



Figure 12: WRR design network highlighted in red connecting to the existing pipe network shown in blue.

### 3.5.13 Overland flow or secondary flow paths

The Auckland Council Code of Practise (version 2 Nov 2015 and version 3 Jan 2022) requires design consideration of the effects on secondary flow paths. The AC definition of a secondary flow path is shown below (from Section 4.3.4.2 of V3 of the AC Code of Practise (CoP)):

*“A secondary stormwater system consists of ponding areas and overland flow paths with sufficient capacity to transfer the flows generated by the event specified in the design standards in Section 4.3.5.2. As far as*

*possible, the location of secondary systems should be aligned with natural flow paths. The existing constructed or natural flow paths shall be retained as far as practical. Any alteration of the existing stormwater system shall result in no detrimental impacts to either upstream or downstream properties."*

In this case the 1% AEP (or 100-year ARI) future rainfall event with climate change is the design standard for the secondary flow path.

The criteria used for this assessment is based on Section 4.3.5.6 of the AC CoP as shown below:

"Secondary overland flow paths shall be designed with sufficient capacity to accommodate the 1% AEP storm event, assuming the following conditions for the primary network:

- *For pipelines up to and including DN600, assume that the pipeline is 100% blocked*
- *For pipelines between DN600 and DN1,050, assume that the pipeline's capacity has been reduced by 50%*
- *For pipelines in excess of DN1,050, assume that the pipeline's capacity has been reduced by 10%"*

In the model these capacity reductions were assessed using the following approach:

- 100% capacity reduction - A 1 mm pipe was replaced for all pipes 600 mm and smaller to allow the model computations to occur but with flow forced to surcharge at the sub-catchment loading node
- 50% capacity reduction - To achieve this a factor of 77% factor was applied to all pipe diameters in the >600 to 1050 mm pipe category to provide an effective pipe diameter. This was done on the assumption that invert levels, pipe roughness and slope all stayed the same. Where pipe Q/H inlet control was applied, this was also reduced using the effective pipe diameter.
- 10% capacity reduction - To achieve this a factor of 96% was applied to all pipe diameters in the >1050 mm pipe category to provide an effective pipe diameter. Where pipe Q/H inlet control was applied, this was also reduced to the effective pipe diameter.

There were also two locations where the design terrain was artificially lowered to the base case levels to allow for geometric changes to the design to reduce the need for added pipe network overland flow. If this cannot be achieved, then this will be dealt with in the detailed design stage.

This capacity reduction was applied to the base and design cases to understand if there are increased flooding issues created by the design.

## 4. Results

The Flood Model results for each section of the Eastern Busway have been processed and the following maps been produced:

