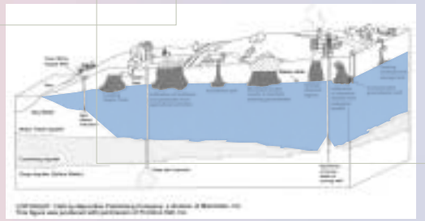
Mulwala Facility Groundwater Management Strategy

The Commonwealth-owned Propellants, Explosives and Chemicals facility, Mulwala, NSW has undertaken groundwater surveys over the past five years of more than 50 groundwater bores located at, and adjacent to the Commonwealth-owned site. As part of this program, groundwater samples have been routinely collected from 5 privately owned bores. The 1999 and 2000 monitoring programs involved sampling of 41 groundwater bores on, or adjacent to the site and a further 26 privately owned bores (samples collected between July and November 1999). It is the purpose of this document to provide information on the status of groundwater quality and what is being done.

Indicative boundary only

What is Groundwater?

Groundwater is part of the water cycle. When rain falls on land, some water evaporates, some flows in to streams and rivers, and some seeps into the soil and is absorbed by plants. Excess water in the soil may percolate further down until it reaches a level known as the water table where all the pore openings in the soil or rock are saturated with water. Water in the saturated zone below the water table is called groundwater. It moves slowly through openings in the rock or soil ultimately discharging to low lying areas, rivers or the sea. The flow rate is much slower than a river and depends on the type of rock or soil the water is passing through, and the slope of the land. In areas like Mulwala, the flow rate may be in the order of 1 to 100 metres (m) per year.



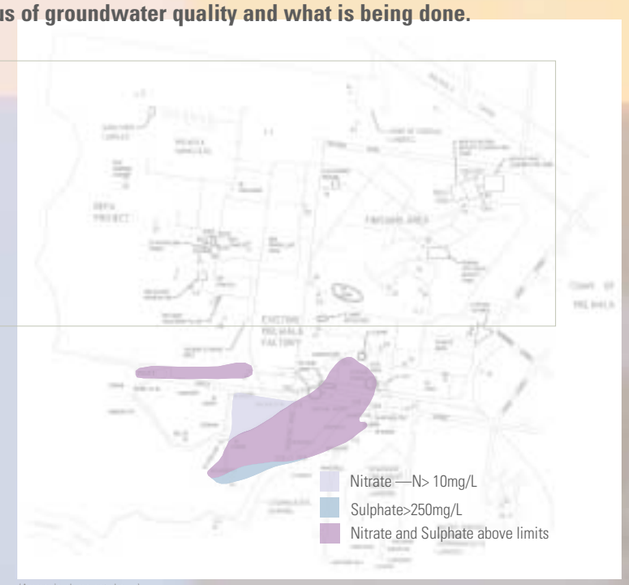
Facility Groundwater Monitoring Program

Comparison of the 1999 and 2000 groundwater data with the NSW EPA nominated guidelines, indicated exceedance of the Australian Drinking Water Guidelines, 1996 for nitrate, sulphate and ammonia. The guideline levels for sulphate and ammonia have been based on aesthetic considerations, that is, taste and corrosion of copper pipes and fittings. The nitrate level is a health-based guideline set to be protective of bottle-fed infants of up to 3 months of age; adults and children older than 3 months are able to tolerate higher levels of nitrate. Residents participating in the monitoring program were provided the results of samples taken from their properties.

Groundwater Plumes

The delineation of the plumes of nitrate, sulphate and ammonia in groundwater has been inferred from the results of groundwater monitoring completed in 1999 and 2000 and is defined by exceedance of the Australian Drinking Water Guidelines, 1996. The likely sources include a former fertiliser manufacturing facility and former gypsum dewatering ponds on the site. These processes ceased in 1970 and 1999, respectively. The testing program has also indicated that other substances used in the manufacturing processes at the facility are not of concern.

The sulphate plume lies south-west of the facility and measures approximately 1250 m and 400 m in length and width, respectively. The plume extends approximately 600 m beyond the southern boundary impacting an area approximately 900 m wide (east to west). The nitrate plume also lies south-west of the facility and measures approximately 1000 m and 250 m in length and width, respectively. The plume lies almost entirely off-site, extending approximately 550 m beyond the southern boundary of the facility, impacting an area approximately 850 m wide (east to west). The plumes cover an approximate area equivalent to 5 hectares. The extent of the ammonia plume is not well defined, however it extends 100m to the south of the facility boundary and is minor when compared to the extent of the nitrate and sulphate plumes. The vertical extent of both the nitrate and sulphate plumes is estimated to lie over a depth of typically 10 to 25 m below ground surface. Based on available data, the plume has taken 40 years to travel approximately 1.5 km from the southern site boundary. The plume is migrating in a south-westerly direction at a rate of approximately 40 m/year.



