

Our Ref: 196916

24 June 2015

Waimakariri District Council
Private Bag 1005
Rangiora 7440

Attention: Shelley Thompson

Dear Shelley

Re: Plan Change 27 Additional Information

Please find attached additional information to support the Plan Change Request for the Clarke Family Trust, in response to District Council and Environment Canterbury submissions, and those other submissions relating to flooding.

We have undertaken additional modelling in response to the 200 year events and displacement modelling with regards to the necessary filling for the future subdivision. The results are attached. It is noted that the filling required is less than that previously shown on the flooding plans, filling (where required) is generally 100-200mm above existing ground levels.

Based on the results of the additional flood modelling and the District Council submission we have amended the proposed rules, as attached. These have been discussed with the District Council and are generally agreed.

As the filling is less than previously anticipated the effects on the sites between the southern road and the esplanade are insignificant and no additional assessment is considered necessary with regards to amenity, stormwater and flood management. We have provided a cross-section (see attached), at the location where the highest fill will be required, to show the typical level and amenity between the esplanade and the southern road. Please note that no retaining walls are anticipated.

We have made a number of minor corrections to the ODP plan, to reflect the width of pedestrian and cycle links being changed to 10m. As a result of the changes to the width of the pedestrian and cycle links we have amended the roading layout internal to the site to enable future allotments to meet the District Plan provisions. The amended layout is a minor correction in location and is not significantly different to the layout notified and no changes have been made to the connection points to South Belt. Based on the amendments to the ODP more certainty has been made and the internal roads are no longer shown as indicative on the ODP.

Additional discussions with District Council staff have resulted in the District Council no longer requesting additional pedestrian connections around the stormwater area to the south-east corner of the site and therefore no changes have been made to the ODP in respect to this matter raised in the District Council submission.

We consider that the information contained in this response addresses the matters raised in the Waimakariri District Council and Canterbury Regional Council submissions.

It is proposed that the ODP as notified be removed and replaced with the amended ODP attached and that the proposed amendments to the Waimakariri District Plan (the rules) also be replaced with those attached in this letter. No other changes are proposed to the Plan Change Request.

If you require any further information or have any questions please contact me.

Yours sincerely

ELIOT SINCLAIR & PARTNERS LTD



Trudi Burney

Senior Resource Management Planner

Proposed Amendments to the Waimakariri District Plan

The Private Plan Change request proposes the following changes to the Waimakariri District Plan rules and planning maps, changes to text are shown as bold and underlined for easy reference.

Additional changes to a number of provisions in the District Plan may be required as a result of the changes to existing provisions and new rules.

Planning Maps

Amend Planning Maps 116 and 117 (Rangiora) to show the site as Residential 2 zoning with reference to new Outline Development Plan and associated Rules.

Add new Outline Development Plan, Map 175.

Amendments to Chapters 30, 31, 32 and 33 of the District Plan

27. Natural Hazards

27.1.1.30 Any new dwellinghouse in the South West Rangiora Townsend Road Residential 2 Zone Outline Development Plan area shown on District Plan Map 184 shall have a finished floor level of at least 300mm above the 0.5% Annual Exceedance Probability flood event.

27.4.3 Any new dwellinghouse within the South West Rangiora Townsend Road Residential 2 Zone Outline Development Plan area shown on District Plan Map 184 that does not comply with Rule 27.1.1.30 is a non-complying activity.

30. Utilities and Traffic Management – Rules

30.6.2 Exemptions

...

30.6.2.6 The intersections of roads within the South West Rangiora Outline Development Plan area **and the South West Rangiora Townsend Road Residential 2 Zone** shown on District Plan Maps 173 **and 184** are exempt from complying with Rule 30.6.1.26.

31. Health, Safety and Wellbeing – Rules

31.1.1.43 Within the South West Rangiora Residential 2 Zone shown on District Plan Map 173 **and the South West Rangiora Townsend Road Residential 2 Zone shown District Plan Map 184** all fencing:

- a. where located between a residential property and reserve land shall have a maximum height of 1.5m and have a minimum visual permeability/openness of 45%; and
 - b. where located on and between the road boundary and any part of a dwellinghouse shall have a maximum height of 1.2m.
- 31.17.2.2 Any dwellinghouse erected within the South West Rangiora Residential 2 Zone Outline Development Plan area shown on District Plan Map 173 **and the South West Rangiora Townsend Road Residential 2 Zone shown District Plan Map 184** is exempt from complying with Rule 31.17.1.10.

32. Subdivision – Rules

Outline Development Plans

- 32.1.1.25 Subdivision within the following areas shall generally comply with the Outline Development Plan for that area.

...

af. The South West Rangiora Townsend Road Residential 2 Zone identified on District Plan Map 184.

32.1.1.85 Within the South West Rangiora Townsend Road Residential 2 Zone area shown on District Plan Map 184:

- a. all new residential allotments in the area shown on the Outline Development Plan shall have a minimum finished ground level that avoids inundation in a 0.5% Annual Exceedance Probability flood event.**

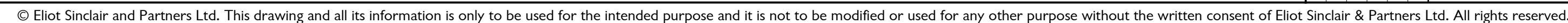
- 32.4.1 Except where exempted under Rule 32.1.2, any subdivision that does not comply with Rules 32.1.1.1 to 32.1.1.26, 32.1.1.51 to 32.1.1.53 or 32.1.1.61 to 32.1.1.72, or 32.1.1.74 and 32.1.1.76 to 32.1.1.78 **or 32.1.1.85** or 32.1.1.87 is a non-complying activity.

