greater WELLINGTON
REGIONAL COUNCIL

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Wairarapa Groundwater Model: Summary of Phase 1 and Scope for Phase 2

1. Purpose

To outline the need to carry out regional conceptual and numerical modelling of the Wairarapa groundwater basin, summarise progress to date in the project (Phase 1) and outline the next steps.

2. Significance of the decision

The matters for decision in this report **do not** trigger the significance policy of the Council or otherwise trigger section 76(3)(b) of the Local Government Act 2002.

3. Background

Groundwater is an important water source in the Wairarapa for public water supply, domestic use, stock water and irrigation. Furthermore, there are a number of groundwater dependent ecosystems in springs and wetlands throughout the valley. The demand for groundwater has increased markedly in the last ten years and a third of Wairarapa groundwater zones, as defined in the Regional Freshwater Plan (RFP), are at allocation levels greater than 60% of their allocation limits. Historically the Wairarapa valley has been divided into groundwater zones (Figure 1). In three of these zones (Parkvale, Kahutara and Martinborough Terraces), Greater Wellington is advocating no additional allocation of groundwater because abstraction may be causing a long-term decline in groundwater levels.

The increase in demand, and subsequent groundwater level decline, has brought into question the appropriateness of the allocation limits specified in the RFP. Consequently, a comprehensive review of the Wairarapa groundwater system was necessary to provide a sound scientific platform for the review of groundwater allocation limits and appropriate management objectives. The investigation has been underway for approximately two years, and it is planned that findings are considered when RFP is reviewed in 2009.

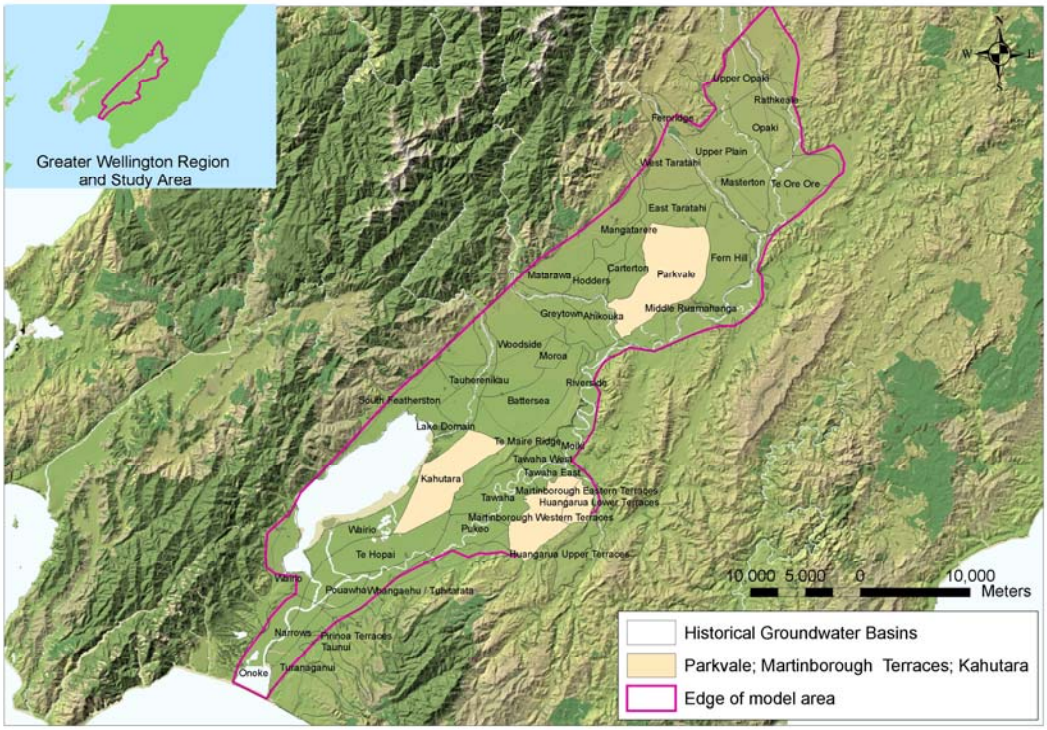

Figure 1: Historical groundwater basins and extent of model area. Location of Parkvale, Martinborough Terraces and Kahutara groundwater zones marked.

4. Review of Phase 1 of the project

Phase One of the study was completed in December 2006 and summarised in a report jointly compiled by Greater Wellington and Phreatos Limited[1]. The report describes a regional-scale revision of the geology and conceptual hydrogeology of the Wairarapa groundwater system. This revision has provided a context for local-scale information and identified information gaps.

