Chapter 1- Importance Of Freshwater

Introduction

Water - arguably the life blood of existence and every living organism relies upon it to some extent for its survival. Without an uninterrupted supply of fresh water, the balance of life is tipped and our very existence is challenged.

In temperate climates like New Zealand, water availability is still largely taken for granted, particularly in urban areas where it comes treated from a tap in apparently unlimited quantities. Farmers rely on it for stock water and irrigation of crops. Industry relies on it for heating, cooling, energy and hygiene. Historically, its value was underestimated and the concept of a finite resource was largely unrecognised. Today we have all realised that our water resources are precious and that an uninterrupted supply can no longer be taken for granted.

Local authorities such as the Marlborough District Council, have the responsibility for administering access to this precious resource and as more information is gathered and analysed, so the understanding of the important role of guardianship grows. Locally we have a team of five involved directly in the groundwater monitoring programme.

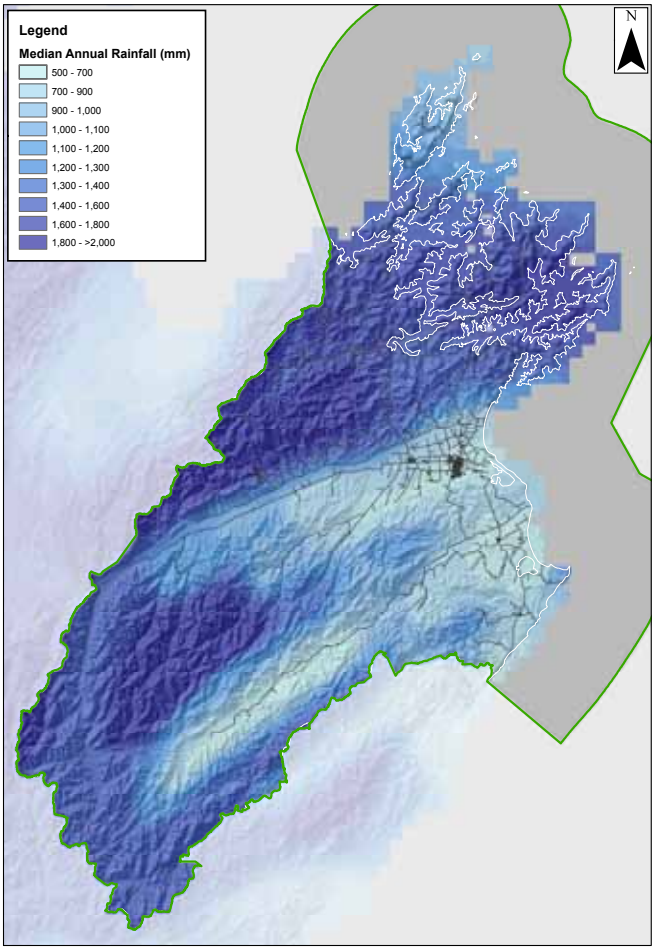

Figure 1.1: Marlborough mean annual rainfall

Freshwater use in New Zealand

In Marlborough the perception of water availability will be influenced by whether you live in the relatively high rainfall Marlborough Sounds, or one of the drier catchments south of the Wairau River (Fig. 1.1). Also whether you are connected to a reticulated supply or manage your own source.

In New Zealand most of the freshwater abstracted from the environment is used for crop irrigation. This is followed by manufacturing or industrial processing and then municipal supply; with rural stock or domestic water takes representing the smallest portion. These are similar to the proportions seen worldwide where the vast bulk of freshwater is used for agriculture and food production.

The majority of consented water takes in New Zealand are sourced from groundwater, although the volume of water taken from surface-water sources is higher than that of groundwater. Groundwater abstractions account for just over one third of allocated water (Ministry for the Environment - 2007).

Marlborough has the highest proportion of resource consents allocated for crop irrigation use of any region in the country. This reflects the rural nature of the region, and its dependence on irrigated agriculture.