33. Esplanades: Locations and Circumstances – Rules

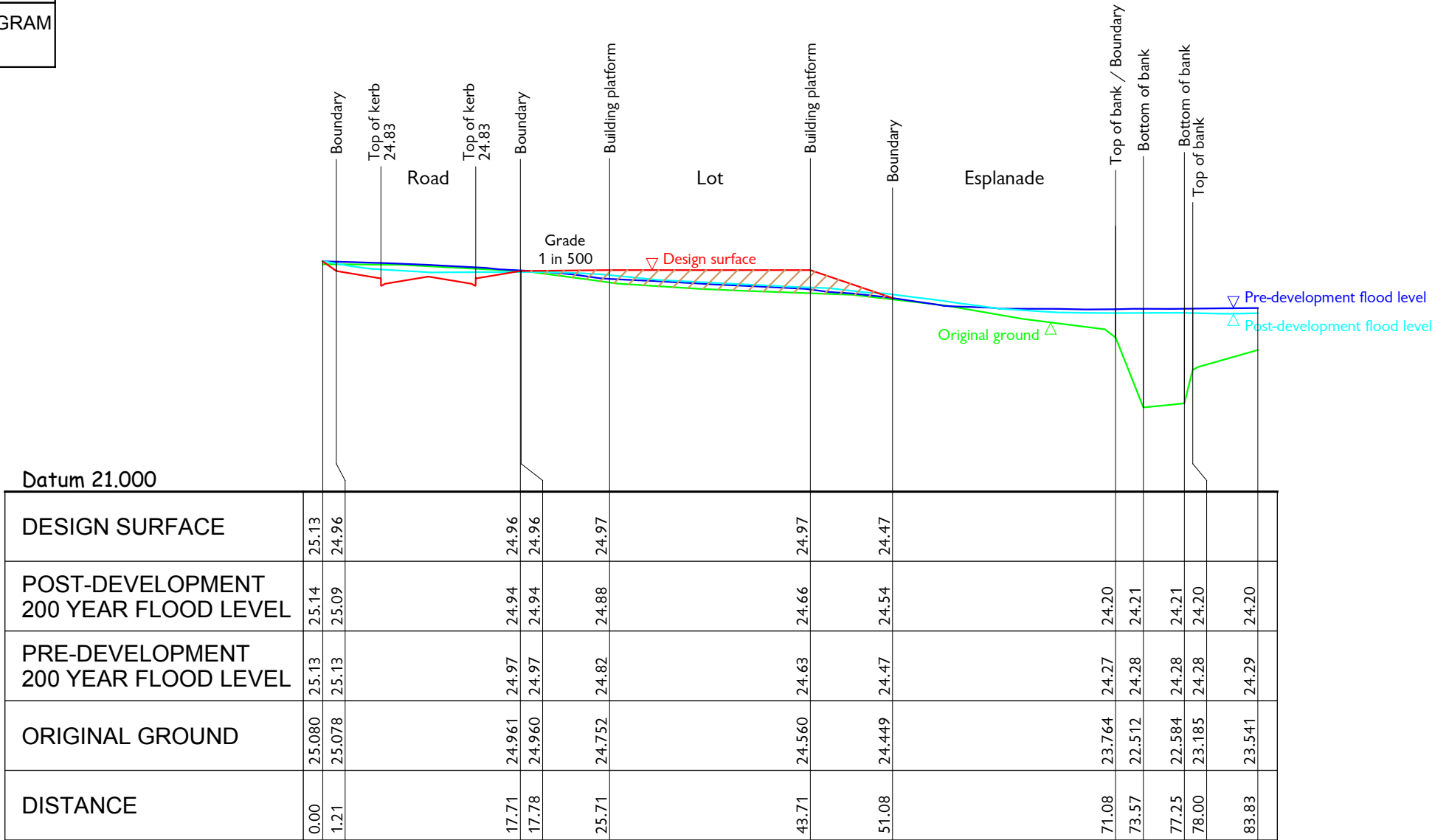
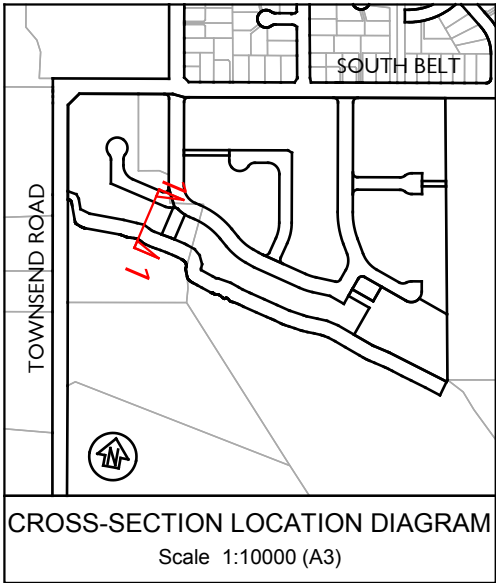
- 33.1.4 Except where provided by Rule 33.1.6 **and Rule 33.1.7**, the minimum width of an esplanade reserve or esplanade strip required under Rules 33.1.1 and 33.1.2 shall be 20m.

- 33.1.7 **Esplanade reserves shall be provided for land adjoining the Southbrook Stream as shown on the Outline Development Plan. The esplanade reserves shall conform with the dimensions shown on District Plan Map 184.**

Any other consequential amendments and numbering changes.



Proposed Outline Development Plan
South West Rangiora
Townsend Road Residential 2 Zone
for MA Clarke and Willaims McKenzie Trustees Limited



no.	amendment	initial	date	designed	origin of levels			surveyed	Scale Hscale 1:1000 Vscale 1:200 (A3)	Drawing Set 196916 M5 PLOT M5 Typical XS	Sheet 1 of 1			
					EMS	MAA	PIH							
												manager	drawn	checked

TYPICAL CROSS-SECTION THROUGH LOT ADJACENT TO ESPLANDE
PROPOSED SOUTHBELT SUBDIVISION, RANGIORA

Eliot Sinclair
surveyors | engineers | planners

Our Ref: 196916

22 June 2015

Waimakariri District Council
215 High Street
Rangiora

Attention: Kalley Simpson

Dear Kalley

Re: Plan Change 27: Flood Displacement Modelling

Please find attached three plans showing our stormwater modelling results. The plans are based on the worst case flooding for a 200 year return period event. Modelling has been completed for the Ashley River breakout scenario and for a localised flood model.

Drawing 196916 M4 Sheet 1 is colour coded to show the depth of the 200 year flood above existing ground levels. The flood modelling indicates that filling of between 0 and 200mm above existing ground level will be required over the majority of the Plan Change 27 site (The Site) to match the 200 year flood levels.

As we are at the plan change stage, a detailed drainage design has not been produced. The proposed ground levels on drawings 196916 M4 Sheets 2 & 3 are based on filling the residential lots to the 200 year flooding level as a minimum and cutting out the roads to direct secondary flow to the stormwater management area and the South Brook, and away from neighbouring properties.

Drawing 196916 M4 Sheet 2 is colour coded to show the depth of the 200 year flood above the proposed ground levels. The flood modelling indicates that 200 year flood levels will be between 0 and 100mm above the filled ground levels over the majority of the residential areas of The Site. This indicates that the 200 year flood would not enter any dwellings given the proposed 300mm freeboard. This approach was agreed with Council staff.

Drawing 196916 M4 Sheet 3 is colour coded to show the difference in the 200 year flood heights between the existing ground level model and the proposed filled site model. The flood modelling indicates that the 200 year flood heights for the proposed filled site will generally be within +/-100mm of the existing heights for the residential parts of the site and the adjoining residential areas north of South Belt. This shows that any change to the 200 year flood risk on the adjoining residential properties is likely to be minimal.

The small areas of darker blue (indicating an increase in flood height of more than 100mm) shown on Sheet 3 within The Site are anomalies resulting from the fill design having been based on the existing 200 year flood heights. These areas represent minor local features and would not appear in the final subdivision design.

The darker blue areas on the adjoining block to the north and west of the intersection of Townsend Road and South Belt shown on Sheet 3 are a result of the modelling methodology. The land is the subject of a separate development proposal and has been modelled with run off coefficients for residential land. However, at this stage no roading or stormwater structures have been included in the model for this land. The inclusion of a subdivision design in the model will be likely to channel the 200 year flood toward the South Brook channel as is the case for The Site, reducing the differences between pre and post development flood heights on this land.

A full description of the modelling methodology is included in the DHI report dated April 2015 and attached with this letter.

I hope this provides you with sufficient information regarding the flood displacement modelling. But, please do not hesitate to contact me should you require anything further.

Yours sincerely

ELIOT SINCLAIR & PARTNERS LTD



Edward Shaw

edward.shaw@eliotsinclair.co.nz

ems:ems

Attachments:

ESP Drawing Set 196916 M4 Sheets 1 to 3 of 3;