Key findings from the Phase 1 report and subsequent peer review include:

- The groundwater and surface water system are essentially **one resource** and should be investigated as so. The majority of available and productive groundwater in the system discharges as surface water at some point in time.

[1] Jones A.J. and Gyopari M. Regional conceptual and numerical modeling of the Wairarapa groundwater basin. Greater Wellington Regional Council Report.

- The shallow (≈ 20 m in depth) aquifers across the region have strong interconnection with rivers, streams, springs and wetlands.

- River gauging studies show stretches of rivers gaining and losing water to the shallow aquifers (Figure 2).

- Surface water infiltrated to shallow groundwater often re-emerges back to rivers down valley or as springs. For example, the Waiohine River loses up to 30 – 40 % of its flow to groundwater north of Greytown to emerge at Papawai Springs and other spring systems south of Greytown.

- Groundwater flow is greater around present-day river systems (Figure 3).

- Minor quantities of groundwater slowly percolate to deeper aquifers (greater than 20 m below ground level). These deeper aquifers have less connection to surface water systems.

- Tectonic movement (faulting) in the area means there is a complex regional groundwater system, with major barriers to groundwater flow (e.g. Te Marie Ridge, Tiffen Hill and Lansdowne Hill) and several sinking (subsiding) sub-basins (e.g. Te Ore Ore, Parkvale and Lake Wairarapa).

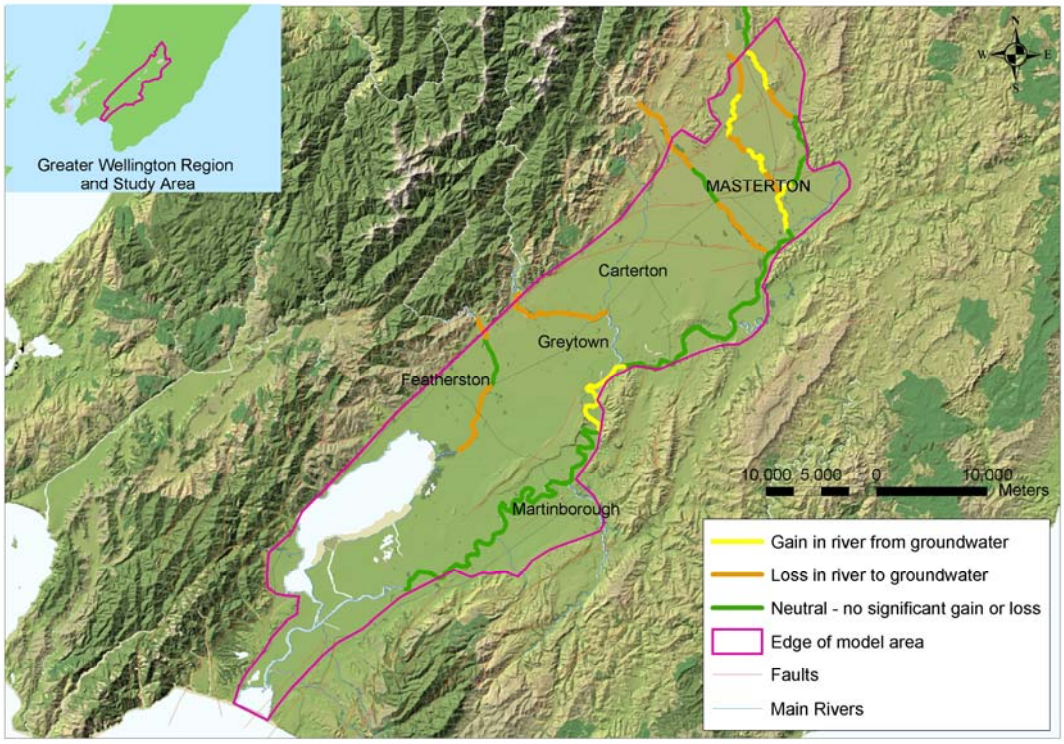

Figure 2: Preliminary results showing reaches of major rivers either losing water to or gaining water from groundwater. Similar patterns are observed in smaller streams and tributaries.

