ENVELOPE

EXTENDED FLOOD MODELLING – TAUPO SWAMP

MT WELCOME

TO	Pukerua Property Group LP	**DATE**	08 September 2026
PROJECT NAME	Mt Welcome	**ENVELOPE REF**	1753-02
ATTENTION	William Dorset	**FROM**	Kyle Dirse
EMAIL ADDRESS	william.dorset@classicdevelopments.co.nz		

1.0 INTRODUCTION

This memorandum responds to paragraph [13] of Minute 18 of the Expert Panel (FTAA-2603-1181, dated 4 September 2026). The Panel requested that the Applicant complete and provide the further flood modelling to assess the effects of within the extended downstream catchment.

The extended catchment modelling assesses whether the proposed Mt Welcome development results in any change to flooding at Taupō Swamp and through the Plimmerton urban area. Taupō Swamp begins approximately 800m downstream of the cut off-model extent, as shown in Figure 1.

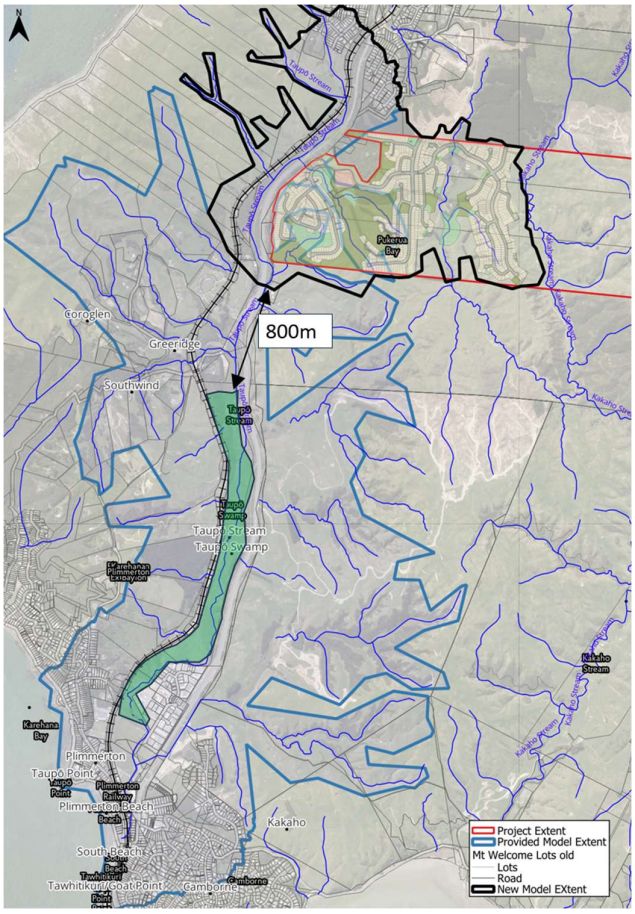


Figure 1. Model extents and Taupo Swamp location.

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2.0 MODELLING

3.1. PROVIDED MODEL

The Wellington Water Taupō Stream catchment model (the "provided model") is an InfoWorks ICM model covering the whole catchment from the south of Pukerua Bay to Plimmerton Beach. It was built by AWA Environmental for Wellington Water in 2017 and calibrated against observed flood events. Although this model is dated, and uses old data and parameters, it is the only tool for to assessment flooding effects in the Taupo Swamp.

The Taupō Swamp is in the 2D mesh on the 2013 LiDAR, with the swamp surface adjusted by the model builder during calibration. The swamp surface is the same in the pre- and post-development runs. Section 5 compares it with the 2023 LiDAR.

3.2. CLIMATE CHANGE

The provided model applies a 20% climate-change allowance to the HIRDS v3 rainfall depths, based on a 2.5°C temperature increase. This rainfall basis was retained for both the pre- and post-development scenarios. The events assessed are the 10-year (10yrCC) and 100-year (100yrCC) events.

HIRDS v3 was retained to maintain consistency with the existing catchment model and provide a like-for-like comparison. The stormwater devices within Mt Welcome have been sized separately using HIRDS v4.

3.3. CUT OFF MODEL

The flood assessment in the application uses a cut-off model, which takes the provided model, trims it to the area around the site, and rebuilds the ground model from the 2023 LiDAR merged with Envelope's own site survey at a 500mm grid. This is the model the flood assessment in the application is based on.

The provided model is useful for catchment wide assessment, as it was intended. However, it is not detailed enough to assess flood effects within the project extents. For this reason, it was decided to cut off the model, which would allow the level of detail to be increased in a defined area. The cut-off model was validated in order to represent similar outlets in the discharge compared with the provided model. After the validation, the cut-off model had several updates that make it more accurate and more reliable in terms of the hazard within the extent, these updates are within the Envelope Flood Assessment Report.

3.4. EXTENDED MOODEL

The cut-off model stops above the Taupo swamp and takes its downstream boundary from the provided model, so it cannot report what happens at the swamp or in Plimmerton. To do that, the proposed Mt Welcome reticulation, stormwater devices, and finished ground levels were copied into the provided model. The provided model as supplied is the pre-development case; the provided model with Mt Welcome added is the post-development case. Everything else in the model is unchanged between the two runs.

Due to the different LIDAR surfaces used, the Mt Welcome site was lowered to match the 2013 lidar datum used.

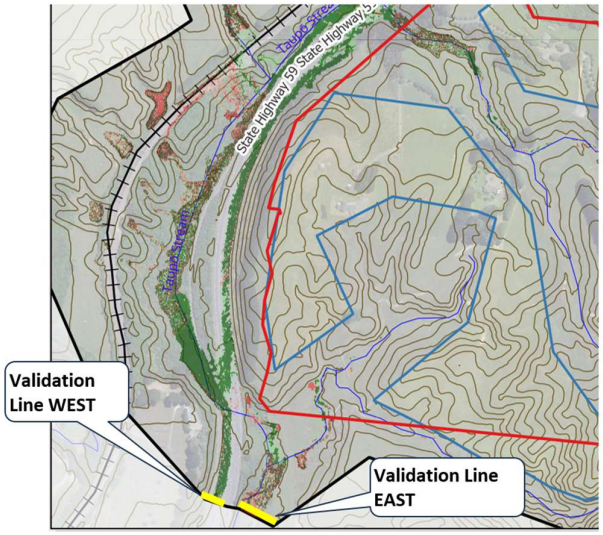


Figure 2. Cut-off lines validation location.

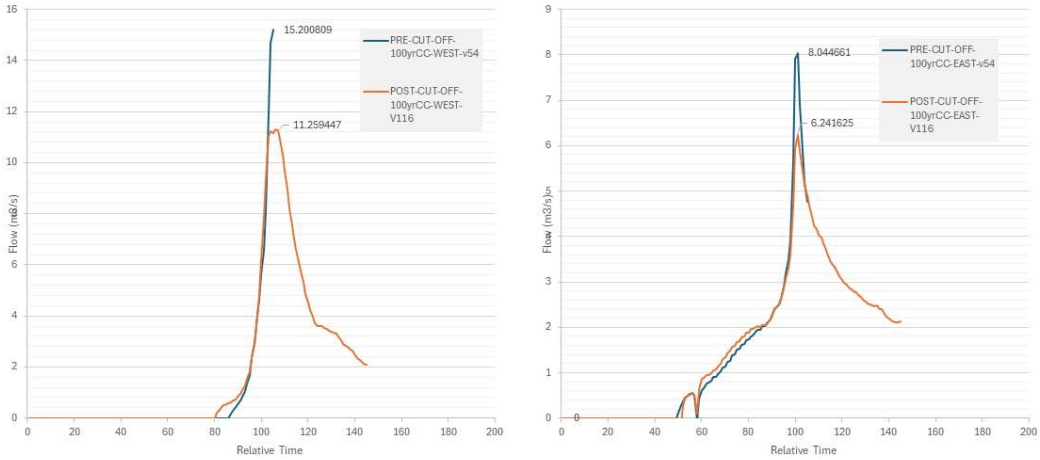


Figure 3. Discharge flows Pre Vs Post - 100yrCC (cut-off model)

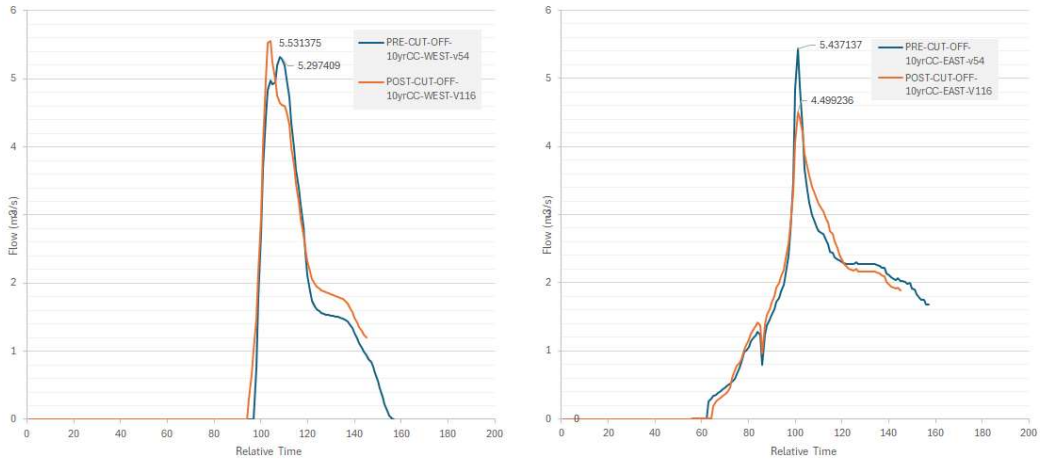


Figure 4. Discharge flows Pre Vs Post - 10yrCC (cut-off model)

3.0 RESULTS

The extended model results are presented below and compare the pre- and post-development scenarios for the 100-year event with climate change. At Tiaki Wai's request, the model was run for 72 hours to capture the full post-development recession and total flow volume through Taupō Swamp.

Five comparison points and four comparison lines were placed along Taupō Stream (Figure 4). Points Taupō 01 to 03 are in the swamp; Taupō 04 and 05 are in the Plimmerton urban area. Lines Swamp 1 to 3 cross the swamp; line "Swamp" is at the swamp outlet. Figure 5 shows the comparison points and lines used in the assessment.