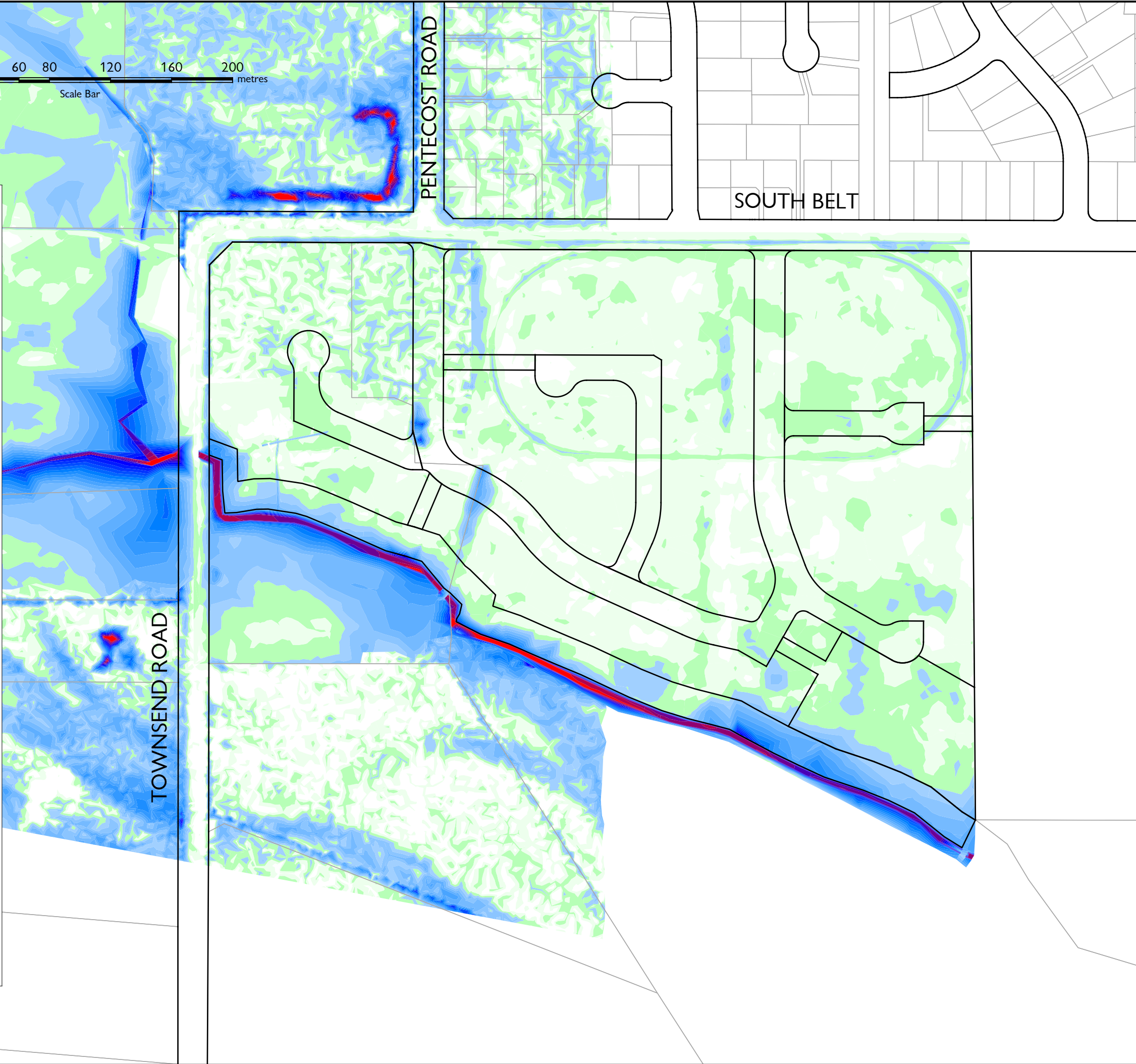
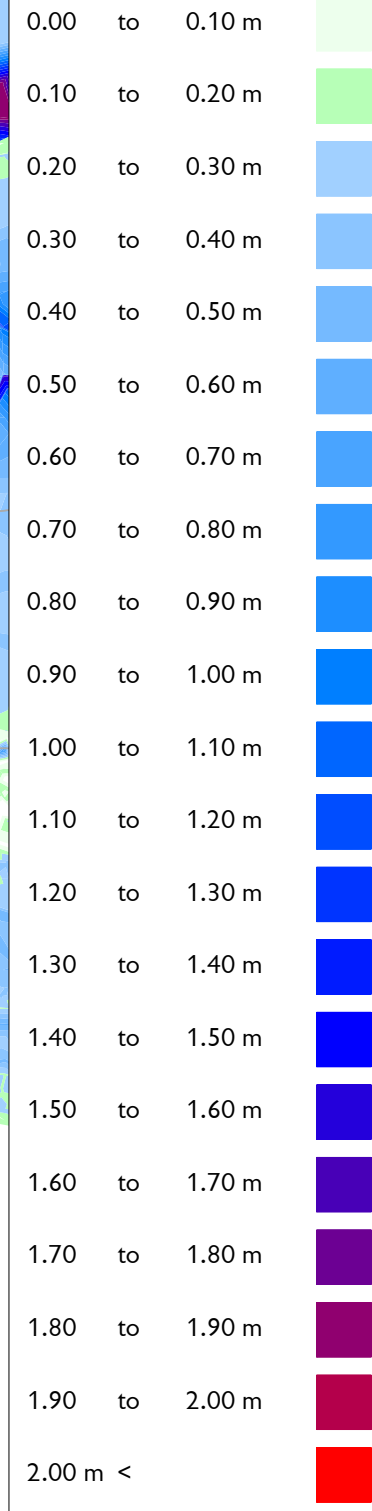
DHI Report Townsend Road/South Belt Modelling, April 2015



Original size mm



FLOOD DEPTH

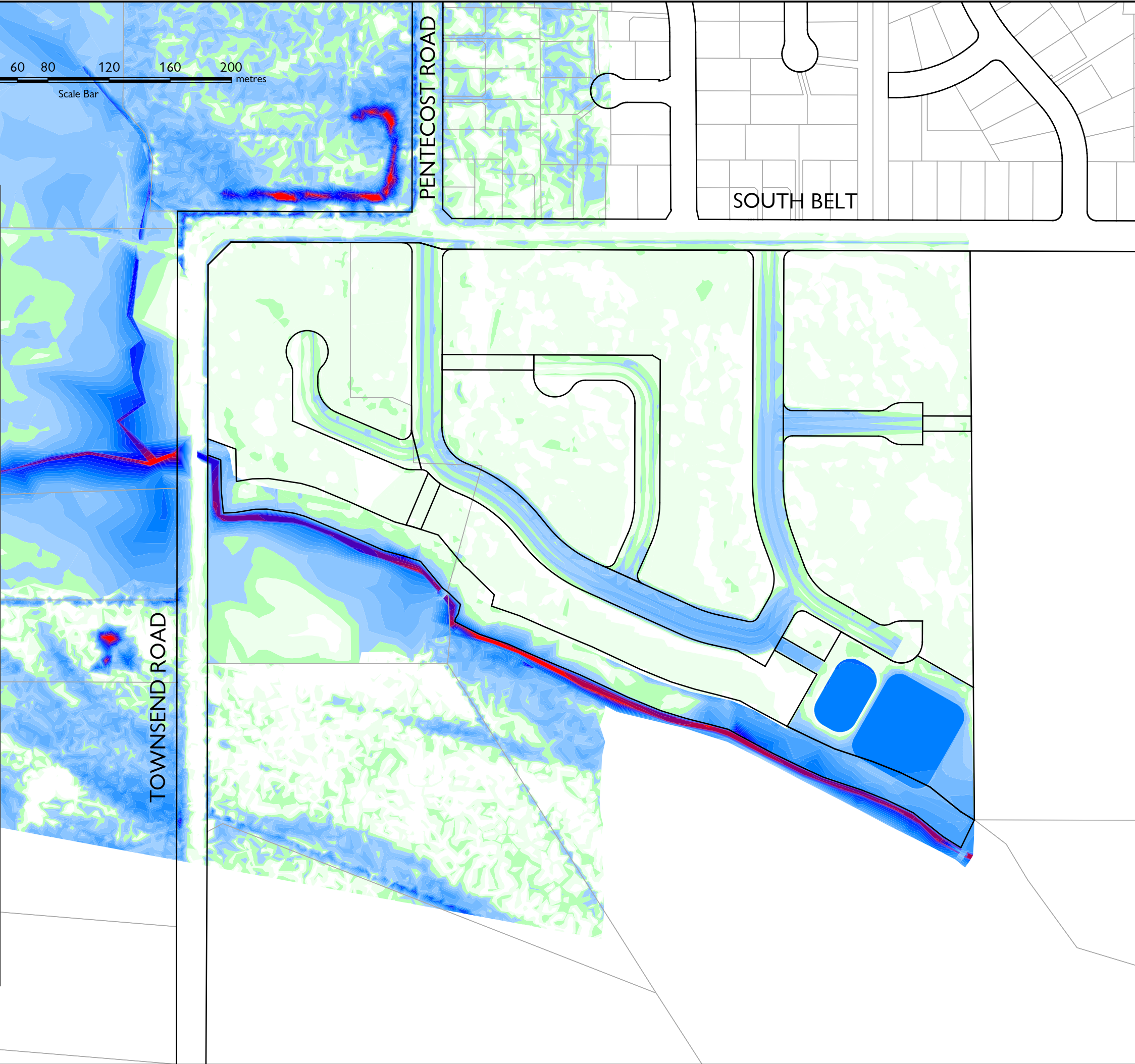


no.	amendment		initial	date	designed manager	MAA	PIH	surveyed	origin of levels datum	Scale: 1:2500 (A3) Date: 14/05/2015	Drawing Set 196916 M4 PLOT M4-01 PRE Dwg	Sheet 1 of 3
					drawn			surv. date				
					checked							