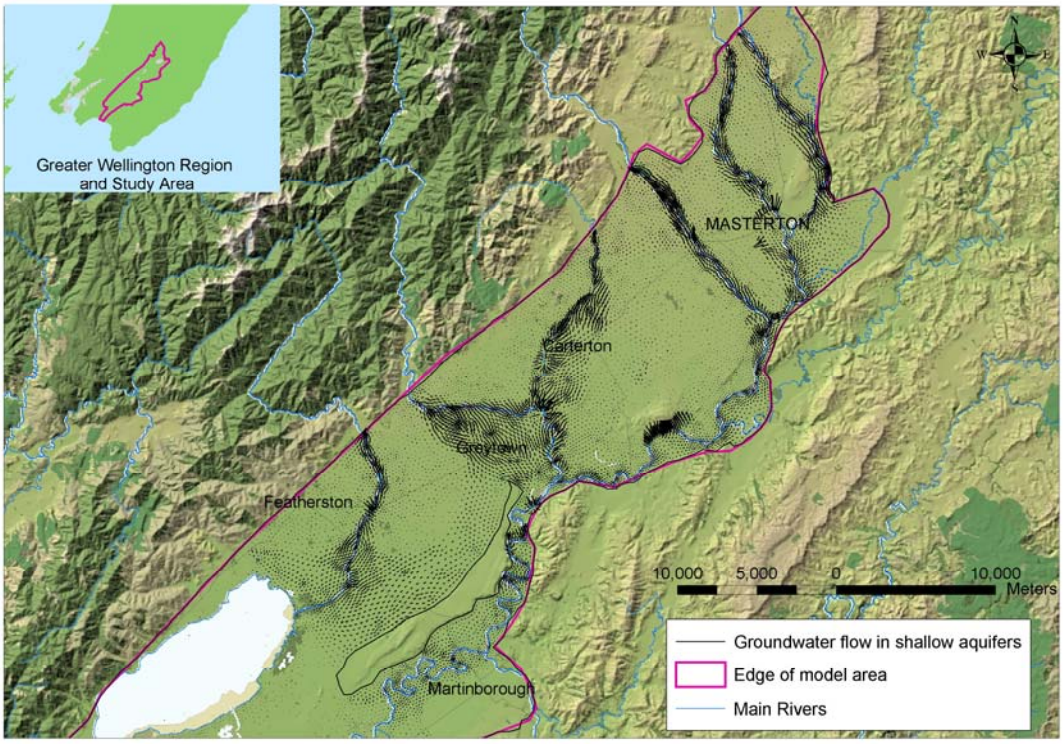

Figure 3: Initial computer model output of shallow groundwater flow lines. The darker patches show higher rates of flow through shallow aquifers close to present-day main rivers, highlighting potential groundwater/surface water interactions.

5. Direction for Phase 2

The Phase 1 conceptual and computer (numerical) modelling exercise has led to recommendations for further work necessary to ensure sustainable use and management of the Wairarapa groundwater resource. A second stage of advanced investigation is to be implemented to build upon the geological and hydrogeological models developed to date. The key goal of this 'Phase 2' investigation is:

To provide a sound technical foundation for the practical and effective sustainable allocation of groundwater resources in the Wairarapa Valley.

Specific next steps are to:

- Refine the conceptual and computer simulated (numerical) groundwater models by addressing critical information gaps (e.g. by undertaking field investigations and further analysis of existing information).

- Construct a computer-based model capable of accurately simulating the behaviour of the groundwater system over time and its responses to stresses such as abstraction and climate change.

- Develop detailed local-scale computer models in areas where groundwater abstraction may be resulting in significant stream flow depletion, particularly in streams of high ecosystem value.

- Define groundwater management objectives focused upon protecting the environmental values of freshwater ecosystems.

- Develop a proposal for groundwater resource allocation and quantify sub-regional allocation limits.

- Recommend a groundwater and surface water monitoring strategy consistent with the conceptual model.

5.1 Current main issues in the project

Since commencement of the project several important data/knowledge gaps appeared, the most important of these are:

- Lack of metering data from groundwater/surface water abstractions,

- Effects of groundwater abstraction on surface water flow,

- Linking groundwater and surface water allocation in policy and consenting.

6. Conclusions

- Phase 1 of project is completed and forms a sound basis for further work.

- Phase 2 of the project has commenced and will integrate large amounts of existing data and where needed be augmented by the collection of new field data.

- Following this thorough review some new permanent monitoring locations may be recommended.

- The existing groundwater zones identified in the RFP may need to be reviewed to better reflect groundwater flow systems.

7. Communication

Copies of the Phase 1 report completed in December 2006 have been distributed to parties that have an interest in this work. A further update will be given to the Environment Committee at the completion of the next major phase of works.

8. Recommendations

It is recommended that the Committee:

1. ***Receive** the report; and*

2. ***Note** the contents.*

Report prepared by:	Report approved by:	Report approved by:
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