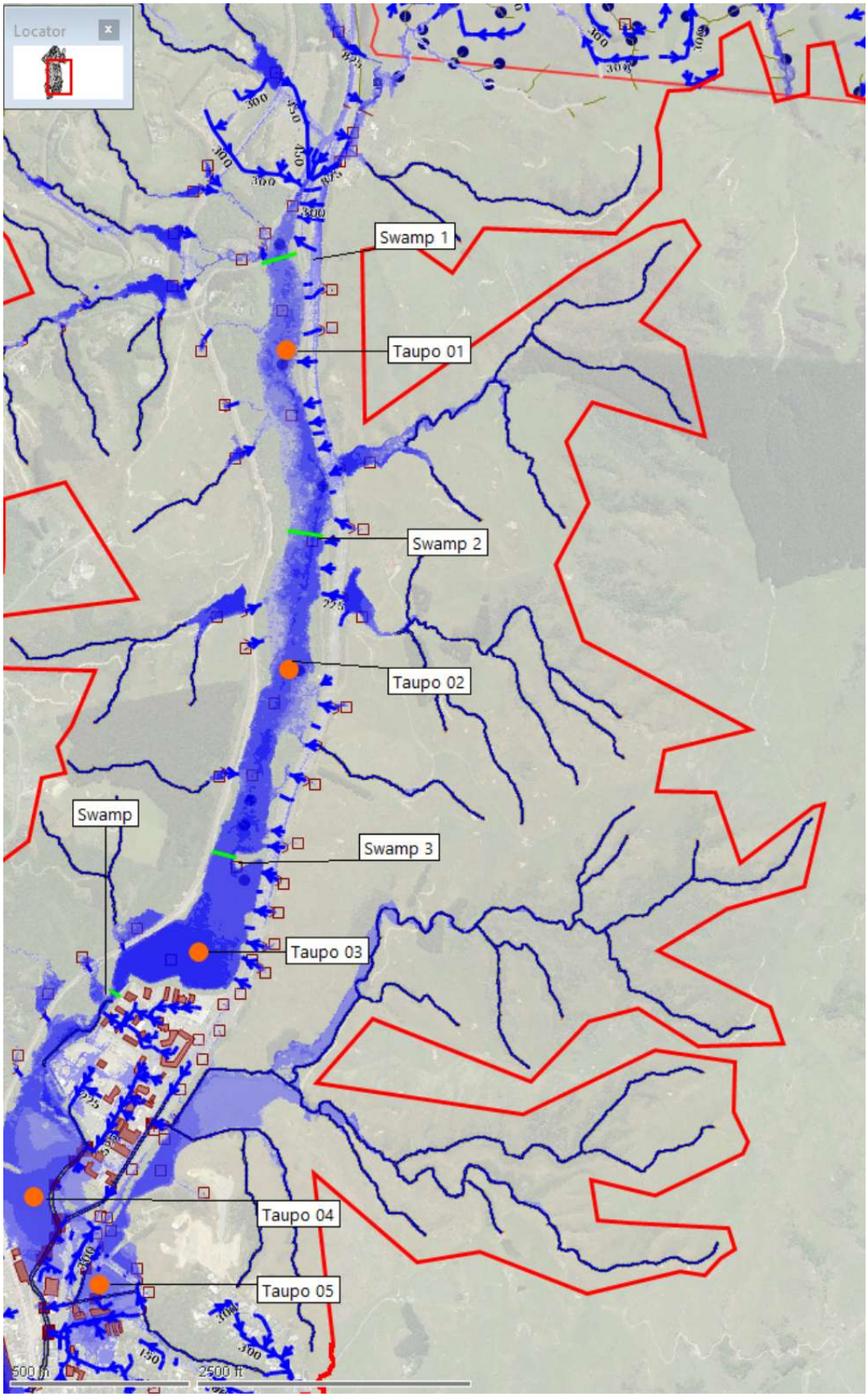


Figure 5. Full model comparison points and lines

4.1. POINT COMPARISON

Table 1 compares the peak flood depths at each point for the 100yrCC event. The corresponding time-series results are provided in Appendix 1.

Peak flood depths reduce by 88–99 mm at the two upstream points within Taupō Swamp (Taupō 01 and 02). At the lower swamp and Plimmerton points, the modelled depths increase by 54 mm at Taupō 03, 20 mm at Taupō 04 and 7 mm at Taupō 05.

Table 1. Point Comparison – Peak flood depth for the 100yrCC scenario

	Provided Model	Provided Model + Mt Welcome	Difference	Difference
Location	Max (m)	Max (m)	(m)	(mm)
Taupo 01	1.248	1.16	-0.088	-88
Taupo 02	2.191	2.092	-0.099	-99
Taupo 03	2.693	2.747	0.054	54
Taupo 04	1.378	1.398	0.02	20
Taupo 05	0.736	0.743	0.007	7

4.2. SECTION COMPARISON

Table 2 compares the peak flows and accumulated volumes at each section for the 100yrCC event. The corresponding time-series results are provided in Appendix 2.

Peak flows reduce at all four comparison sections in the post-development scenario, by between 0.30m³/s and 3.30 m³/s. Accumulated volume reduces at 3 sections and increases at 1 section for a 72-hour simulation. \

Table 2. Section Comparison – Peak flow and accumulated volumes for the 100yrCC scenario

	Provided Model		Provided Model + Mt Welcome		Peak Difference Flow	Difference Acum. Vol.	Difference Acum. Vol.
Location	Max (m3/s)	Volume (m3)	Max (m3/s)	Volume (m3)	(m³)	(m³)	(%)
Swamp 1	18.07	209230	15.57	195524	-2.50	-13706	-6.6%
Swamp 2	31.74	433493	28.44	423875	-3.30	-9619	-2.2%
Swamp 3	31.23	566390	29.44	570908	-1.78	4517	+0.8%
Swamp 4	21.12	705713	20.82	635571	-0.30	-70143	-9.9%

4.3. FLOOD DEPTH AND WATER LEVEL MAPS

Appendix 4 presents the pre- and post-development peak flood-depth maps and the corresponding afflux map for the 100yrCC event. The afflux map shows the difference in peak depth between the two scenarios.

The afflux map contains some noise from the comparison of mesh elements between runs. Isolated, patchy differences should generally be disregarded.

Because the pre- and post-development models share the same ground surface outside the cut-off model extent, a water-level afflux map can also be produced. This provides a clearer basis for assessment, and the areas where increases or decreases are observed are described below.

Taupo Swamp

Within Taupō Swamp, the maps show reductions in peak depth at the two upstream comparison points and a small increase at the lower-swamp point. Through the Plimmerton urban area, the modelled increases are between 7mm and 54mm. These changes are localised and are contained within the Taupo Swamp. In section 4 we further assess the volumes, which provide further context to volume, depths and storage.

Plimmerton Industrial Estate

Within the Ulric Street industrial area, including Cedric Place and Northpoint Street, the post-development model shows a reduction in flood depth. This result appears to arise from model instability in this area. The model indicates that stormwater discharges from the industrial area into Taupō Swamp faster in the post-development scenario than in the pre-development scenario, adding to peak flows and slightly increasing volumes and flows in the lower reaches of the swamp, this is shown in Appendix 3. We consider this effect insignificant and attribute it to modelling instability that could not be resolved within this assessment.

Palmers Garden Centre

The afflux map shows isolated increases around Palmers Garden Centre. These have been traced to modelling instability in this area. Figure 6 shows the left bank flow at the Taupō Stream outlet: the pre-development result is smooth, while the post-development result oscillates rapidly around a similar mean, which is characteristic of instability rather than a physical change in flow.

Figure 7 compares the flow at Ulric Street Bridge and the downstream culverts for both scenarios. The hydrographs are stable and show similar peak flows and total volumes, with no corresponding increase from Mt Welcome. The isolated depth increases around Palmers Garden Centre are therefore a model artefact and are not accompanied by any material change in flood extent.

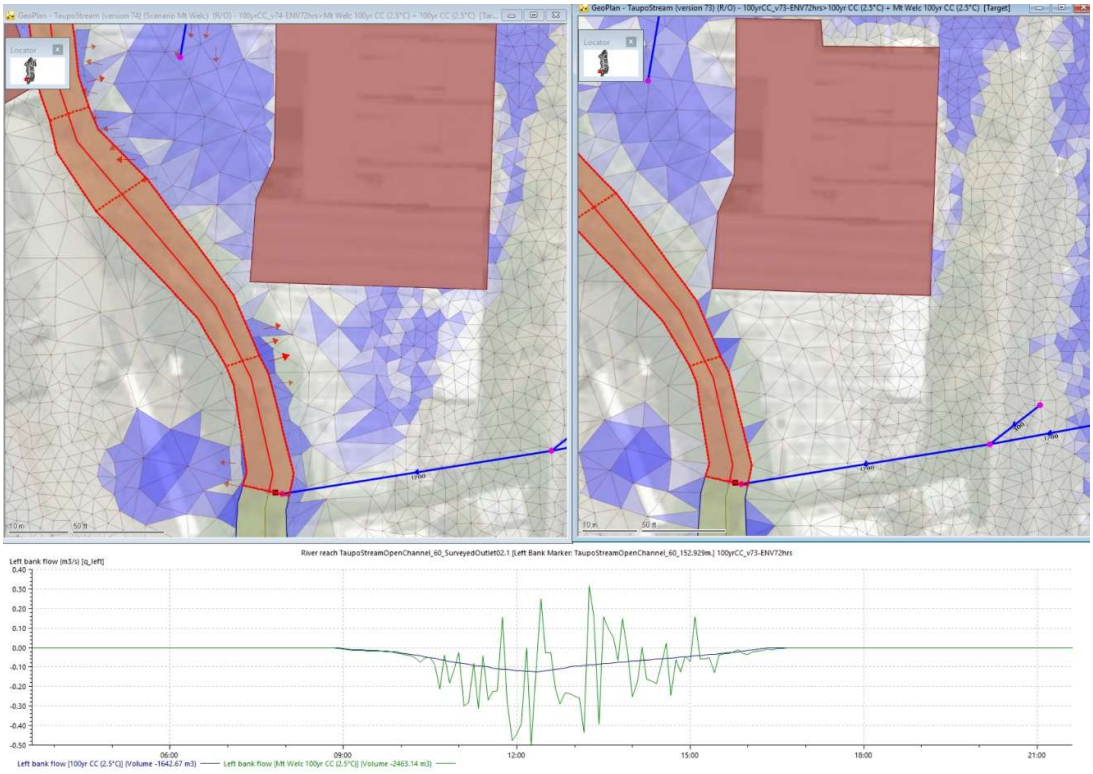


Figure 6: Pre-Post Channel

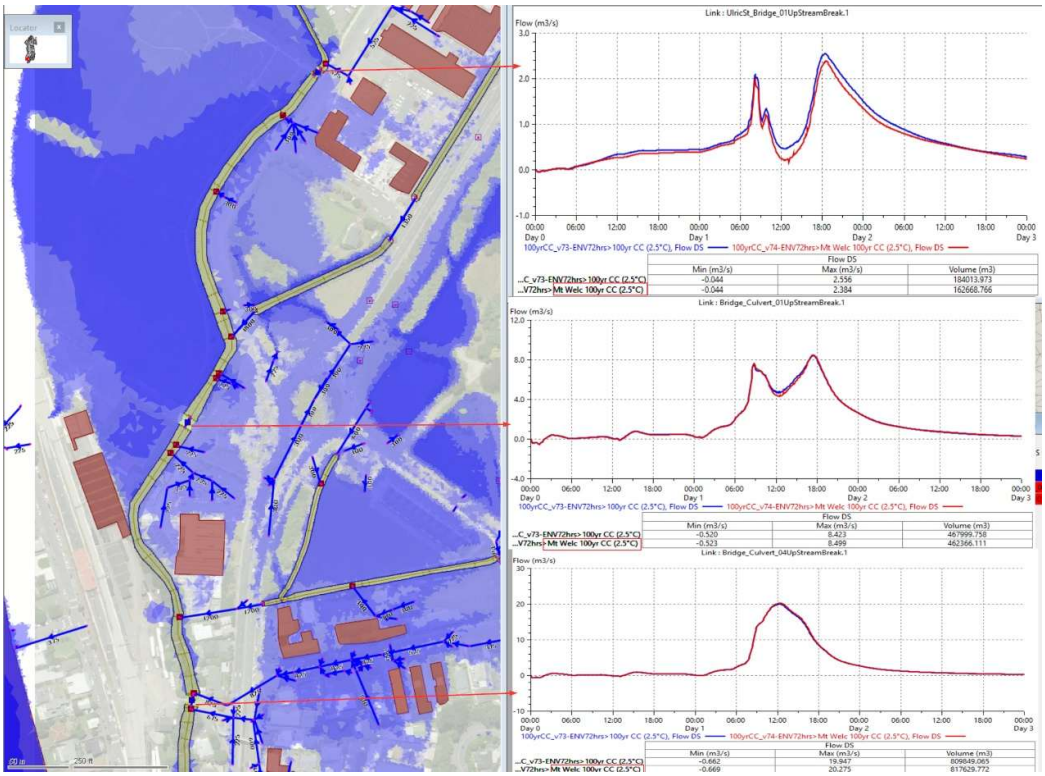


Figure 7. Flow comparison at Ulric Street Bridge & Culvert

4.4. FLOOD EXTENT

Appendix 4 compares the pre- and post-development flood extents for the 100yrCC event from the head of Taupō Swamp through to Plimmerton.

The post-development extent generally coincides with the pre-development extent through the swamp, along the SH59 corridor and within the Plimmerton urban area. The local depth changes identified in the afflux maps do not result in a material expansion of the flood extent or show additional properties or roads being affected.

4.0 VOLUME ASSESSMENT – TAUPO SWAMP SURFACE

A high-level assessment of the Taupō Swamp surface has been undertaken by comparing the 2013 LiDAR, the adjusted ground surface used in the model, and the available 2023 LiDAR.

The swamp is represented in the model as a 2D mesh with a mesh zone of 5m² minimum and 25m² maximum element area. The adjusted ground model is the 2013 LiDAR at 2 m grid, with a vertical accuracy of ±0.10 to 0.15 m (1 sigma) and a density of about 1.3 points/m². The 2023 LiDAR is specified at a minimum of 4.0 pulses/m² and a vertical accuracy of ±0.2 m (95%).