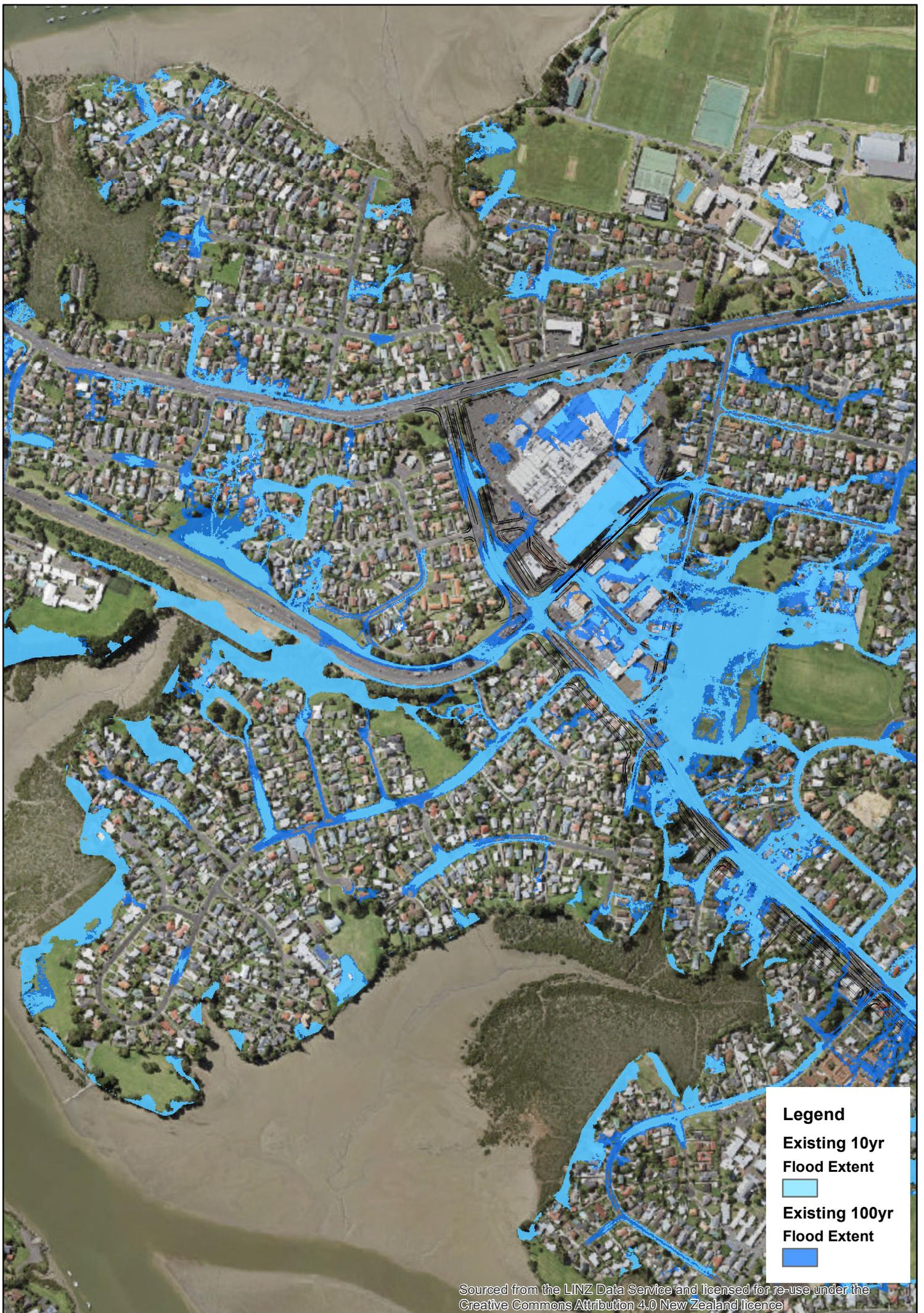
- EB2 flood assessment maps (see Appendix 1)
  - Base case 10 and 100-year flood extents (included)
  - Base case 10-year flood depths (included)
  - Base case 100-year flood depths (included)
  - Design case 10 and 100-year flood extents (included)
  - Design case 10-year flood depths (included)
  - Design case 100-year flood depth (included)
  - Depth difference 10-year (interim included)
  - Depth difference 100-year (interim included)
- WRR flood assessment maps (see Appendix 2)
  - Temporary design case 10-year flood difference (included)
  - Temporary design case 10-year flood extents (included)
- EB3R flood assessment maps (see Appendix 3)
  - Base case 10 and 100-year flood extents (included)
  - Base case 10-year flood depths (included)
  - Base case 100-year flood depth (included)
  - Design case 10 and 100-year flood extents (included)
  - Design case 10-year flood depths (included)
  - Design case 100-year flood depth (included)
  - Depth difference 10-year (included)
  - Depth difference 100-year (included)
- EB3C flood assessment maps (see Appendix 4)
  - Base case 10 and 100-year flood extents (in progress)
  - Base case 10-year flood depths (in progress)
  - Base case 100-year flood depth (in progress)
  - Design case 10 and 100-year flood extents (in progress)
  - Design case 10-year flood depths (in progress)