MAXIMUM FLOOD DEPTHS DURING 200 YEAR RETURN PERIOD LOCAL FLOOD MODEL - PRE DEVELOPMENT
PROPOSED SOUTHBELT SUBDIVISION, RANGIORA

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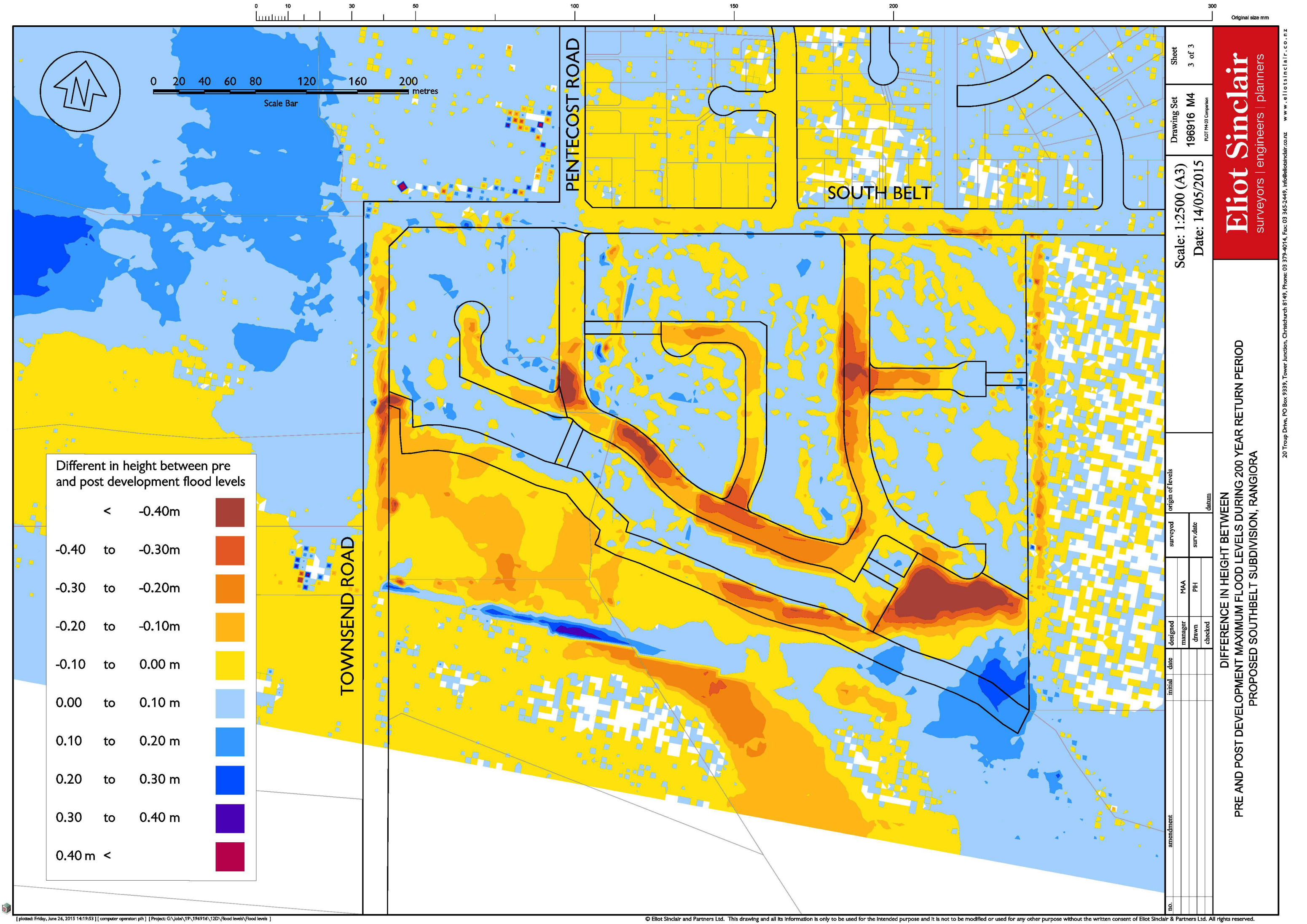
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MAXIMUM FLOOD DEPTHS DURING 200 YEAR RETURN PERIOD LOCAL FLOOD MODEL - POST DEVELOPMENT

PROPOSED SOUTHBELT SUBDIVISION, RANGIORA

Eliot Sinclair

surveyors | engineers | planners



Different in height between pre and post development flood levels

<	-0.40m	
-0.40	to -0.30m	
-0.30	to -0.20m	
-0.20	to -0.10m	
-0.10	to 0.00 m	
0.00	to 0.10 m	
0.10	to 0.20 m	
0.20	to 0.30 m	
0.30	to 0.40 m	
0.40 m	<	

Scale: 1:2500 (A3)
Date: 14/05/2015

no.	amendment		initial		date		designed		manager		MAA		PIH		surv		date		origin of levels		datum	

DIFFERENCE IN HEIGHT BETWEEN
PRE AND POST DEVELOPMENT MAXIMUM FLOOD LEVELS DURING 200 YEAR RETURN PERIOD
PROPOSED SOUTHBELT SUBDIVISION, RANGIORA

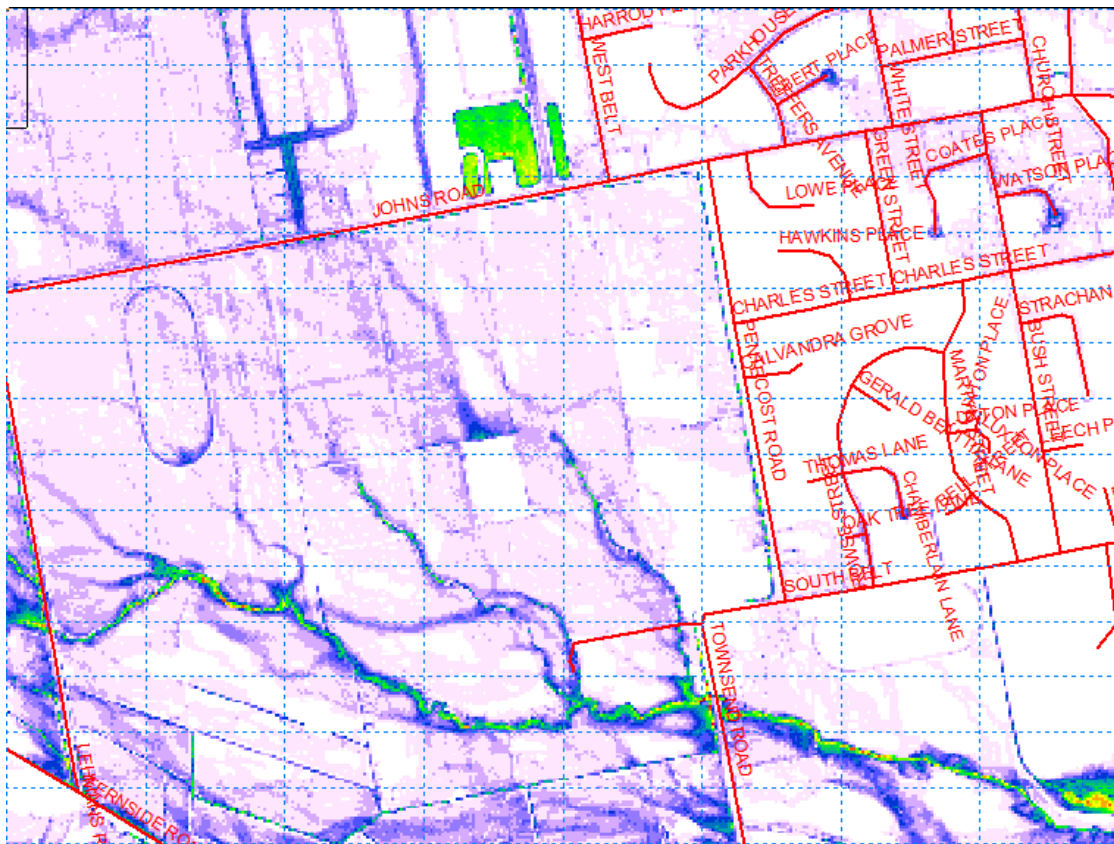
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Townsend Road/South Belt Modelling