Across the swamp floor the raw 2013 LiDAR sits 1 to 2 m above the 2023 LiDAR, because it picked up the top of the flax rather than the ground. This is noted in the original model build report by AWA. The model builder recognised this and records that the DEM within the swamp was lowered to account for the difference between the real ground and the LiDAR surface, and smoothed. This adjusted surface “Bathy Validated Filled” was used for the modelling assessment, and is compared to the 2023 LiDAR below.

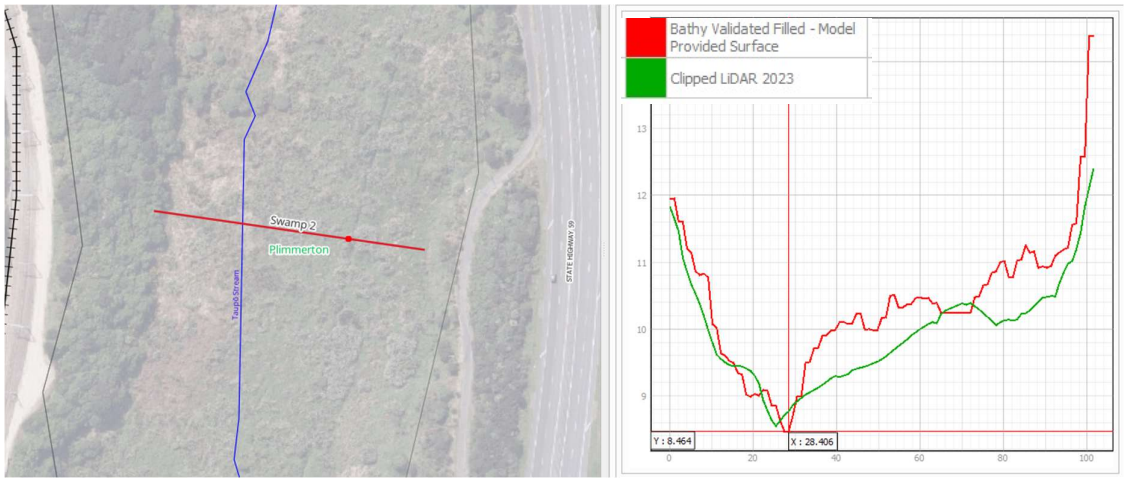


Figure 6. LiDAR Comparison on the Taupo Swamp. Swamp 2 Line

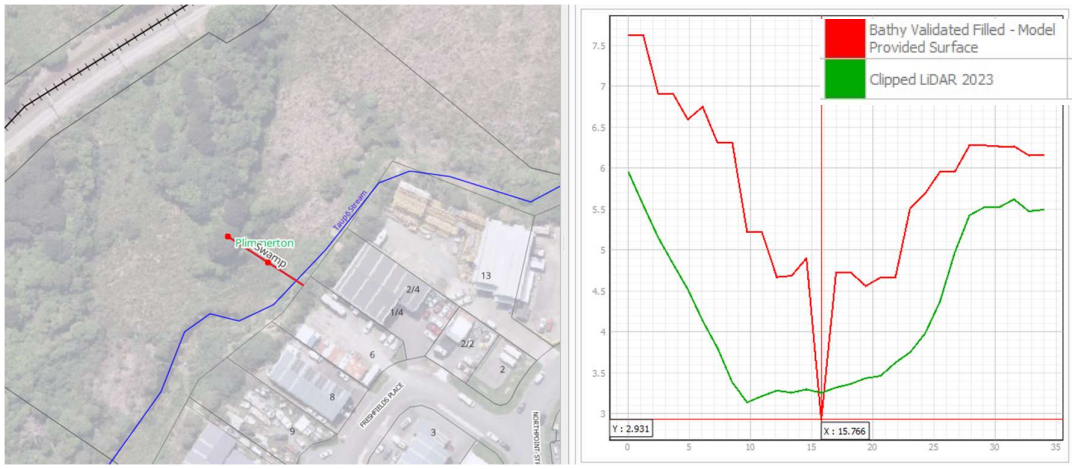


Figure 8. LiDAR Comparison on the Taupo Swamp. Swamp 4 Line.

Comparing the adjusted model surface with the 2023 LiDAR over the swamp (45.04 ha) shows the model surface sits above the 2023 LiDAR over most of the swamp, by a net 226,344 m^3. This is shown in Figure 9 below.

This is a rough approximation, but it indicates there is likely considerably more storage available in Taupō Swamp than the model represents.

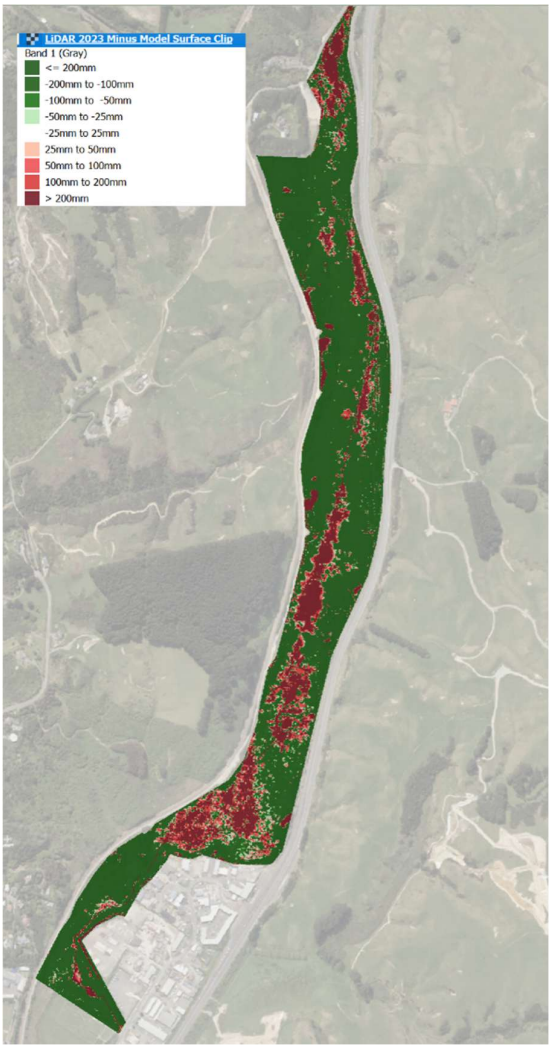


Figure 9 LiDAR Comparison on the Taupo Swamp.

5.0 ASSESSMENT OF EFFECTS

The modelling shows that the proposed wetlands and detention attenuate flows leaving Mt Welcome. In the 100yrCC event, peak flows reduce at all four comparison sections through Taupō Swamp, by between 0.30m³/s and 3.3 m³/s. Over the 72-hour simulation, accumulated volume reduces at three sections and increases by 0.8% (4,517 m³) at Swamp 3.

Peak flood depths reduce by 88–99 mm in the upper swamp and increase by 7–54 mm through the lower swamp and Plimmerton. These increases are localised, contained within Taupō Swamp, and do not materially change the flood extent or affect additional properties or roads.

Appendix 5 presents a longitudinal profile (3,139 m) of maximum pre- and post-development water levels along Taupō Swamp. The bottle neck near chainage 1950 produces a greater backwater effect in the pre-development scenario, which carries higher volumes. Between chainages 2550 and 2900 the swamp narrows and flattens, reducing the difference between pre- and post-development water levels and lowering flood depths.

Based on the results available, the Mt Welcome development does not materially increase downstream flood risk within Taupō Swamp or Plimmerton.

6.0 CONCLUSION

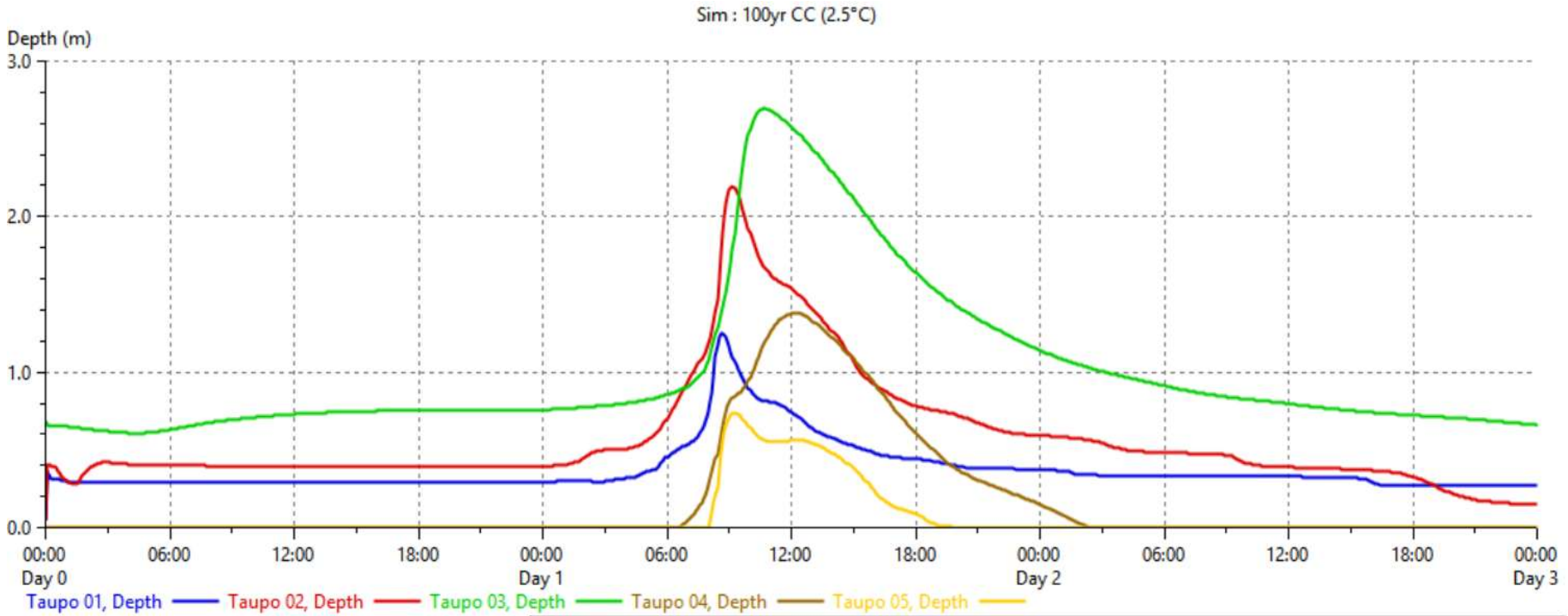
The extended catchment modelling confirms that Mt Welcome does not materially increase downstream flood risk within Taupō Swamp or Plimmerton.

- The Wellington Water Taupō Stream model was used unchanged as the pre-development case, with Mt Welcome added for the post-development case, and run for 72 hours in the 100yrCC event.
- Peak flows reduce through the swamp by 0.30–3.30 m^3/s.
- Some localised model instability is apparent in the Plimmerton industrial area and around Palmers Garden Centre. This has been interrogated and assessed as a model artefact, not a result of Mt Welcome post-development flows.
- Peak depths reduce in the upper swamp and increase by up to 54 mm in the lower swamp and 7–20 mm within Plimmerton, with no change in flood extent or properties affected.
- The 2023 LiDAR indicates the swamp has considerably more storage than modelled, so we believe the results are conservative.
- The proposed retention wetlands and detention functions provide the required mitigation within Mt Welcome. No further mitigation is necessary.

