatment Plants to ensure the water that comes out of our taps meets the requirements of the Australian Drinking Water Guidelines.

At Woy Woy, the extracted groundwater will be pumped to the new Water Treatment Plant at the Council Depot for treatment to ensure it meets the Australian Drinking Water Quality Guidelines.

Q14: How much is it costing to extract groundwater on the Central Coast?

- A: The cost of establishing the seven borefields on the Central Coast is around \$30 million but this represents total project costs and includes all investigation, construction, ongoing monitoring, administration, staffing and other related costs.

Q15: What impact will the extraction of groundwater have on the naturally occurring aquifers over time?

- A: A key part of the modelling that has been done to estimate the sustainable harvesting of groundwater resources on the Central Coast is the recharge rates and levels of the various aquifers.

In addition, a key requirement of our Test Pump Licence is that the Councils only extract water, for example from the largest borefield at Woy Woy, when the aquifer is at a level that will allow harvesting at a sustainable rate.

Q16. How will the aquifers, particularly the one on the Peninsular, be recharged with water to make up for what the Councils are extracting?

- A: Most aquifers are recharged through a combination of sources including surface water, streamflows and rainfall.

The largest borefield on the Central Coast will be at Woy Woy when it comes on line. This aquifer is recharged primarily by local rainfall based.

On the detailed modelling in relation to the water table and aquifer that has been undertaken by the Councils and which will continue as part of the stringent monitoring systems that have been put in place as part of the overall groundwater project.

Q17: What impact will the extraction of groundwater have on the environment and those wetlands that rely on it for their existence?

- A: The Councils are acutely aware of the need to extract groundwater in a manner that does not put at risk any of the wetland environments or other flora and fauna that rely on this naturally occurring source of water.

As part of the DNR's licensing requirements, the Councils carried out an Environmental Impact Assessment prior to being granted its Test Pump licence.

The Councils have also put in place ongoing monitoring systems of the impact of groundwater extraction on the immediate and surrounding environments.

This ongoing monitoring is also a key part of the licence requirements imposed by the DNR on all commercial groundwater extraction licence holders.

Q18: What systems are in place to ensure that the groundwater borefields, particularly the one at Woy Woy, does not lead to salt ingress?

A: The Councils have put in place multiple safeguards to monitor the salt content or salinity of the region's groundwater resources. These include the installation of Electrical Conductivity (EC) meters at each individual bore.

These meters provide an accurate indication of the salt content of the water or Total Dissolved Solids (TSD) levels. The readings from these meters are sent via a radio communications system to the Somersby and Woy Woy Water Treatment Plants. If at any time, these readings exceed the acceptable levels of salinity, an alarm is raised and the bore is automatically shut down.

In addition, the water treatment plant has a dedicated EC meter on the incoming raw water feed to the plant. The treated water is also monitored for salinity.

Two areas have been identified to more closely monitor any salt water intrusion into the borefield aquifer with additional monitoring bores being installed near Squirrel Street and Burrawang Street. These two areas are located over a very deep section of the aquifer which connects Booker Bay to the North and Ettalong Beach to the South.

These monitoring bores comprise three clustered pipes that allow them to monitor TDS at three different depths up to a maximum of 70 metres. These monitoring bores act very much like an early warning system in that they can provide the earliest indication of changes to the salt/freshwater interface in the aquifer well before the water even gets to the bores.

The readings from these sentinel bores are monitored via Councils' radio communications system and tracked very closely. If the salinity exceeds acceptable levels, an alarm is raised and the whole borefield is shut down automatically. Last but not least, further monitoring bores have also been established across each production bore to collate EC readings and standing water levels.

Q19: What impact will the Central Coast's borefields have, in particular the Woy Woy borefield, in terms of causing subsidence and damaging those houses closest to the bores?

A: Prior to the Woy Woy borefield coming on line, a precise levelling survey is currently being carried out. At the same time, a base 'benchmark' survey is also being carried out on the area outside of the borefield for comparison purposes.

The precise level survey will be repeated at 3/6 months and more frequently if necessary during the first 12 months of the borefield's operation and then will be repeated as required after that period.

In addition, building dilapidation surveys will also shortly be carried out on those residences that are located in a 50 metre radius of each groundwater bore prior to the Woy Woy borefield coming on line.

These building surveys will be extended to other residences located further away from the bores if any significant subsidence is reported or observed once the borefield comes on line.

Q20: How much of a risk is there of the extracted groundwater being contaminated, particularly given there are a large number of old tips on the Peninsula?

A: The Councils are aware of the presence of a number of old tips in the Woy Woy/Umina area, in particular at James Brown and Rogers Park and near Woy Woy Oval.