Modelling flood levels for two design events

Preliminary report: Overland flow modelling.



Eliot Sinclair & Partners Ltd

Report

April 2015

Townsend Road/South Belt Modelling

Modelling flood levels for two design events

Preliminary report: Overland flow modelling.

Prepared for Eliot Sinclair & Partners Ltd
Represented by Mr Edward Shaw



Project manager	Greg Whyte
Project number	44800722
Approval date	29 April 2015
Revision	Draft: 0.4
Classification	Restricted

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1 Introduction

1.1 Background

The town of Rangiora lies on the North Canterbury plains immediately south of the Ashley River, and is experiencing steady urban growth. The Townsend Road/South Belt Plan Change is located at the southern edge of the town.

The two recognised flood risks to Rangiora and adjacent areas are local rainfall on the plains and a breakout from the Ashley River. The Waimakariri District Council (WDC) has developed a numerical model of the entire area of plains between the Ashley and Waimakariri Rivers. Output from this model is available for more detailed modelling of specific areas such as the present study. Environment Canterbury has analysed and modelled the Ashley River and its catchment, and is able to provide design hydrographs of breakout flows from the Ashley River onto the plains to its south.

1.2 Project Brief

The work described in this report has been carried out in accord with a proposal letter from DHI dated 5 November 2014, to undertake flood modelling for the Townsend Road/South Belt Plan Change and associated development areas, located in Rangiora. The proposal was in response to a request from Eliot Sinclair and Partners Ltd on behalf of the developer.

The proposed modelling, of both pre- and post-development topography, comprises two parts:

- Overland flow modelling covering areas A, B, C and D (Figure 1-1), for local rainfall of 200-year average recurrence interval (ARI) and also for a breakout from the Ashley River, also of 200-year ARI and to be provided by Environment Canterbury.
- Stormwater network modelling of area A (Figure 1-1) for 5-year, 10-year and 50-year ARIs, using an existing MIKE URBAN model to be provided by Waimakariri District Council (WDC).

This preliminary report covers only the overland flow modelling, and incorporates post-development ground levels for Area C only.

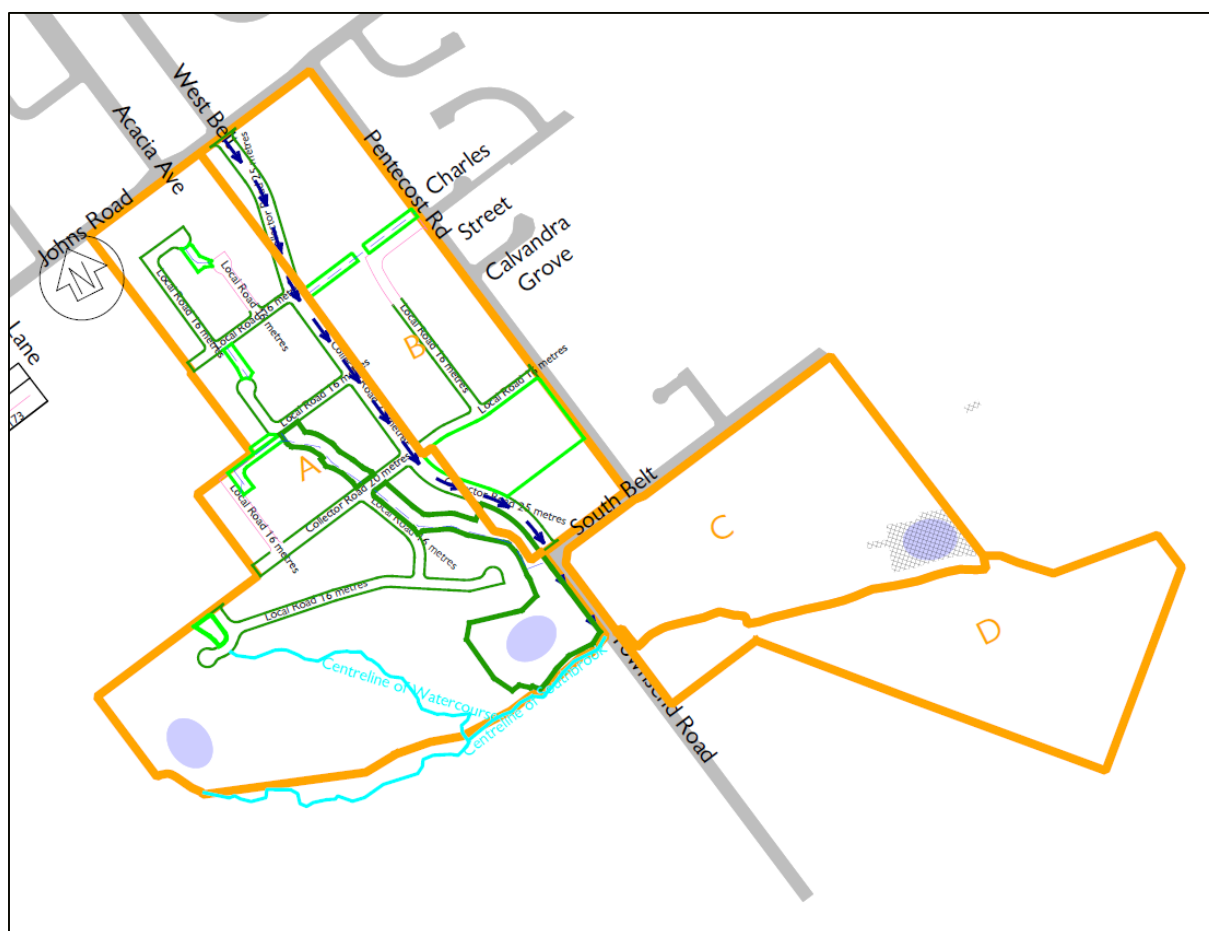


Figure 1-1 Location of the Townsend Road/South Belt Plan Change

2 Overland flow modelling

2.1 Modelling Methodology

Rangiora and the Townsend Road/South Belt Plan Change site lie within the area covered by the “South Ashley” numerical flooding model developed by WDC. Flood depths from that model are available but its 10m grid size is considered too coarse to be particularly suitable for investigating flooding patterns within a particular development site. The present models have therefore been developed (at a finer grid) for the Townsend Road/South Belt Plan Change.

The rectilinear (i.e. “classic”) version of DHI’s MIKE 21 software has been used for the present model, (as it was for WDC’s model).