ENVELOPE

APPENDIX 1 POINT COMPARISION - FLOOD DEPTH

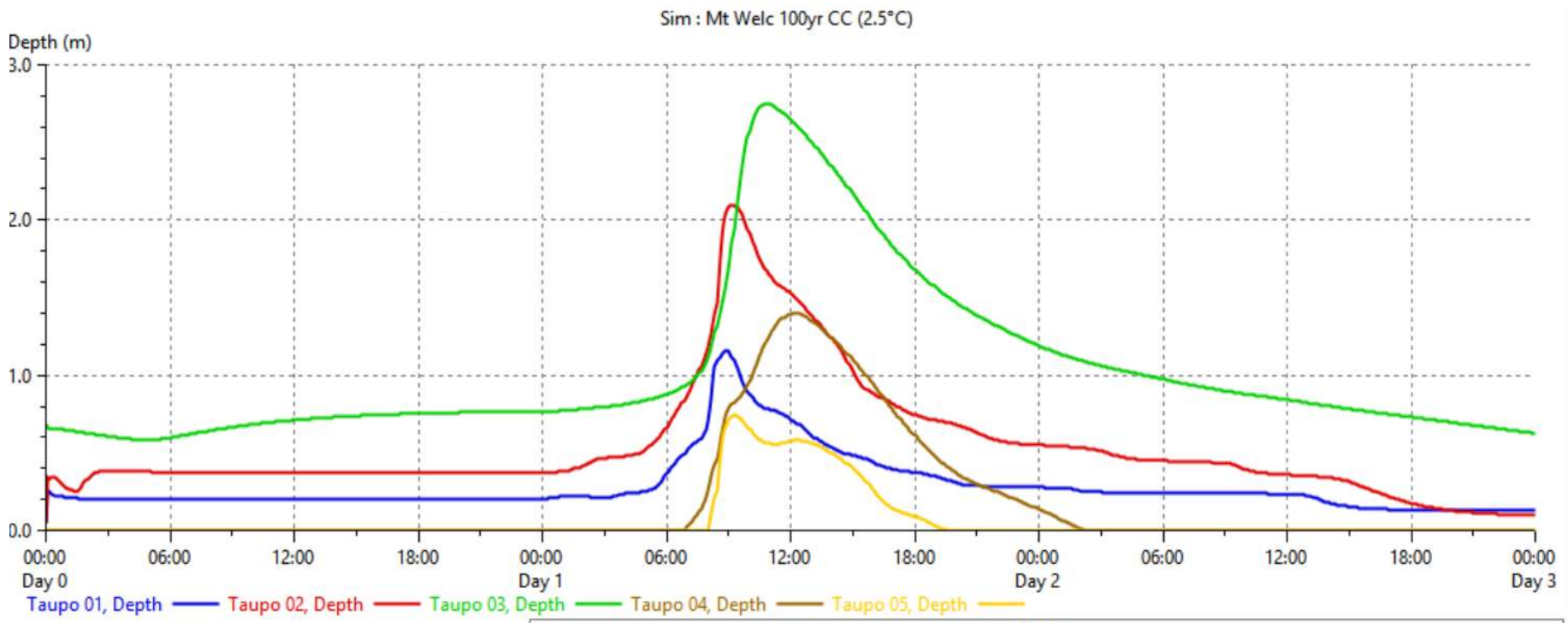
PRE-DEVELOPMENT



	Depth	
	Min (m)	Max (m)
Taupo 01	0.050	1.248
Taupo 02	0.050	2.191
Taupo 03	0.607	2.693
Taupo 04	0.000	1.378
Taupo 05	0.000	0.735

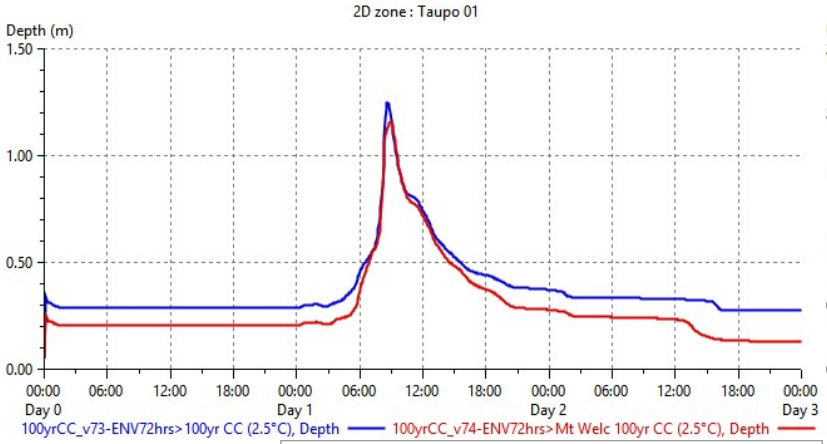
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POST-DEVELOPMENT

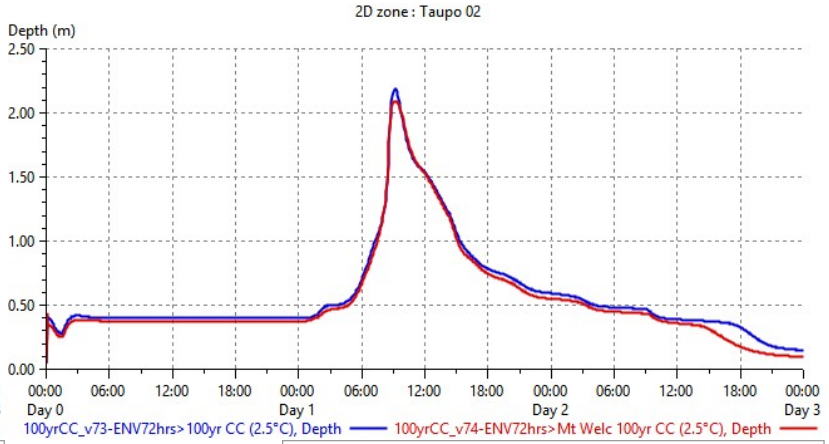


	Depth	
	Min (m)	Max (m)
Taupo 01	0.050	1.160
Taupo 02	0.050	2.092
Taupo 03	0.583	2.747
Taupo 04	0.000	1.398
Taupo 05	0.000	0.744

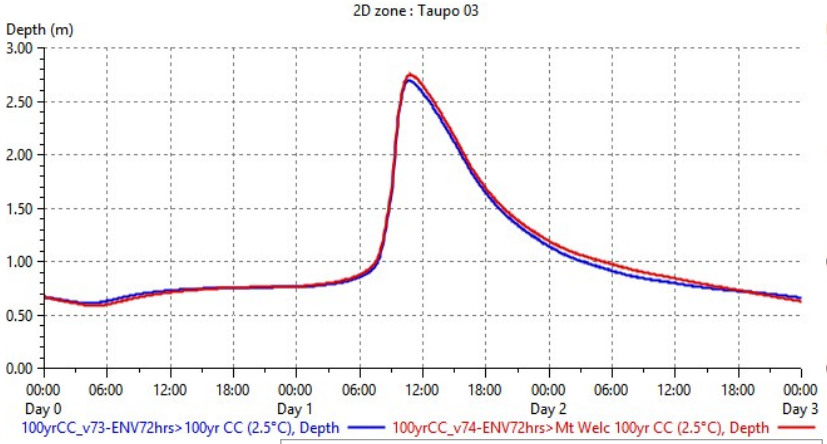
PER POINT



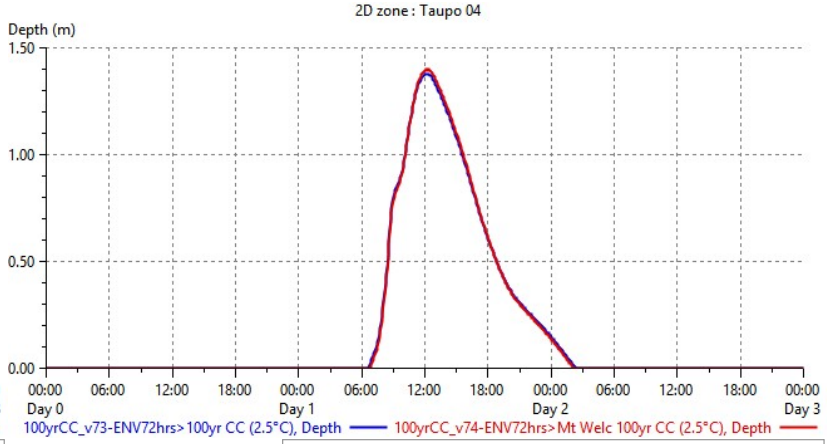
	Depth	
	Min (m)	Max (m)
...0yrCC_v73-ENV72hrs>100yr CC (2.5°C)	0.050	1.248
...4-ENV72hrs>Mt Welc 100yr CC (2.5°C)	0.050	1.160



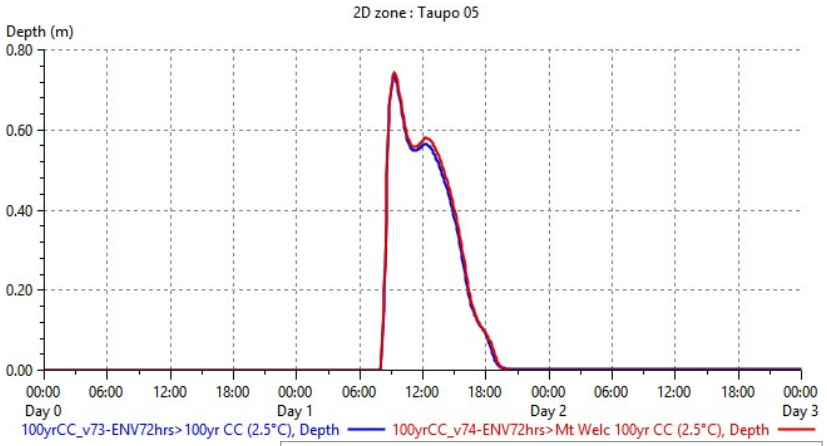
	Depth	
	Min (m)	Max (m)
...0yrCC_v73-ENV72hrs>100yr CC (2.5°C)	0.050	2.191
...4-ENV72hrs>Mt Welc 100yr CC (2.5°C)	0.050	2.092



	Depth	
	Min (m)	Max (m)
...0yrCC_v73-ENV72hrs>100yr CC (2.5°C)	0.607	2.693
...4-ENV72hrs>Mt Welc 100yr CC (2.5°C)	0.583	2.747



	Depth	
	Min (m)	Max (m)
...0yrCC_v73-ENV72hrs>100yr CC (2.5°C)	0.000	1.378
...4-ENV72hrs>Mt Welc 100yr CC (2.5°C)	0.000	1.398

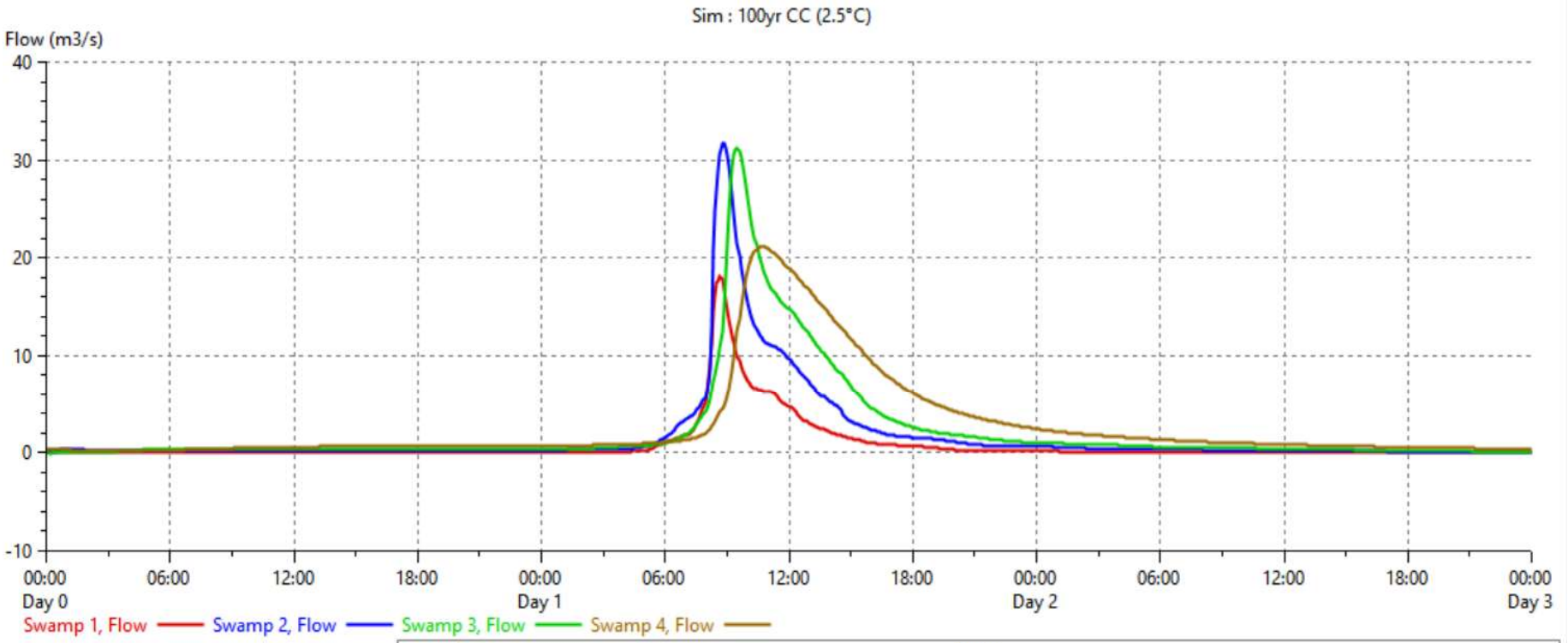


	Depth	
	Min (m)	Max (m)
...0yrCC_v73-ENV72hrs>100yr CC (2.5°C)	0.000	0.735
...4-ENV72hrs>Mt Welc 100yr CC (2.5°C)	0.000	0.744