Most New Zealanders don't yet fully appreciate the value of freshwater which reflects its relative abundance here compared to most of the rest of the world. Recent research has identified the significant contribution it makes to our agricultural based economy and ongoing analysis will ensure a continuation of supply for all sectors of the community.

Groundwater

It is estimated that around 20% of the world's population relies on groundwater for their drinking, industrial and agricultural needs. This proportion is increasing as water from more accessible sources such as rivers is used up or continues to deteriorate in quality. Many of the worlds deeper groundwater resources have yet to be exploited as they are relatively inaccessible compared to rivers or streams.

Groundwater is seen as a potential saviour for future world water demand, however much of this untapped water is very old and its quality makes it unsuitable for all uses. It is also slow to replenish which limits the rate at which it can be used sustainably, particularly for high demand sectors such as industry or agriculture.

Groundwater was discovered and utilised by ancient civilisations as long ago as 3000 years BC. In the

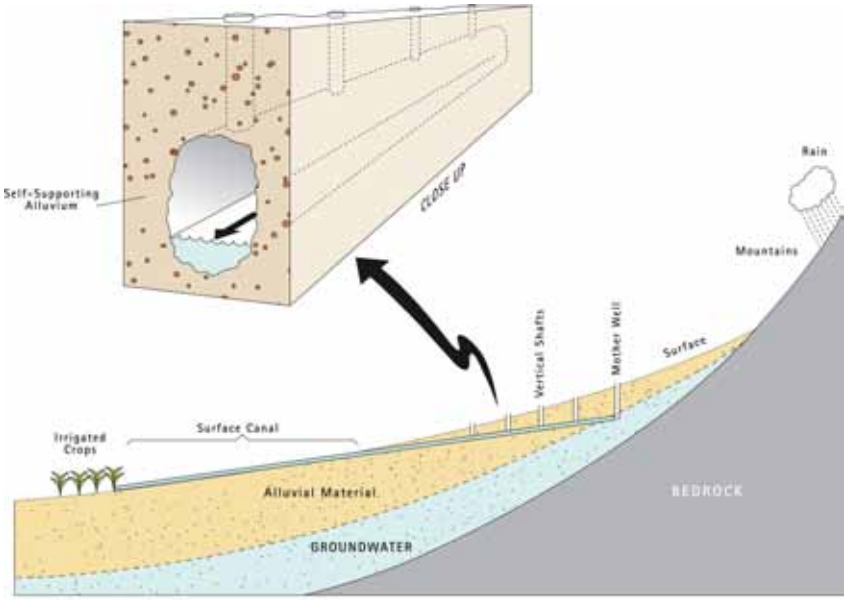

Figure 1.2: Qanat construction

Middle East underground channels called qanats were constructed to intercept groundwater near the mountains and transport it underground out into the dry desert areas where people lived or farmed in ancient times.

A typical qanat system is made up of a series of vertical shafts linking to a common horizontal tunnel which carries the water (Fig. 1.2). The grade of the channel was carefully designed to maximise efficiency, while avoiding scouring and showed the ingenuity of the engineers.

The oldest and largest known qanat is in the Iranian city of Gonabad which after 2700 years still provides drinking and agricultural water to nearly 40,000 people. It sources water from wells more than 360 metres below the surface and transports it over a distance of 45 kilometres. Apparently the older systems are the most efficient and skillfully made.

Figure 1.3: Carrying well water, Mysore, India

Today little has changed for hundreds of millions of people in the third world where the village water well remains the focus of daily existence for the community and people physically carry water from the well to their homes (Fig. 1.3). Before the reticulation of water supplies European cities also relied on communal wells (Fig. 1.4). The bucket would be lowered to the water table and filled with water, before being lifted to the surface and carried to where it would be used.

Groundwater is usually associated with coastal river floodplains, where the bulk of the world's population live such as the Ganges River delta in Bangladesh.