A different rectangular area of the north Canterbury Plains has been modelled for the two flooding risks. The model for the local rainfall covers an area 4 km (east-west) by 5 km, including the environs of the Townsend Road/South Belt Plan Change and higher areas to the north-west. The model of the Ashley River breakout needed to cover the larger area between the breakout and the site, and is 11.5 km (east-west) by 6.5 km. Both models represent the terrain by 5m x 5m cells, this resolution having been chosen to balance the level of detail against practical concerns including the model run time.

The area modelled for the Ashley River breakout is shown in Figure 2-1 with modelled terrain levels. The existing urban Rangiora and Area C of the Townsend Road/South Belt Plan Change are outlined in yellow, and the purple lines represent stopbanks (mostly south of the Ashley River). The breakout is assumed to occur along the black line in the extreme north-west of the map.

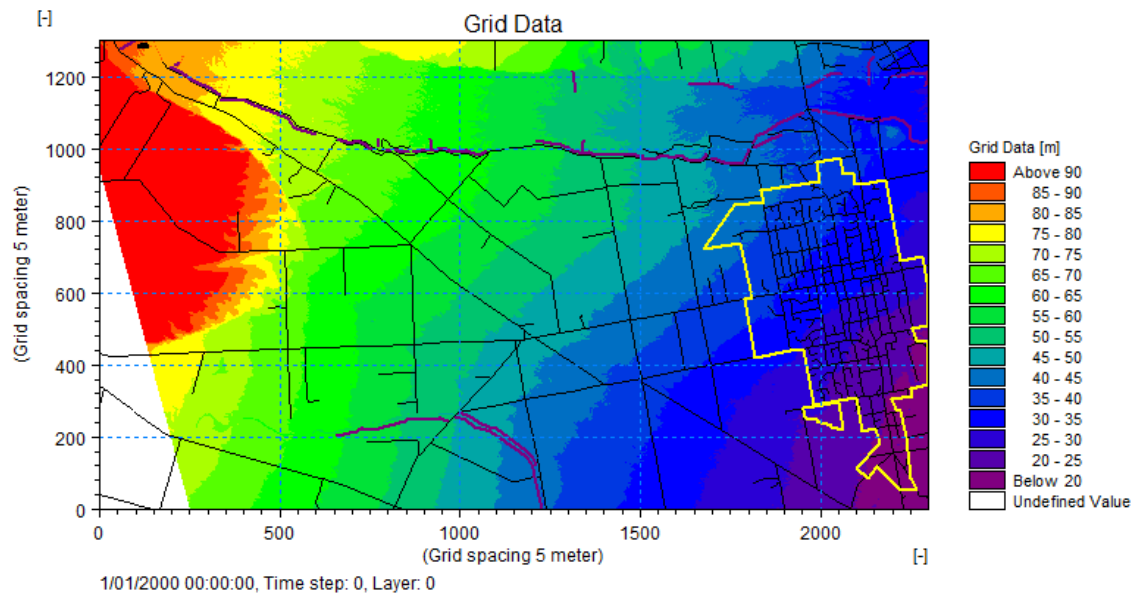


Figure 2-1 Model terrain for Ashley River breakout.

Minor drains are not well represented by the 5m grid, but in any case are not expected to play a significant role in the 200-year ARI flood event. However, the two streams running through or past the southern parts of the modelled area are large enough to be reasonably represented.

The site has few other significant topological features, other than a consistent slope of about 1.0% from north-west to south-east. The topography of the present model has been derived from the new (2014) LiDAR data set flown for WDC and also used in their South Ashley model.

2.1.1 Hydrological model for local rainfall

WDC have made available the results from running the South Ashley model they developed for the 200-year rainfall event. Flows predicted by WDC's model at the western and northern boundaries of the present model have been extracted for application as inflows to the present model, but have first been modified as described below to account for infiltration of flowing water.

The rainfall events used in WDC's model have also been applied to the present model. The approach to hydrological modelling has been broadly the same as that adopted for WDC's model, in that DHI's Model B has been applied, using mainly the same model parameters as adopted by WDC.

For the post-development scenario, the rainfall hyetograph applicable to adjacent parts of urban Rangiora has also been applied to Areas A, B and C of the proposed development. This results in slightly increased local runoff, and is reflected in the results in section 2.2 below.

The rainfall hyetographs applied to the Townsend Road/South Belt area and its immediate environs are shown in Figure 2-2. The "rural" hyetograph is applicable to the existing land use, and the "urban" hyetograph to the proposed development.

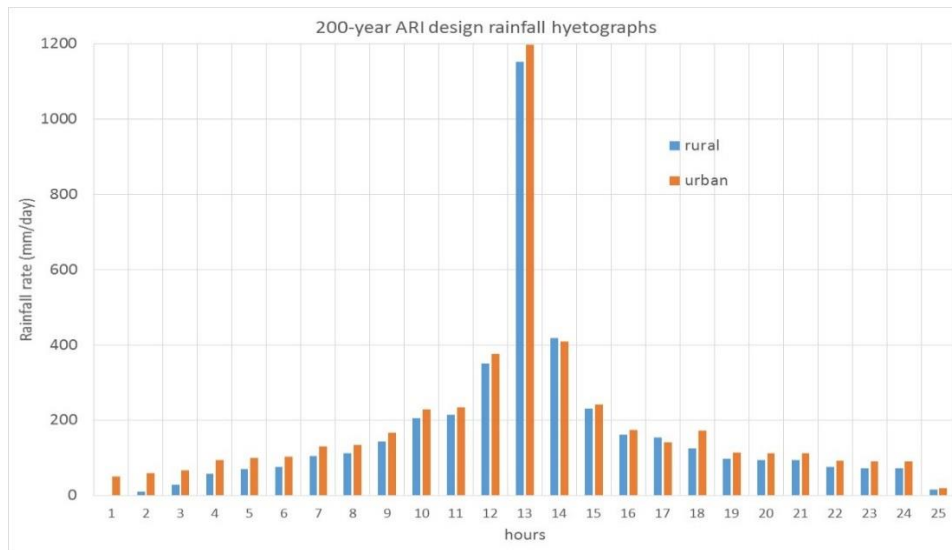


Figure 2-2 200-year ARI design rainfall hyetographs

2.1.2 Design breakout from Ashley River

Environment Canterbury provided the hydrograph (Figure 2-3) and location to be modelled for a 200-year ARI breakout from the Ashley River. The breakout is assumed to occur over a river bank length of 100 m, at NZTM co-ordinates 1557020m to 1557120m E, 5208604m N.

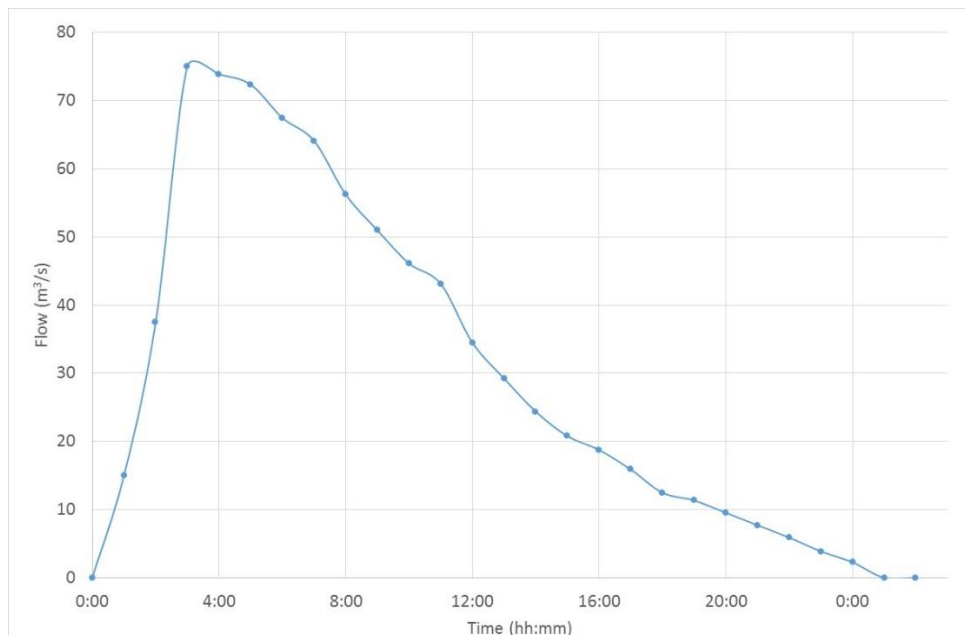


Figure 2-3 Design hydrograph for Ashley River breakout, 200-year ARI, supplied by Environment Canterbury

2.1.3 Hydraulic model details

As noted above, the full effect of any existing minor drains is not modelled by the 5m grid. In general, this effect would be minor during the 200-year event. In contrast, natural swales and stream channels are wide enough to be reasonably well captured by the 5m grid, and their effect can be seen in the results below.