ENVELOPE

APPENDIX 2 SECTION COMPARISION – FLOW AND ACCUMULATED VOLUME

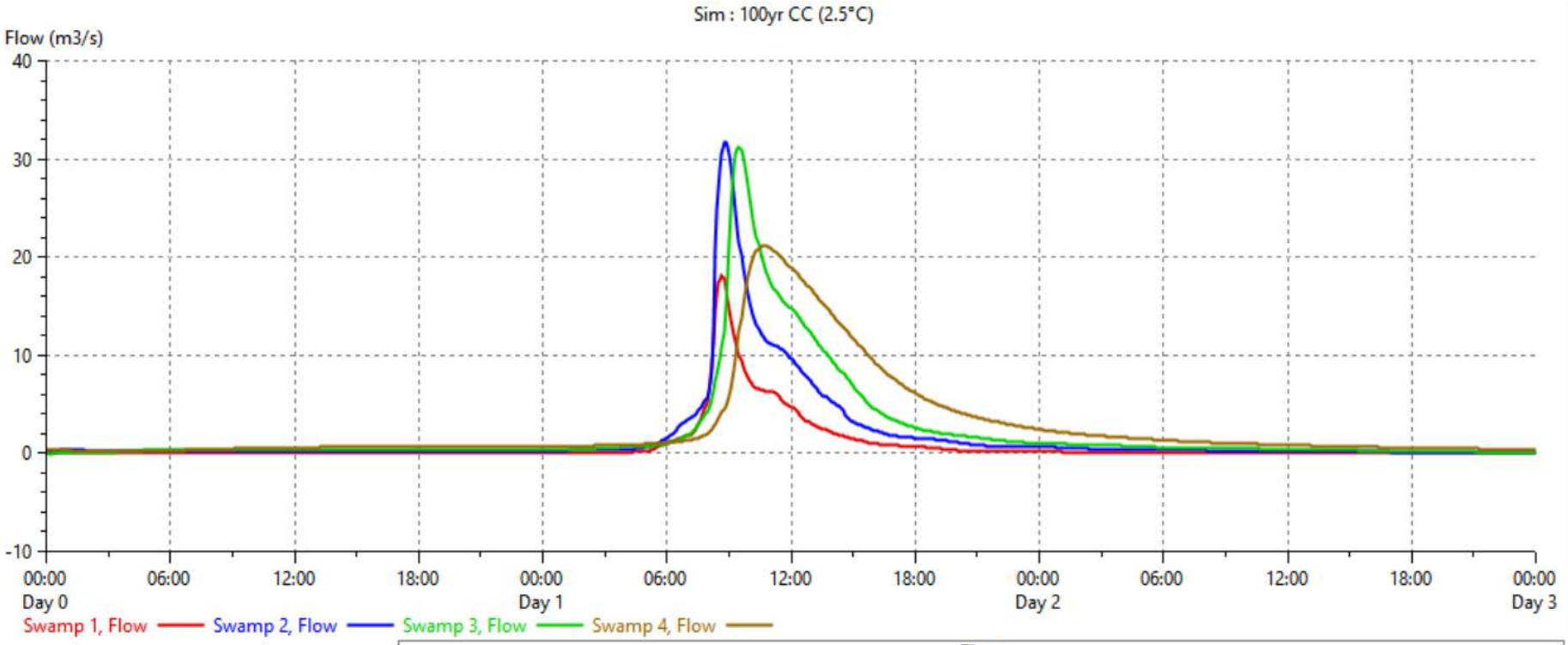
PRE-DEVELOPMENT



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
Swamp 1	0.000	18.068	209229.881
Swamp 2	0.000	31.734	433493.226
Swamp 3	-0.026	31.225	566390.107
Swamp 4	0.000	21.119	705713.236

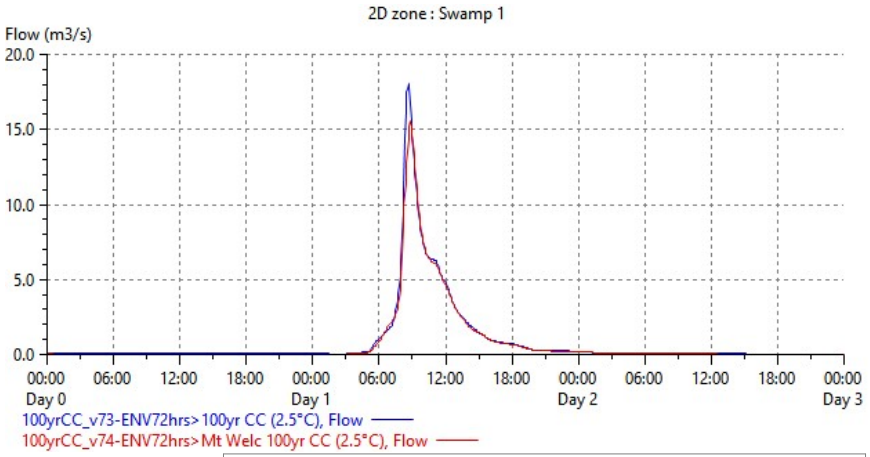
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POST-DEVELOPMENT

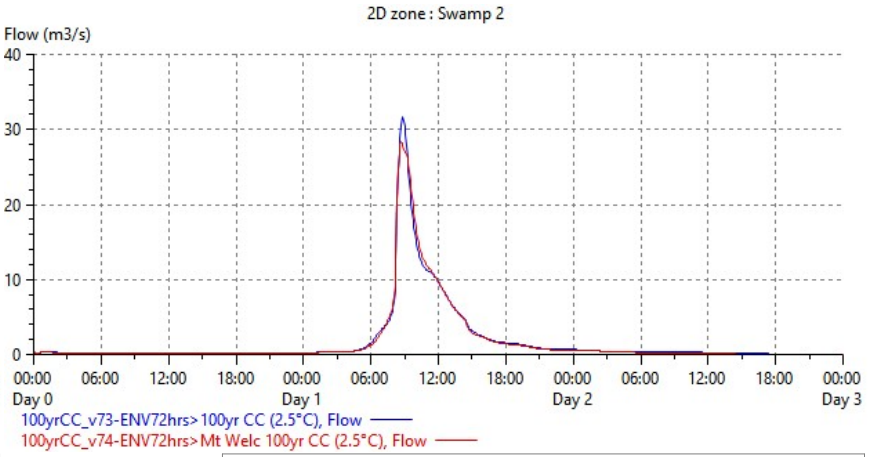


	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
Swamp 1	0.000	18.068	209229.881
Swamp 2	0.000	31.734	433493.226
Swamp 3	-0.026	31.225	566390.107
Swamp 4	0.000	21.119	705713.236

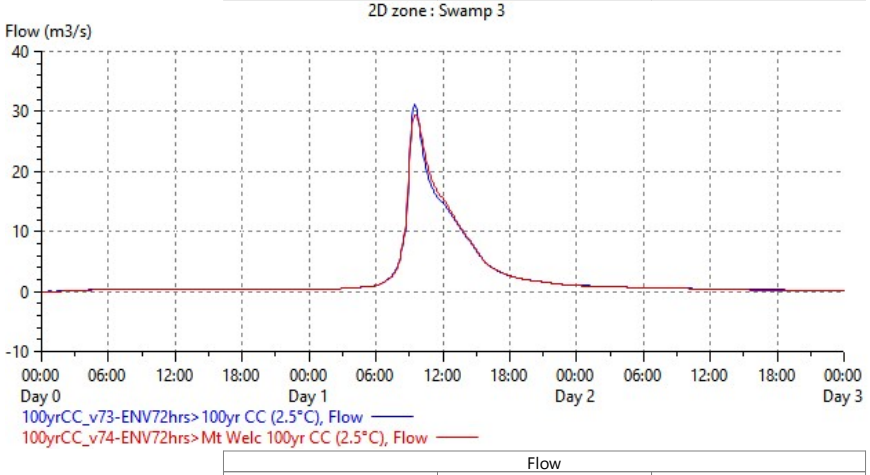
PER SECTION



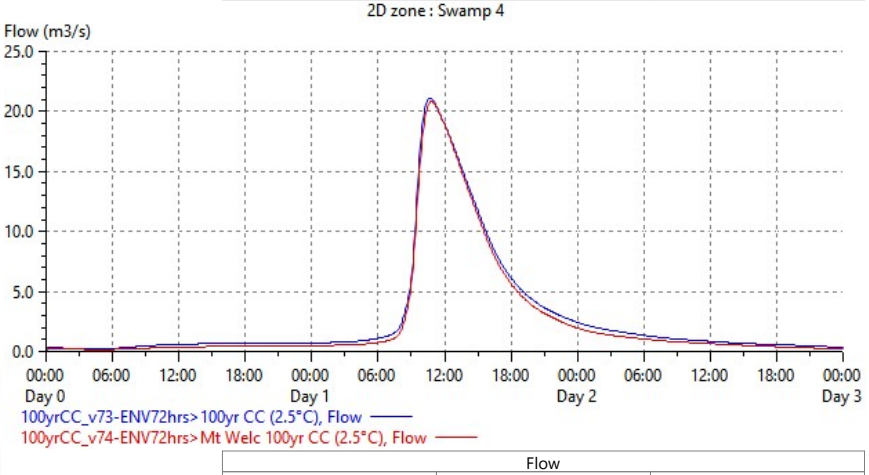
	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...ENV72hrs>100yr CC (2.5°C)	0.000	18.068	209229.881
...>Mt Welc 100yr CC (2.5°C)	0.000	15.575	195523.530



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...ENV72hrs>100yr CC (2.5°C)	0.000	31.734	433493.226
...>Mt Welc 100yr CC (2.5°C)	0.000	28.437	423874.695