Groundwater is a popular source of water worldwide for a number of reasons; it can be accessed close to its point of use, wells are relatively cheap to construct and it is generally of higher quality than either river or rain water. However its biggest advantage over surface water is its inherent ability to store water. It can naturally store water that fell as rain weeks or even years before.

This naturally smooths out variations in rainfall or recharge and makes water available when river flows may be low, but demand is highest. Because groundwater is usually located below the influence of evaporation, groundwater can be stored without losses, unlike a dam.

Aquifers are natures subsurface water transporters and can move water over distances of thousands of kilometres. This means that recharge water that entered the Wairau Aquifer near Renwick can be naturally conveyed underground all the way to the Cloudy Bay coast without seeing the surface again.

Figure 1.4: Traditional European well in the 16th century fortified city of Ciudad Rodrigo in Spain

The highest demand on groundwater resources occurs on the drier east coast of New Zealand and it is generally stored by alluvial gravel aquifers associated with nearby rivers. Groundwater resources underpin economic activity in Gisborne, Hawkes Bay, Wairarapa, Nelson, Marlborough, Canterbury and Otago regions. This reflects the fact that many east coast rivers are unreliable or only flow intermittently when large volumes of water for crop irrigation are needed during the driest months of the year.

According to Thorpe (1992) groundwater supplies the drinking or municipal needs of at least one third of the population including the residents of: Christchurch, Napier/Hastings, Lower Hutt, Wanganui, Blenheim and Picton. Other centres such as Whangarei will be partially supplied from groundwater or spring-flow during part of the year. Unlike a village well the modern municipal well-field is largely inconspicuous and hidden below ground level (Fig. 1.5).

In Marlborough freshwater is supplied from a number of different sources including aquifers, river or streams and roof top runoff. Groundwater is the main source for the inhabitants of the Wairau Plain where most of Marlborough's population live and the largest concentration of irrigated crops are grown.

While the greatest demand for groundwater locally is for crop irrigation over summer, during the remainder of the year municipal water supply for the towns of Blenheim, Renwick, Woodbourne, Ward, Picton and Havelock is the largest consumer.

However like all natural systems, aquifers are vulnerable and things can go wrong such as if they are over-pumped or contaminated for example. A groundwater resource, while serving a key role in providing water for a community, may be detrimentally affected by the development it helped to create.

Dependence on groundwater

Freshwater is arguably Marlborough's most precious natural resource both economically, for community well-being and as a necessity of life. The sustainable management of groundwater is vitally important to all of us. To those of us living and working on the Wairau Plain, the availability of groundwater in sufficient quantity and of acceptable quality is paramount. Elsewhere in many parts of Marlborough there are alternative sources of water but the Wairau Plain is totally dependant on groundwater. Groundwater is something that often does not have a lot of thought put into it and it is assumed it will always be available in sufficient volume for all of our needs.

Groundwater has been used since the early days of European settlement throughout the district, but particularly on the Wairau Plain. Maori were attracted to the Wairau Plain by the plentiful sources of food and particularly the freshwater springs, created by up-welling aquifer water. Waipuna is the Maori word for springs and the aptly named Waipuna Street is located in the Springlands area of Blenheim.

Figure 1.5: Municipal well-field at Grove Road in central Blenheim

If you suddenly found yourself without water at home or on the farm, or if your drinking water kept making you ill, what would you do? One thing is certain, if this happened consistently over even a small area there would be a public uproar.

Areas of future interest

In the 1970s and 1980s people working in the groundwater resources field thought there were few new aquifers remaining to be discovered, or new water resources issues to face. They have since however been shown to be wrong on both scores.

As water resources become scarcer and competition between various users increases, aquifers that were previously uneconomic to draw water from, are now being used. History has shown that issues relating to water resources don't go away and in the context of predicted climate variability, there is likely to be a continuing need for good hydrological science well into the future.

References

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