This overland flow model also ignores any urban stormwater pipe network. This is a conservative approximation, but a reasonable one for the 200-year event, because the network can carry only a minor fraction of the total runoff.

All rural areas have been assigned a hydraulic roughness of $M=33$, which equates to a Manning's n value of 0.03. This value might be considered applicable to reasonably open grazed pasture with occasional fences and hedges.

Urban areas, including Areas A, B and C of the proposed plan change, have been assigned $M=8$, corresponding to a Manning's n of 0.125. This rather high roughness has been chosen to take account of the overall effect of residential sections, houses and roads. Urban residential lots and the like offer significant resistance and obstruction to flow, only partly offset by the low resistance offered by roads.

2.2 Modelling Results

Flow depths and flow rates have been saved from each model run at 20-minute intervals, and then post-processed to determine the peak flooding depths, which are mapped in this section. In the flooding maps computed flooding depths less than 0.1 m have been treated as insignificant and have not been differentiated from dry ground.

2.2.1 Existing land use

Maximum flood depths for the 200-year local rainfall event and a 200-year Ashley River breakout are shown in Figure 2-4 and Figure 2-5 respectively.

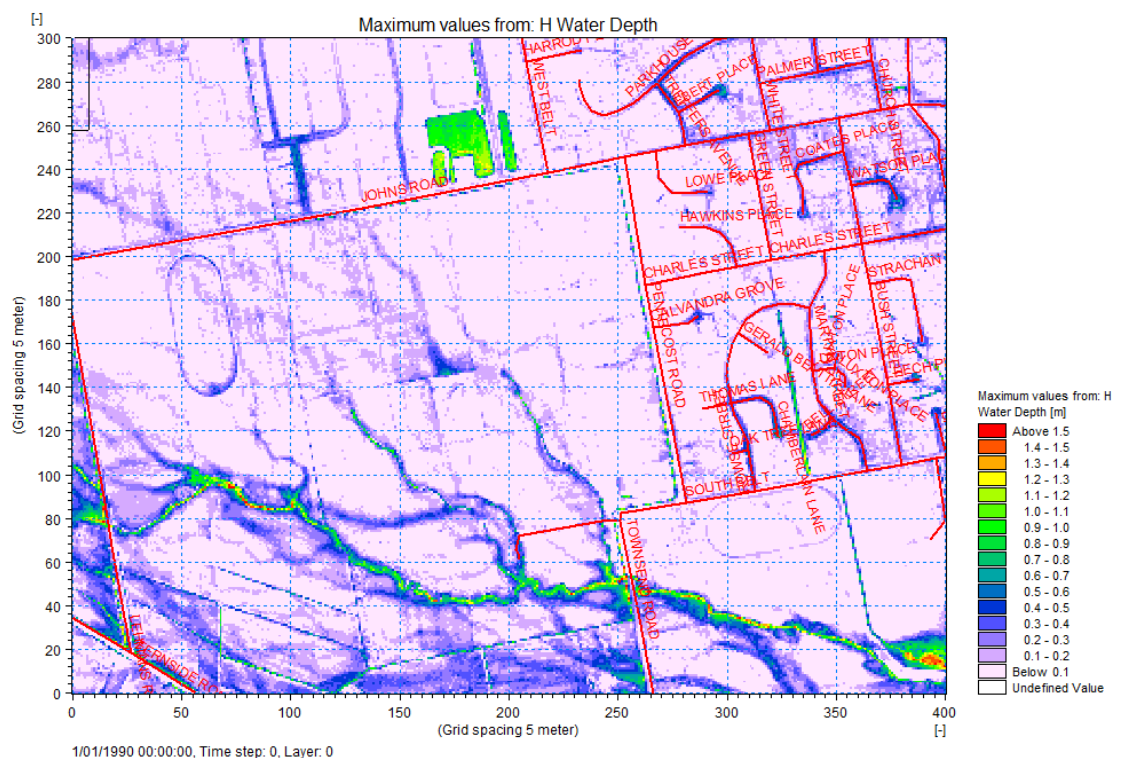


Figure 2-4 Modelled maximum flood depths, existing topography, 200-year ARI local rainfall

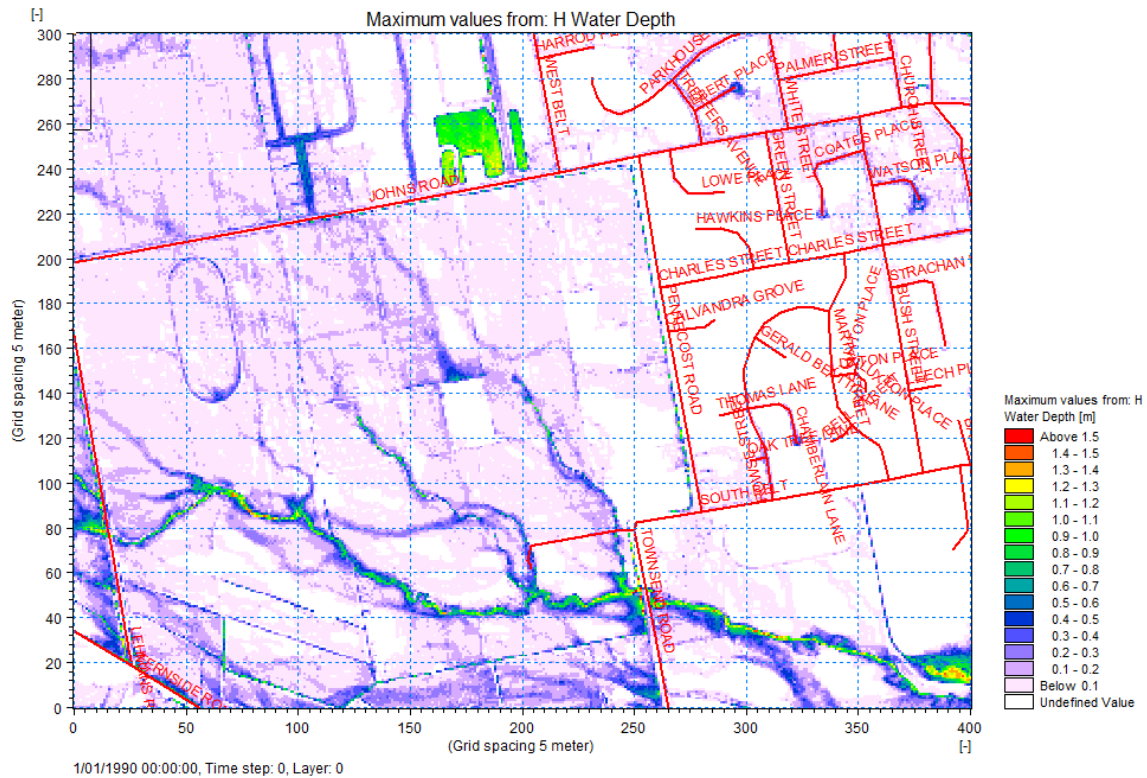


Figure 2-5 Modelled maximum flood depths, existing topography, Ashley River breakout

2.2.2 Proposed Townsend Road/South Belt Plan Change development

Corresponding maps are presented here with the proposed ground levels in Area C of the Townsend Road/South Belt development. Figure 2-6 and Figure 2-7 show maximum modelled flood depths for the 200-year local rainfall event and a 200-year Ashley River breakout respectively.