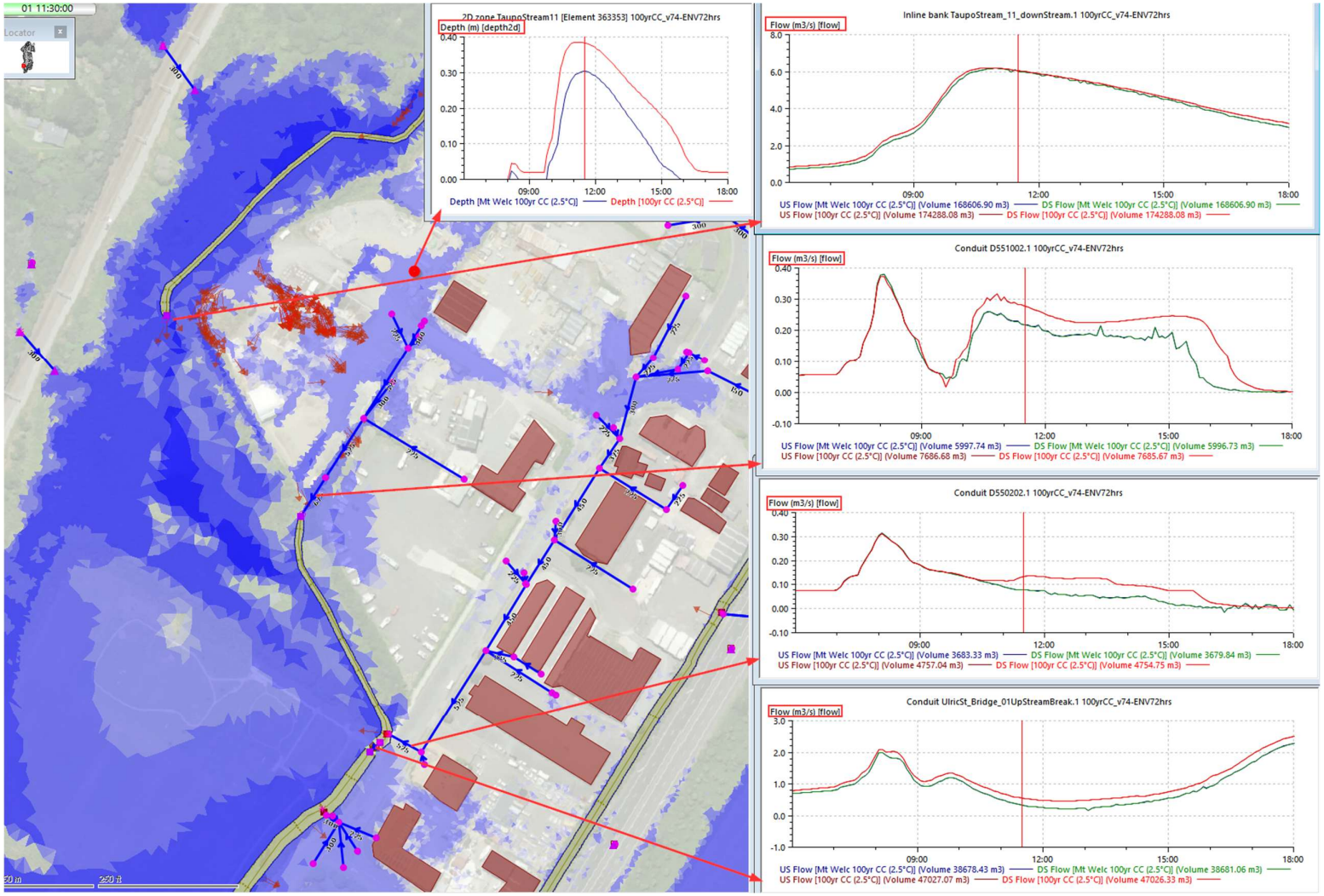
	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...ENV72hrs>100yr CC (2.5°C)	-0.026	31.225	566390.107
...>Mt Welc 100yr CC (2.5°C)	-0.033	29.441	570907.510



	Flow		
	Min (m3/s)	Max (m3/s)	Volume (m3)
...ENV72hrs>100yr CC (2.5°C)	0.000	21.119	705713.236
...>Mt Welc 100yr CC (2.5°C)	0.000	20.818	635570.651

