



Executive Summary

Maitai Drought Security WSP – OPUS Report

1.0 Background

The Maitai dam serves two purposes. The first is to allow compensation and augmentation flows into the Maitai River in response to resource consent conditions for the abstraction of water from the South Branch for the city water supply; and the second is to provide a raw water source when access to the South Branch of the Maitai River and the Roding River is restricted by weather, construction or drought.

In 2007 OPUS International Consultants Ltd prepared a report for Council on the role of the Maitai dam in providing drought security for the city out to 2055. That report set out the results from a computer model that had been developed in 1996 by Works Consultancy Services (later to become OPUS) to investigate the interaction of the raw water sources and city demand and identify required storage volumes. In 2017 WSP-OPUS were engaged to refresh the 2007 report for the purpose of understanding the impact of proposed new resource consent conditions. The WSP-OPUS model has been peer reviewed by Keane Associates Ltd of Wellington.

2.0 WSP-OPUS Report and Addenda

The 2017 WSP-OPUS report and addenda update the river flow records, abstraction consent conditions for both the Maitai and Roding Rivers and analyses a range of demand scenarios for the years 2028, 2053 and 2100. Demand has been modelled using current volumes of water supplied from the water treatment plant. These volumes are a composite figure for residential, commercial and industrial usage. The demand scenarios are based on different population growth scenarios and the possible need to supply water to South Nelson in the future. A further demand representing a supply to Richmond was also investigated.

Two population growth scenarios were tested through the model. The main report and addendum 1 uses the Statistics NZ medium series plus high net migration and addenda 2 and 3 use the Statistics NZ high series for the first ten years with the medium series plus high net migration for the remainder.

The report and addenda 1-3 set out the total expected water storage volume required to meet the un-modified demands from the city. Addenda 4 looks at how storage is impacted by either a 5% or 10% reduction in demand. This reduced demand is consistent with what we expect could be achieved with the water conservation measures that would be introduced citywide under serious drought conditions. This approach simplifies a more complex real time response where water conservation measures are introduced sequentially as the storage in the dam reduces.



There are some features of the model that restrict the type of conclusions that can be drawn from the results:

- Climate change has not specifically been incorporated in the model given the difficulty in identifying how river flows and demand may change as a result.
- There is considerable uncertainty in population growth figures, particularly beyond 2050-60 and caution is required when reviewing the longer term results.
- Significant drought events are rare and consequently there is limited data on demand and river flows in these extreme events that can be incorporated into the model. This leads to mathematical uncertainties in the model in these extreme events.

3.0 Results

Table 1 sets out the volume of water that will be needed in order for the city to maintain a water supply in a 1:60 year drought (a drought that on average we would expect to happen once every 60 years).

These results can be compared directly against the capacity of the Maitai Dam which contains 4.2Mm³ when full. One option for increasing this volume is to modify the dam spillway to increase storage to 4.5Mm³. Beyond this volume an additional source of water will be required or demand will need to be reduced.

The model results confirm that in order to maximise the city's drought security raw water operation protocols based on keeping the dam as full as possible are required to support this. To achieve this the city preferentially sources water from the South Branch of the Maitai and the Roding Rivers. Resource consent conditions limit abstraction rates from the river and require minimum river flows to be maintained.

Scenario	Description of Growth and Extra Demand	Storage Volume Required (Mm3)	
		2053	2100
2a	medium series-plus	3.19	
3a	medium series-plus		4.47
7a	medium series-plus & 2500 m ³ /day to Sth Nelson	3.58	
8a	medium series-plus & 2500 m ³ /day to Sth Nelson and 5000m ³ /day to Richmond	4.32	
9a	medium series-plus & 2500 m ³ /day to Sth Nelson		4.79
10a	medium series-plus & 2500 m ³ /day to Sth Nelson and 5000m ³ /day to Richmond		5.38
12a	high series for ten years then medium series-plus	3.29	
13a	high series for ten years then medium series-plus		4.57



16a	high series for ten years then medium series-plus and 2500m ³ /day to Sth Nelson	3.62	
17a	high series for ten years then medium series-plus and 2500m ³ /day to Sth Nelson and 5000 m ³ /day to Richmond	4.37	
18a	high series for ten years then medium series-plus and 2500m ³ /day to Sth Nelson.		4.85
19a	high series for ten years then medium series-plus and 2500 m ³ /day to Sth Nelson and 5000 m ³ /day to Richmond		5.38

4.0 Conclusion

There is sufficient water storage capacity in the Maitai Dam for the city to maintain supply to meet expected levels of demand, within its boundaries, out to 2053 in a 1 in 60 year drought. The scenarios that involve Nelson providing a water supply to both South Nelson and Richmond result in a shortfall before 2053 unless spillway modification works are undertaken. At some date beyond 2053 Nelson will need to consider a range of options to address the city's demand for water. These options will include limiting peak demand, augmenting storage in the Maitai Dam and seeking an additional raw water source.