These two maps show only minor flooding within Area C. The stormwater treatment pond is mapped as flooded simply because its bed levels are included in the modelled topography.

Areas A and B show increased flooding with the development, because they have been modelled as urban areas and infiltration is therefore reduced. However, their existing topography has been applied, and it is expected that modelling the proposed ground levels would significantly reduce the modelled flood depths.

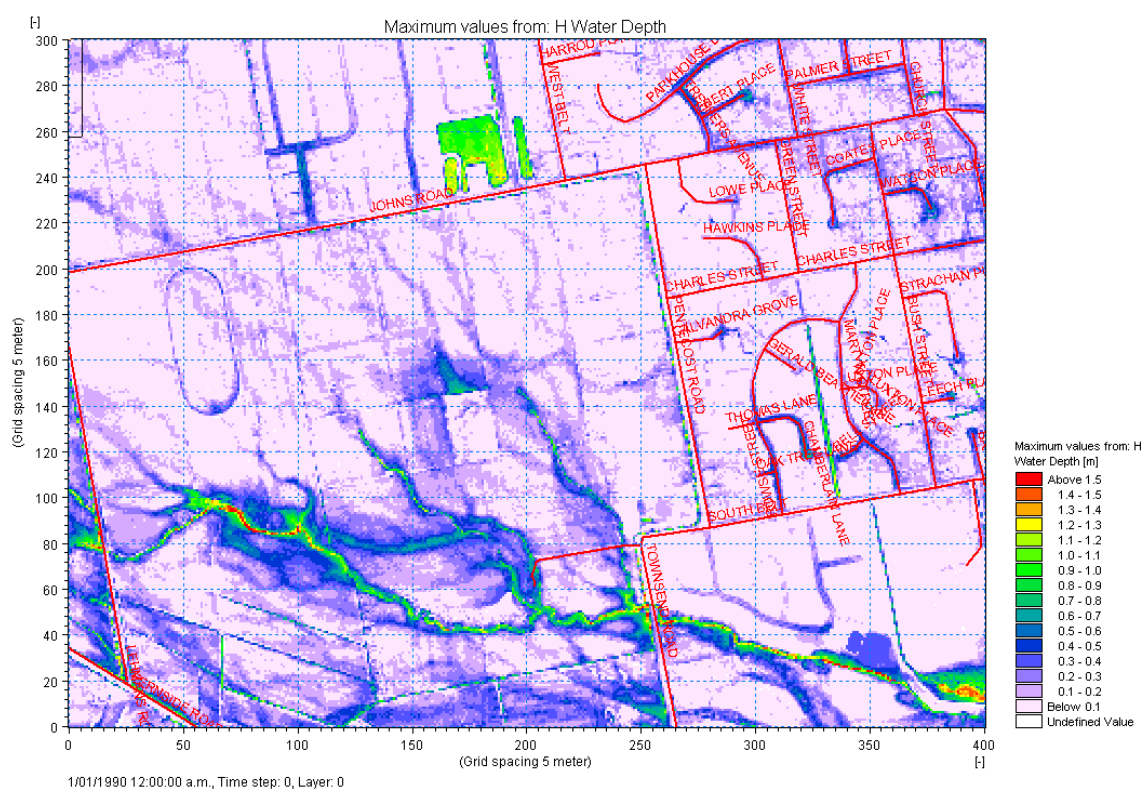


Figure 2-6 Modelled maximum flood depths, post-development Area C topography, 200-year ARI local rainfall

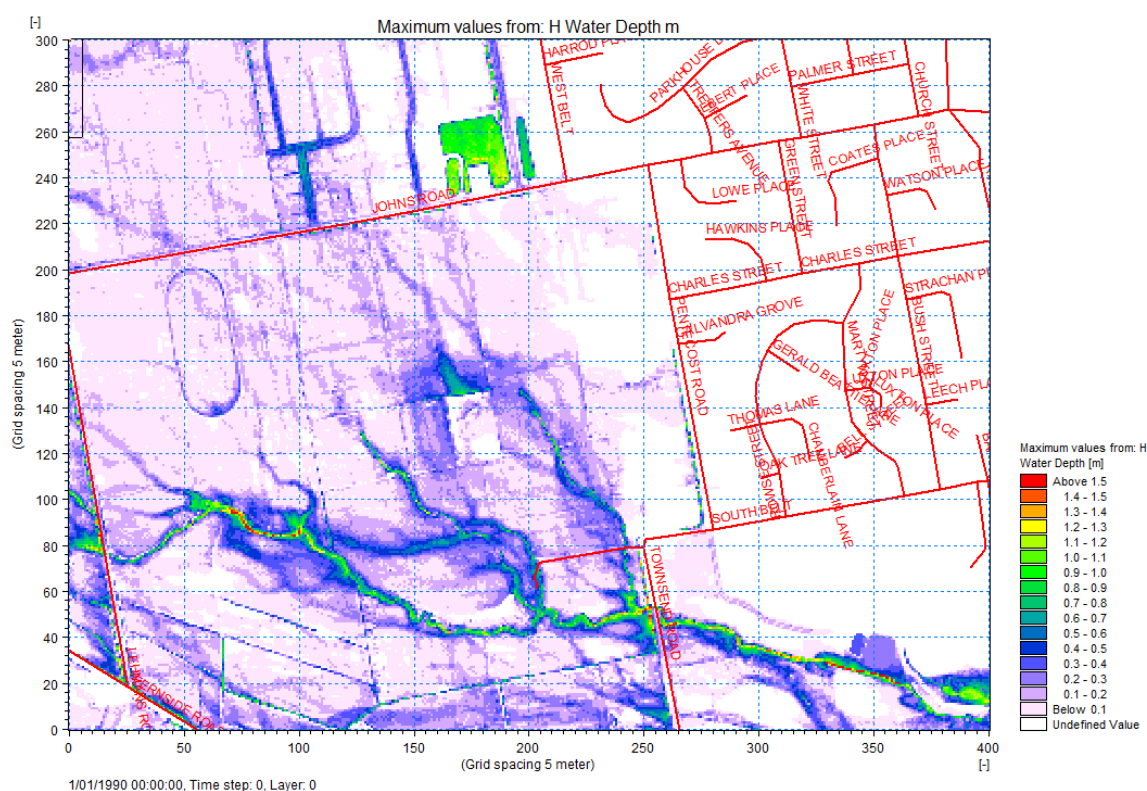


Figure 2-7 Modelled maximum flood depths, post-development Area C topography, Ashley River breakout

3 Conclusions

A 2-dimensional hydraulic model has been developed of overland flow affecting the proposed Townsend Road/South Belt Plan Change.

This model is based on the South Ashley model developed by the Waimakariri District Council (WDC), and on WDC's LiDAR data. The hyetographs of nett rainfall (i.e. with infiltration subtracted) used by WDC have been applied to this model also, but for the post-development scenario the hyetograph WDC applied to nearby urban Rangiora was also applied to Areas A, B and C of the Townsend Road/South Belt Plan Change.

The post-development model includes the ground levels proposed for Area C, but post-development ground levels were not available for Areas A and B. The model is therefore valid for determining flood depths within Area C, but not Areas A and B.

Two flooding scenarios were considered: a local rainfall event of 200-year Average Recurrence Interval (ARI) and a breakout from the Ashley River.

Within Area C, modelling shows only very minor flooding during both these design events.