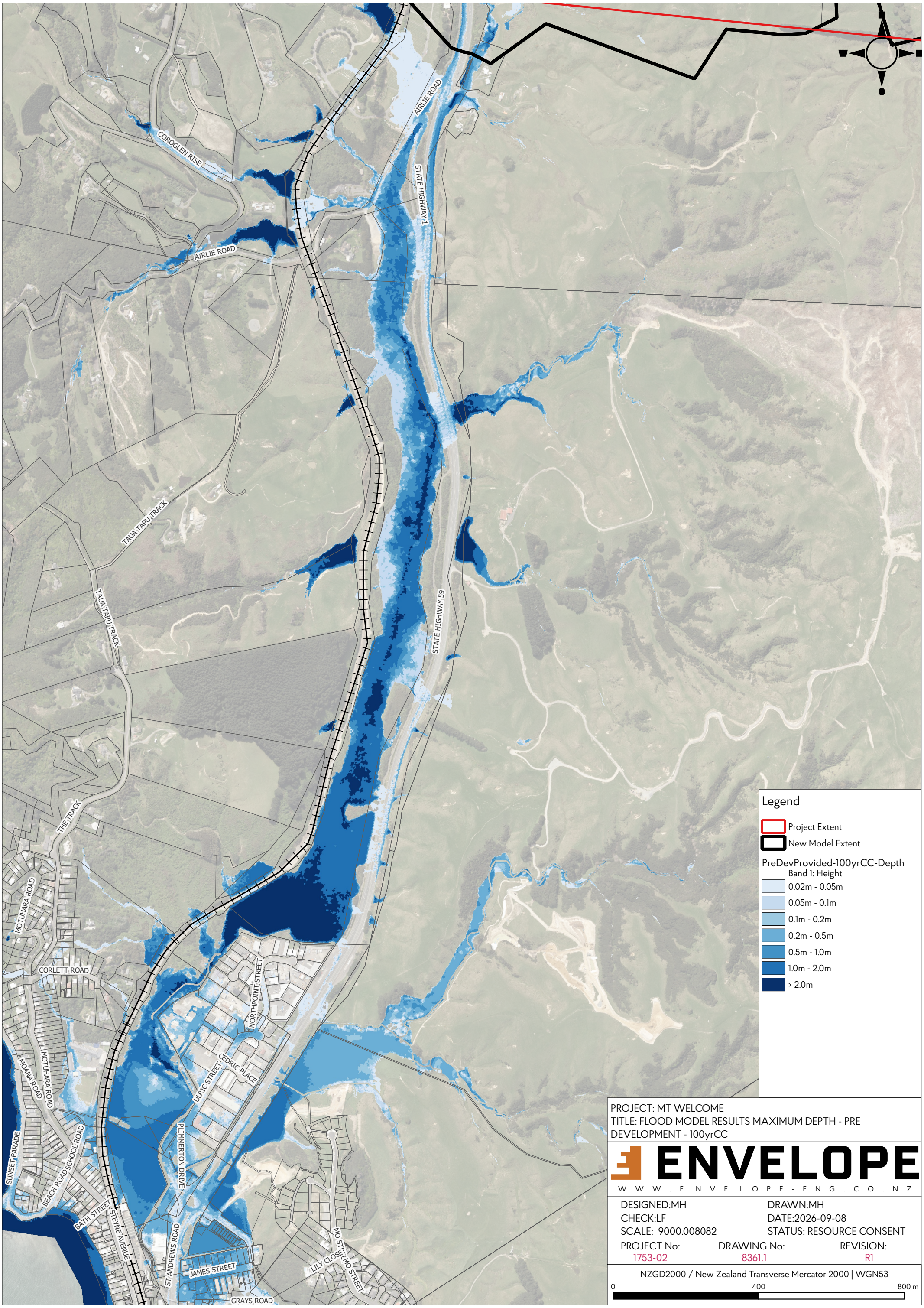
ENVELOPE

APPENDIX 3 PLIMMERTON INDUSTRIAL ESTATE

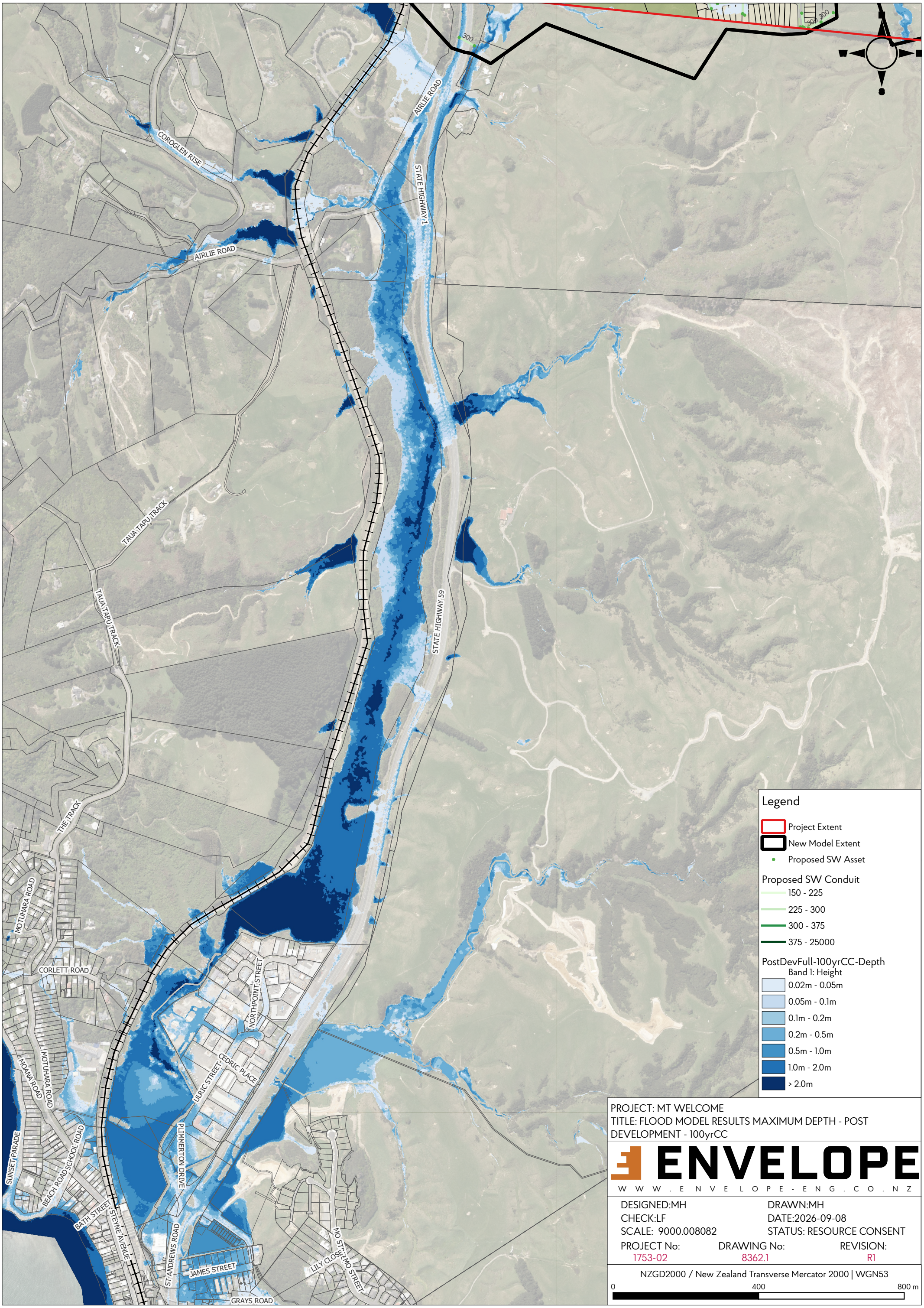


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Te Aro, Wellington 6010

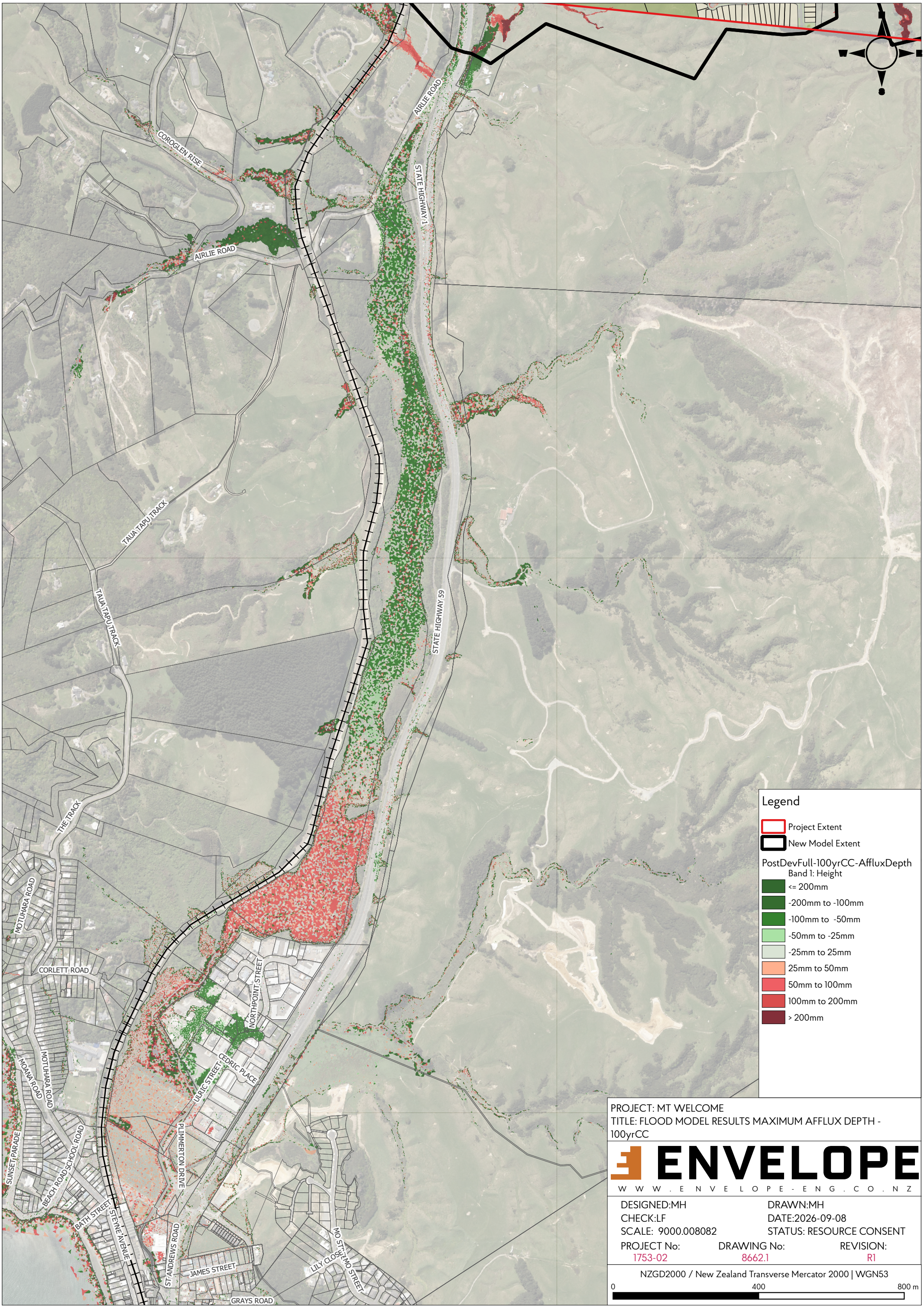
APPENDIX 4 FLOOD DEPTH & AFFLUX MAPS – 100YRCC



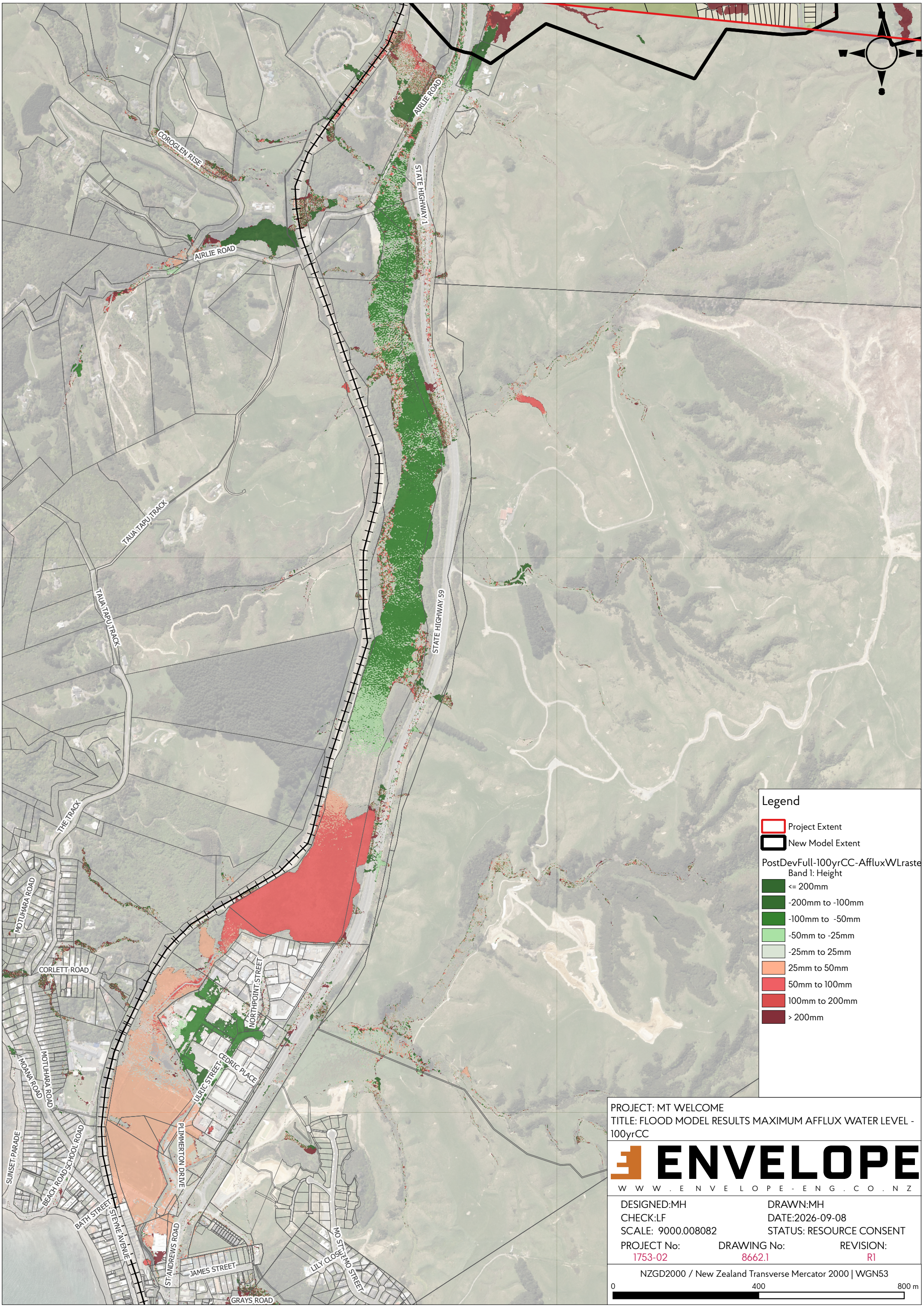
D:_Projects\1753-02 Mt Welcome\1753-02 Mt Welc Stormwater.qgz



