

Attention: David Leong
[REDACTED]

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**Northland Water Storage and Use Project:
Peer Review Scope for Catchment Models**

1. Introduction

Williamson Water & Land Advisory (WWLA) was commissioned as the lead contractor with partners Riley Consultants and a number of other experts by Northland Regional Council (NRC) in August 2019 to undertake the Northland Water Storage & Use Project (NWSUP): Pre-feasibility Demand Assessment and Design Study.

As part of this project, WWLA developed catchment flow models for the Mid-North and Kaipara Study Areas. These models simulate the daily average streamflow from 1972 to present. The objectives / purpose of the catchment models was to:

- quantify available surface water resources for the purpose of identifying sources of water (through either direct catchment inflows or pumped takes) to fill storage reservoirs; and
- simulate the long-term daily historic streamflow record to enable the calculation of key streamflow statistics (e.g. 7-day MALF and median) in order to determine allocable flow for both core allocation and high-flow water take consents.

The models are currently being utilised to support water take consent applications for the NWSUP: Feasibility Study and the current client Te Tai Tokerau Water Trust (TTTWT) are seeking a peer review.

This letter summarises our scope of works for the review, as has been agreed with NRC and TTTWT.

2. Scope of Peer Review

The development, calibration and application of the catchment flow models are detailed in two key reports summarised in **Table 1**.

Table 1. Key reports provided for review.

Reference	Report Title	Comment	Key Report Sections for Review
WWLA (2020a)	Northland Water Storage and Use Project. Volume 2: Water Resources Analysis.	Main report detailing the development, calibration and application of the catchment flow models.	<ul style="list-style-type: none"> • Section 3 – Catchment delineation. • Section 4.2 – Available Data. • Section 4.3 – SMWBM Overview. • Section 4.4 – SMWBM Parameterisation. • Section 4.5 – SMWBM Calibration (Mid-North). • Section 4.6 – SMWBM Calibration (Kaipara). • Appendix B – Validation of VCSN rainfall data at representative locations. • Appendix C – SMWBM Parameters – Relationships with Catchment Characteristics.
WWLA (2020b)	Consenting for the Matawii Reservoir – Hydrology Assessment.	Provides details on additional verification undertaken on VCSN rainfall data and simulated flows local to the Matawii Reservoir.	<ul style="list-style-type: none"> • Section 4.3 – Additional model verification to new streamflow data. • Appendix A – Additional validation of VCSN rainfall data specifically for Matawii.

The scope of the review is summarised in **Table 2**.

Table 2. Questions for review.

Review Component	Review Questions / Topics
Model Development (Input Data)	<ul style="list-style-type: none"> • Comment on the appropriateness of key model input data used. Key datasets used in model development included: <ul style="list-style-type: none"> ○ NIWA VCSN Rainfall and Evaporation data; ○ LINZ NZ 8m DEM; ○ NRC LiDAR DEM; ○ Mfe REC – Catchment Boundaries; ○ Landcare Research SMap Soil Data; ○ GNS QMap Geology data; and ○ NRC’s continuous and spot gauge flow monitoring data. • If not considered appropriate, what alternative input data sets are recommended?
Model Development Methodology	<ul style="list-style-type: none"> • Comment on the appropriateness of the Soil Moisture Water Balance Model (SMWBM) to simulate catchment daily-flows given the stated model objectives/purpose. • Comment on the appropriateness of the method applied to assign model parameters to sub-catchments. • Comment on the appropriateness of the method applied to assign model parameters to ungauged sub-catchments.
Model Calibration	<ul style="list-style-type: none"> • Comment on the level of calibration achieved given the stated objectives and purpose. • Given the paucity of available flow monitoring data, particularly in the Kaipara / Pouto Peninsula region, comment on the adequacy of the qualifiers made in the documentation.

Model Documentation and Reporting	<ul style="list-style-type: none">• Comment on whether the model documentation and reporting are appropriate for the purposes of providing detail and confidence in model development and future use.
Overall Appropriateness	<ul style="list-style-type: none">• Please provide comment on the overall appropriateness of the model and its ability to simulate daily streamflow, particularly in ungauged catchments, and catchments with no measured rainfall data (VCSN data were used).• Comment on the overall appropriateness of the model in regards to determining key flow statistics (e.g. MALF and median flow), used in determining allocation limits. Particularly in smaller sub-catchments where measured flow data are not available.• Comment on the adequacy of discussion related to hydrological risk in terms of:<ul style="list-style-type: none">○ Ability to fill the reservoirs; and○ accuracy for consenting purposes,• Comment on whether the model architecture (the models used, and overall methodology) could be transferred to other catchments in Northland, outside of the areas covered by the two models being reviewed.

We look forward to receiving your thoughts and comments on this review.

Yours sincerely,



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