As part of the groundwater investigations, prior to the drilling of the 14 bores that make up the Woy Woy borefield, the Councils took a very close look at these old tips. These investigations found that the majority of the tips are very shallow and that they constitute a very small percentage of the Peninsula area.

In designing the Woy Woy borefield, the Councils did take the old tips along with a number of factors into account, setting drilling depths to around 18 to 24 metres below ground. At this depth, there is about 20 metres of thick sand between the base of the old tips and the bore screens.

This sand mass forms a natural barrier between the groundwater bores and the tips because it acts as a filtration unit to prevent any contaminants, if they are present, from reaching the bores in detectable concentrations.

Since 2005, extensive testing of extracted groundwater from the Woy Woy bores has been carried out. In 2006, this testing was extended to cover over 80 compounds, elements and parameters as part of the Australian Drinking Water Guidelines.

As part of this testing, the Councils have carried out extensive screening for a whole range of possible contaminants. To date no pesticides or herbicides have been detected in the extracted groundwater above the Australian Drinking Water Guideline levels. Levels of dissolved metals that could pose health risks have consistently been found to be below the requirements of the Australian Drinking Water Guidelines.

It is important for all water users to be aware that iron, manganese and arsenic are naturally occurring metals that are common in what is called brackish coastal groundwater.

These metals are readily and easily removed through two water treatment processes called oxidation and flocculation. Other heavy metals, which are commonly found in groundwater such as lead, are also easily removed by a process called coagulation flocculation.

To date, the amount of arsenic found in the extracted groundwater is no higher than the amount a person would normally consume by drinking several cups of tea or eating a range of root vegetables.

In summary, the groundwater borefields that have been established on the Central Coast have all been designed to include many levels of protection at the harvesting and water treatment level.

The Woy Woy borefield will produce water quality to the same level or better than the Somersby Water Treatment Plant, with additional monitoring including:

- constant laboratory testing of samples of the extracted groundwater as well as the blended raw water that is being treated at the water treatment plant
- treatment of the extracted groundwater using the latest membrane technology at the new Woy Woy water treatment plant
- online monitoring of the treated water using what is called a spectro-photometer which includes specific testing for pesticides and herbicides
- ongoing laboratory testing of the resulting treated water
- constant reviews of the monitoring data and performance of all groundwater bores
- the Councils having the ability to turn off any of the bores at any time if any contaminant risk is observed.

Q21: What impact will the extraction of groundwater from the Peninsula aquifer have on those private residents who currently access bore water at their individual properties?

A: Last year, the Councils conducted door-to-door research of residents who live within a 50 metre radius of the 14 production bores that make up the Woy Woy borefield.

The aim of this research was to gather important data on how many homes currently have bores or spear points, how much water they extract, what they use this water for and the depth at which these bores or spear points are installed.

This data, together with the raft of information that has been logged about the Peninsula's aquifer over the past two years through sophisticated monitoring system, it was estimated that the biggest impact would be on domestic bores or spear points within a 10 to 20 metre radius of the production bores.

The door-to-door research revealed that there are approximately four residents with bores or spear points up to 50 metre radius of the production bores.

These residents will be individually monitored throughout the 12 month test period for the Woy Woy borefield to check what impact, if any, the borefield has on the performance of their bores and spear points.

Q22: Why are the commercial water bottlers and other users up on the Kulnura plateau being allowed to take so much water when a recent DNR research report said it was too much?

A: All groundwater resources in Australia are State controlled. This means that in NSW, groundwater is managed and controlled by the NSW Department of Natural Resources (DNR).

It is the DNR that is responsible for setting the overall policies for extraction and management of all groundwater resources including those on the Central Coast. The DNR also issues all licences for the extraction of groundwater.

A recent study commissioned by DNR and undertaken by the University of Technology found that there are strong links between this groundwater source and the streamflows in the region's main sources of drinking water, namely Ourimbah, Mooney and Mangrove Creeks as well as Wyong River.

The report also found that further development of the Kulnura/Mangrove Mountain groundwater resources, from which only a very small percentage of the Central Coast's water supply system is directly drawn, could lead to a decline in the above streamflows.

Further, the report has highlighted that the current licences issued by DNR exceed the yield from the aquifer in dry years. That is, the Kulnura/Mangrove Mountain aquifer is over already allocated in dry years. It is therefore expected that DNR will review the level of current and future licences.

Q23: Will Council take action to stop the commercial water bottlers in the area from accessing groundwater so more of it can be used to supply much needed drinking water to the Central Coast?

- A: The Councils have no authority to stop any individual or business from accessing groundwater but have been lobbying for a moratorium to be placed on increasing existing licences or issuing new licences for extraction of groundwater from the Kulnura-Mangrove Mountain aquifer.

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