D:_Projects\1753-02 Mt Welcome\1753-02 Mt Welc Stormwater.qgz

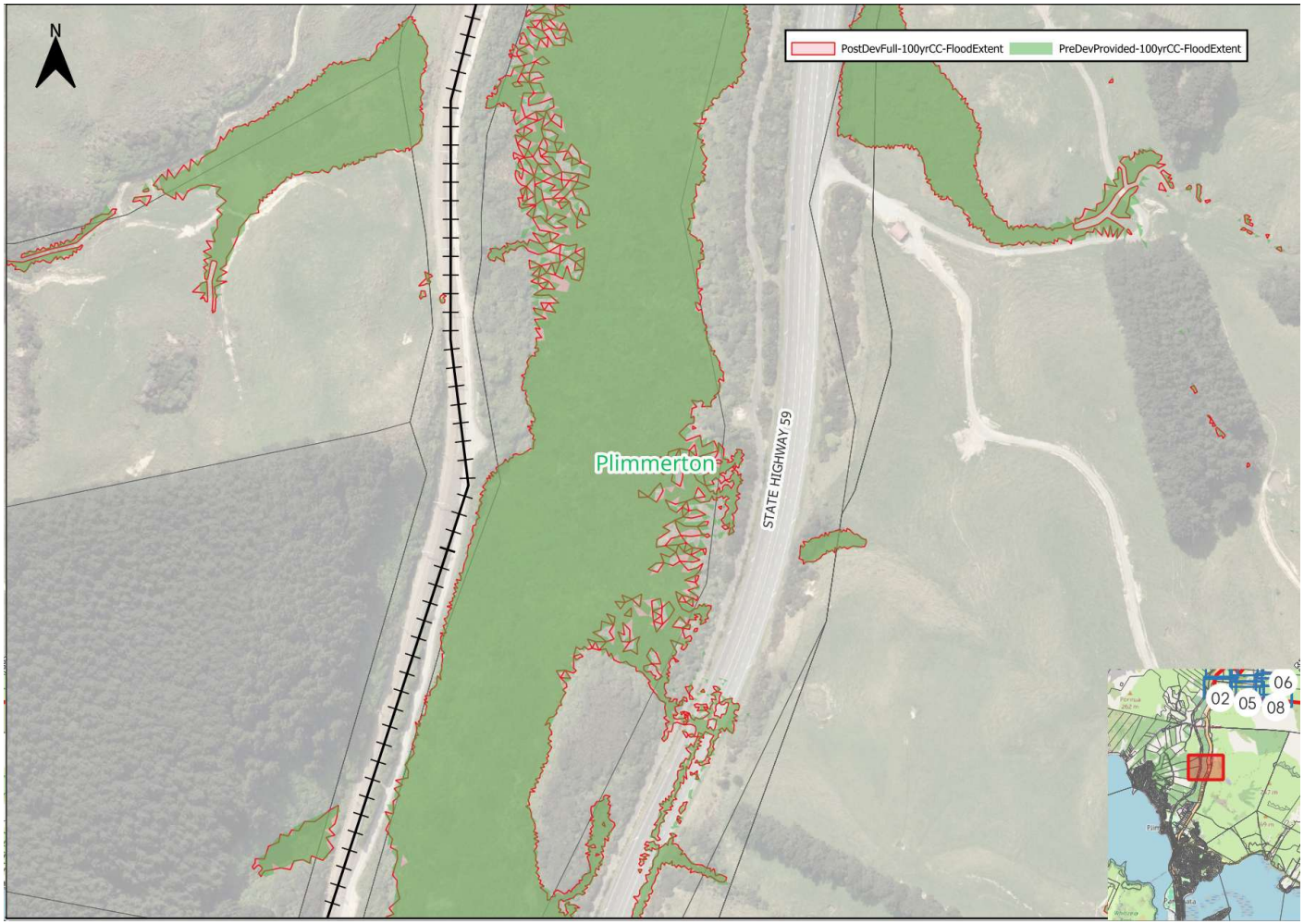


D:_Projects\1753-02 Mt Welcome\1753-02 Mt Welc Stormwater.qgz

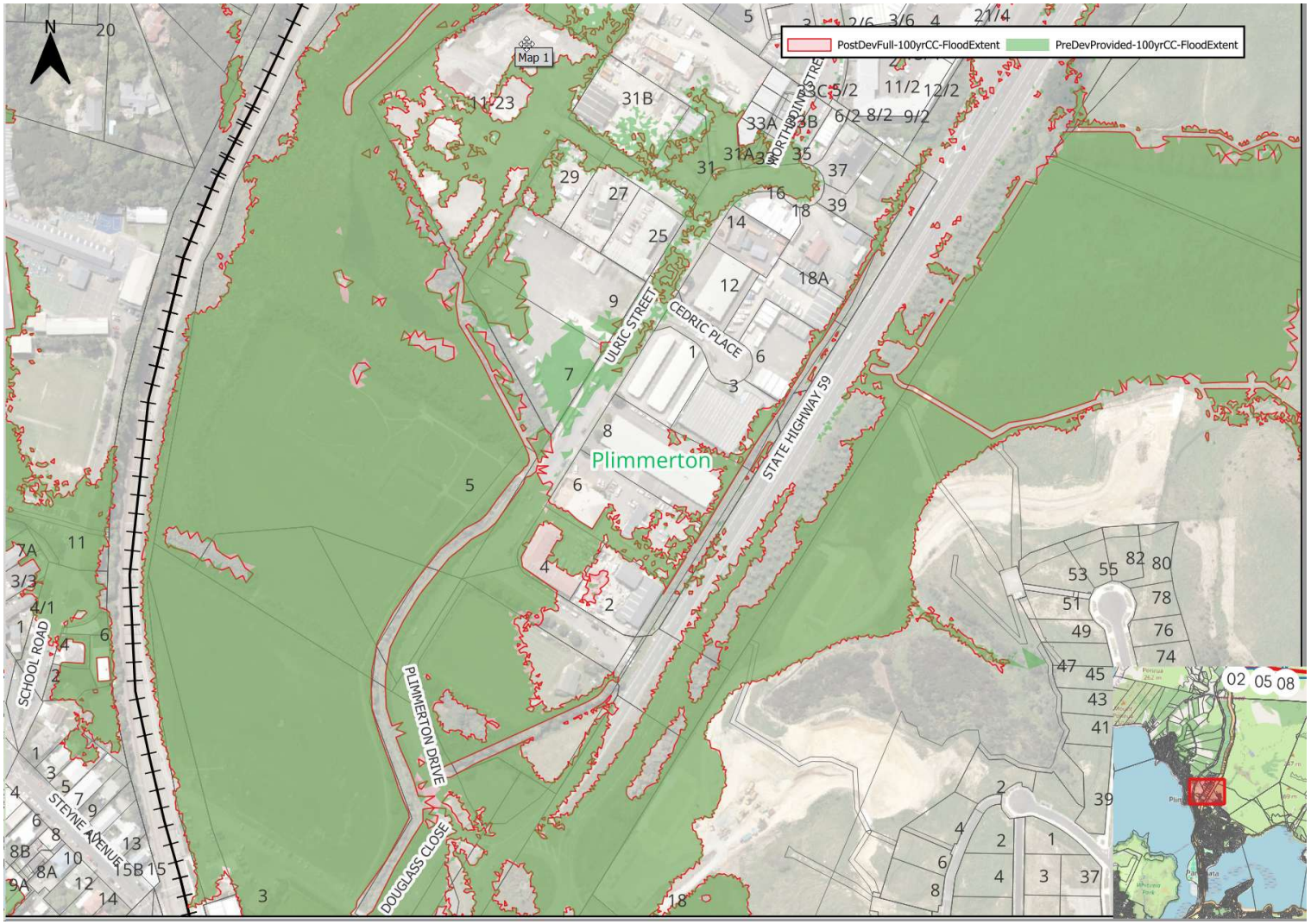


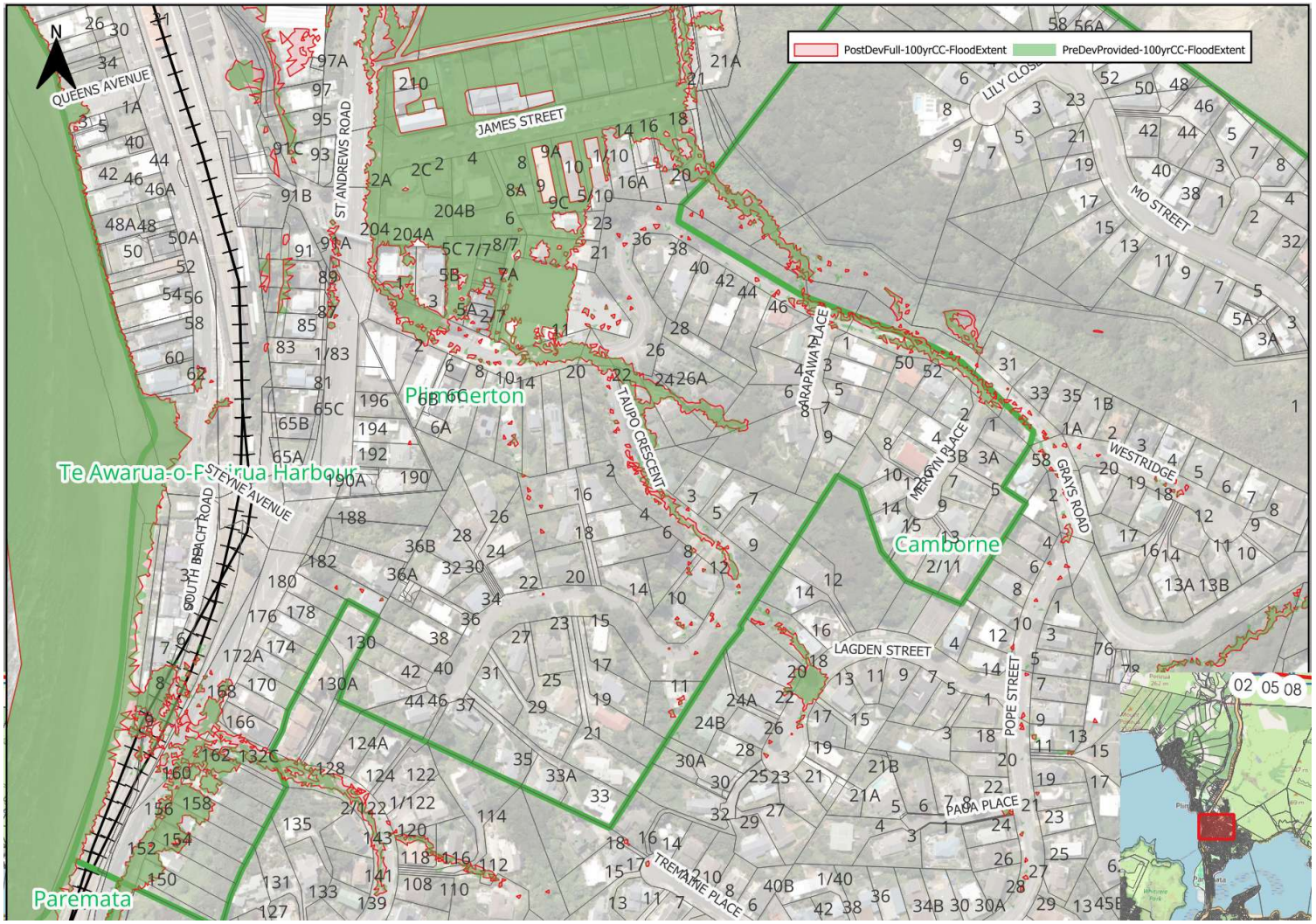
D:_Projects\1753-02 Mt Welcome\1753-02 Mt Welc Stormwater.qgz

APPENDIX 5 TAUPO SWAMP - FLOOD EXTENT COMPARISON




N
PostDevFull-100yrCC-FloodExtent
PreDevProvided-100yrCC-FloodExtent
Plimmerton
STATE HIGHWAY 59
02
05
06
08


PostDevFull-100yrCC-FloodExtent
PreDevProvided-100yrCC-FloodExtent
Map 1
N
Plimmerton
ULRIC STREET
CEDRIC PLACE
STATE HIGHWAY 59
PLIMMERTON DRIVE
DOUGLASS CLOSE
SCHOOL ROAD
STEYNE AVENUE


PostDevFull-100yrCC-FloodExtent
PreDevProvided-100yrCC-FloodExtent
N
QUEENS AVENUE
JAMES STREET
ST ANDREWS ROAD
TAUPO CRESCENT
LAGDEN STREET
POPE STREET
PAPA PLACE
TREMAINE PLACE
MERVYN PLACE
GRAYS ROAD
WESTRIDGE
LILY CLOSE
MO STREET
STEYNE AVENUE
SOUTH BEACH ROAD
Te Awarua-o-Porirua Harbour
Plimmerton
Camborne
Paremata

ENVELOPE

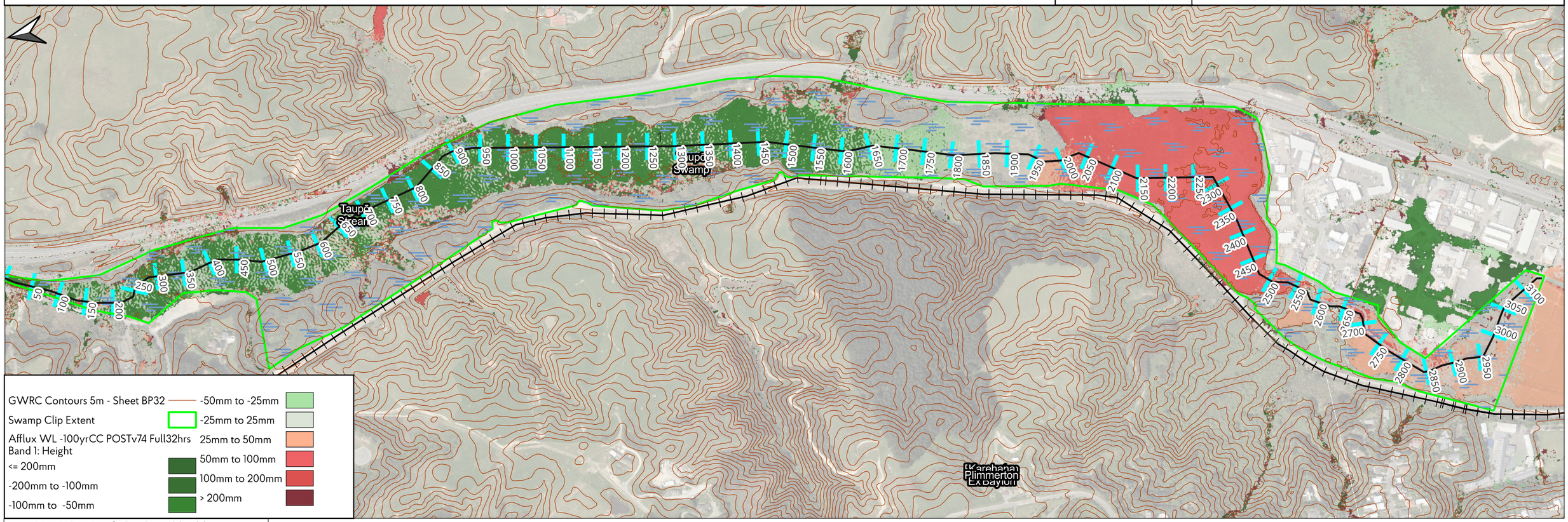
APPENDIX 6 LONG PROFILE ALONG TAUPO SWAMP

ENVELOPE
James Smith Building, Level 1, 65 Cuba Street
Te Aro, Wellington 6010

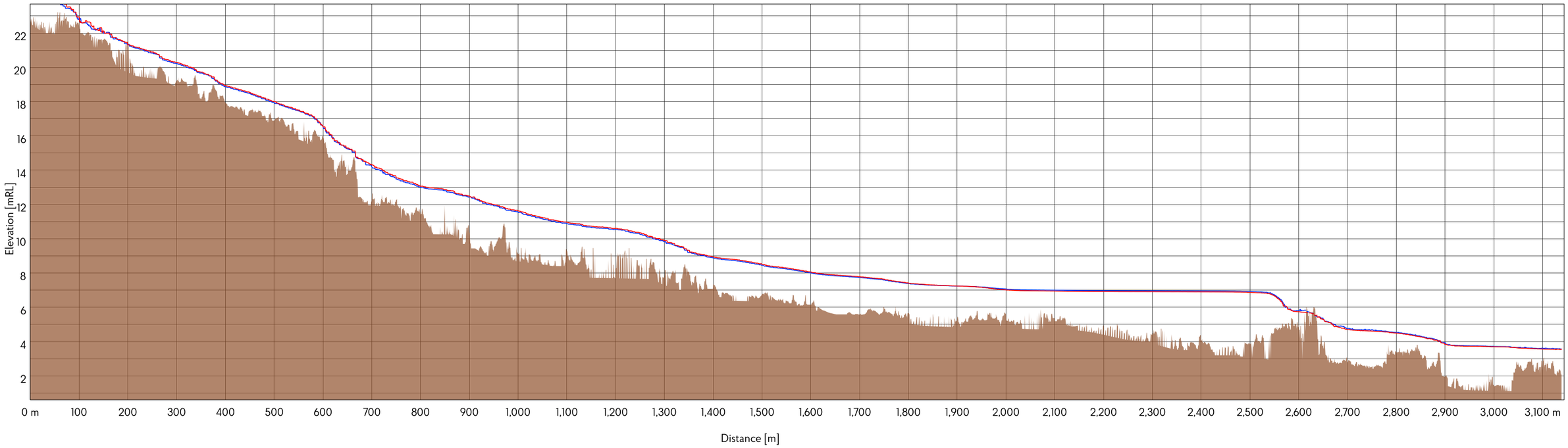
PROJECT: 1753-02 MT WELCOME
TITLE: MODEL RESULTS LONG PROFILE ALONG TAUPO SWAMP

DESIGNED:MH
CHECK:KD
SCALE: 7000
DATE:08/09/2026

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ



Taupo Swamp



D:_Projects\1753-02 Mt Welcome\1753-02 Mt Welc Stormwater.qgz