(Ammonia plume not shown)

Use of Groundwater for Drinking Purposes

In some locations the concentrations of nitrate, ammonia and sulphate in the groundwater exceed drinking water guideline values. The importance of these chemicals is as follows:

Nitrate

High levels of nitrate in household water supplies may be of concern to families with infants under 3 months, using groundwater for formula preparation. Human babies are susceptible to high nitrate levels due to the action of certain bacteria, which live in the digestive system during the first few months. Around the age of three months, as the baby's digestive system develops, digestive acids kill these bacteria. By the time babies are about six months old, their digestive system is fully developed, and none of the nitrate-converting bacteria remain. In older children and adults, nitrate is absorbed and excreted, and this issue is no longer a health concern.

Ammonia

Ammonia is an important metabolite in humans and animals. Almost all ammonia is absorbed by the body tissues and transported to the liver and used predominantly in the urea cycle. Ammonia may have an effect on humans when the intake becomes higher than the human body to can naturally remove, typically over 1000 mg/L. The ammonia level set in the Australian Drinking Water Guidelines 1996, is based on aesthetic considerations. High ammonia levels may also corrode plumbing, particularly copper piping and fittings.

Sulphate

People unaccustomed to drinking water with elevated levels of sulphate can experience diarrhoea and dehydration. If sulphate in water exceeds 250 mg/L, a salty taste may render the water unpleasant to drink. The sulphate level set in the Australian Drinking Water Guidelines, 1996 is based on aesthetic considerations. High sulphate levels may also corrode plumbing, particularly copper piping. In areas with high sulphate levels, plumbing materials more resistant to corrosion, such as plastic pipe, are commonly used.

Use of Groundwater for Irrigation and Stockwatering

The ANZECC Guidelines for Fresh and Marine Water Quality (Draft July 2000) present guideline levels for agricultural water uses, which include irrigation and stock watering. The water quality guidelines for irrigation use are aimed at maintenance of productivity of irrigated agricultural land and associated water resources, in accordance with the principles of Ecological Sustainable Development and catchment management. The stockwatering guidelines are based on the protection of stock, which may rely on the water for drinking purposes.

Based on the nominated guidelines, results from the groundwater monitoring program indicate that groundwater collected from the privately owned bores may be suitable for irrigation of moderately salt- tolerant crops/plants. Some effects, such as reduction in yield may occur if the groundwater is used for sensitive crops and its suitability should be checked before use.

Groundwater quality throughout the inferred plume area varies between individual bores; a number of private bores have been tested and owners notified as to the suitability of groundwater for irrigation.

The testing results also indicate that groundwater collected from the privately owned bores is suitable for use by stock with respect to nitrate and sulphate levels. Some bores may not be suitable for poultry and/or dairy cattle due to elevated salinity levels in the groundwater. Regional background salinity within the Mulwala area ranges typically from 500 to 1500 mg/L Total Dissolved Solids (TDS) with some bores in the general area north of the Mulwala Facility reporting salinity levels in the order of 7500 mg/L TDS. Salinity levels within the groundwater plume range from 80 to 6500 mg/L TDS.

Other Issues Associated with the Groundwater

The groundwater plume is located typically 10 to 25 m below the surface and the chemicals which characterise the plume are not volatile in nature and will not affect the normal use of the land in the residential areas south of the site. In addition, the groundwater plume is not expected to give rise to any measurable effect on the Murray River, and further studies are being carried out to confirm this and to determine potential effects on the low lying areas adjacent to the River.

On-going Actions

Further to the program of groundwater monitoring in residential bores in 1999 and 2000, a survey of residents throughout the residential area south of the site has been undertaken and has identified groundwater users. Letters were written to each of the residents to communicate results of the monitoring program and the potential issues associated with groundwater use. Currently, based on data from the Department of Land and Water Conservation, there are no residents identified using groundwater for drinking purposes.

The Facility is committed to developing an effective and appropriate solution, and has presented an on-going strategy for groundwater management to the NSW EPA. This strategy was prepared with the participation of the Department of Land and Water Conservation, EPA-appointed Auditor (Peter Nadebaum), EPA and Corowa Shire Council. This strategy proposes a number of actions, which will address groundwater issues for all residents to the south of the site.

For further information regarding the groundwater management strategy for the facility, please contact the Department of Defence Community Hotline on 02 6266 7504, the Albury EPA office on 02 6041 4963 during business hours or visit the website at www.defence.gov.au/deo/demf/deh.

Consultants' Role

CH2M HILL is acting as a technical advisor on management of the off-site groundwater plumes and is assisting in the development of a suitable groundwater management strategy. CH2M HILL is a large international company with extensive experience in groundwater management worldwide and was selected based on similar experience at sites such as the San Gabriel Basin in California, USA. CH2M HILL was engaged by the US Environmental Protection Agency and the water supply authority as technical advisor, to undertake a review of remediation strategies for nitrate and volatile organic compound contamination and monitor the performance of the strategy. The Basin is widely used as a groundwater resource for domestic and irrigation water supply.

Dr Peter Nadebaum of Egis Consulting Australia has been appointed by the Facility to carry out an independent review of the groundwater remediation action plan. Dr Nadebaum is recognised nationally and internationally for his expertise in soil and groundwater contamination management. The outcome of his review will be a report, which provides a critical review of the remediation action plan to ensure that the plan will meet the desired objectives, and will be submitted to all stakeholders.

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