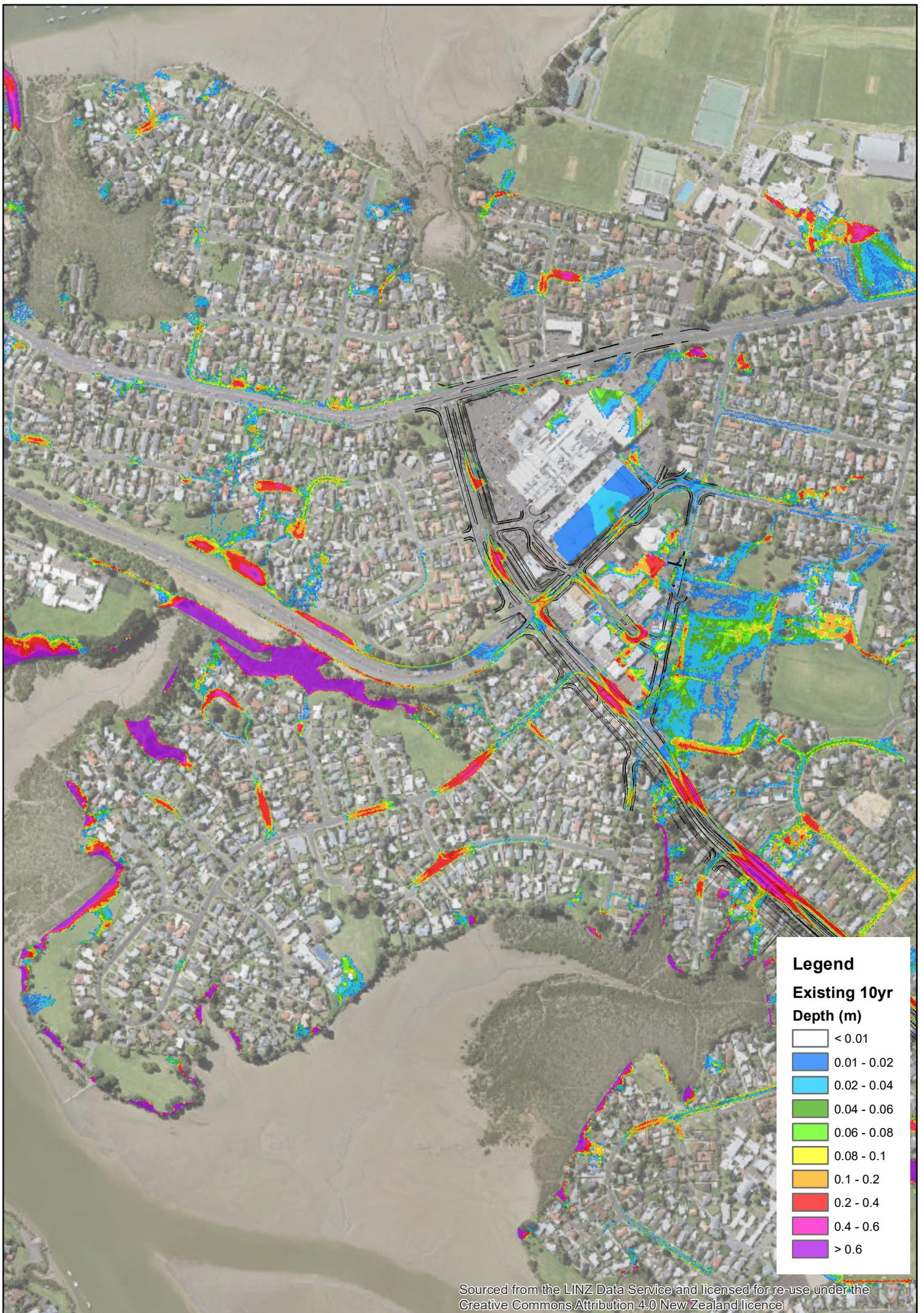
- Design case 100-year flood depth (in progress)
- Depth difference (in progress)
- EB4 flood assessment maps (see Appendix 5)
  - Base case 10 and 100-year flood extents (in progress)
  - Base case 10-year flood depths (in progress)
  - Base case 100-year flood depth (in progress)
  - Design case 10 and 100-year flood extents (in progress)
  - Design case 10-year flood depths (in progress)
  - Design case 100-year flood depth (in progress)
  - Depth difference 10-year (in progress)
  - Depth difference 100-year (in progress)
- EB2 overland flow assessment maps (see Appendix 6)
  - Base case 10 and 100-year flood extents (included)
  - Base case 10-year flood depths (included)
  - Base case 100-year flood depth (included)
  - Design case 10 and 100-year flood extents (included)
  - Design case 10-year flood depths (included)
  - Design case 100-year flood depth (included)
  - Depth difference 10-year (included)
  - Depth difference 100-year (included)
- EB3R overland flow assessment maps (see Appendix 7)
  - Base case 10 and 100-year flood extents (included)
  - Base case 10-year flood depths (included)
  - Base case 100-year flood depth (included)
  - Design case 10 and 100-year flood extents (included)
  - Design case 10-year flood depths (included)
  - Design case 100-year flood depth (included)
  - Depth difference 10-year (included)
  - Depth difference 100-year (included)
- EB3C overland flow assessment maps (see Appendix 8)

- Base case 10 and 100-year flood extents (in progress)
- Base case 10-year flood depths (in progress)
- Base case 100-year flood depth (in progress)
- Design case 10 and 100-year flood extents (in progress)
- Design case 10-year flood depths (in progress)
- Design case 100-year flood depth (in progress)
- Depth difference 10-year (in progress)
- Depth difference 100-year (in progress)
- EB4 overland flow assessment maps (see Appendix 9)
  - Base case 10 and 100-year flood extents (in progress)
  - Base case 10-year flood depths (in progress)
  - Base case 100-year flood depth (in progress)
  - Design case 10 and 100-year flood extents (in progress)
  - Design case 10-year flood depths (in progress)
  - Design case 100-year flood depth (in progress)
  - Depth difference 10-year (in progress)
  - Depth difference 100-year (in progress)

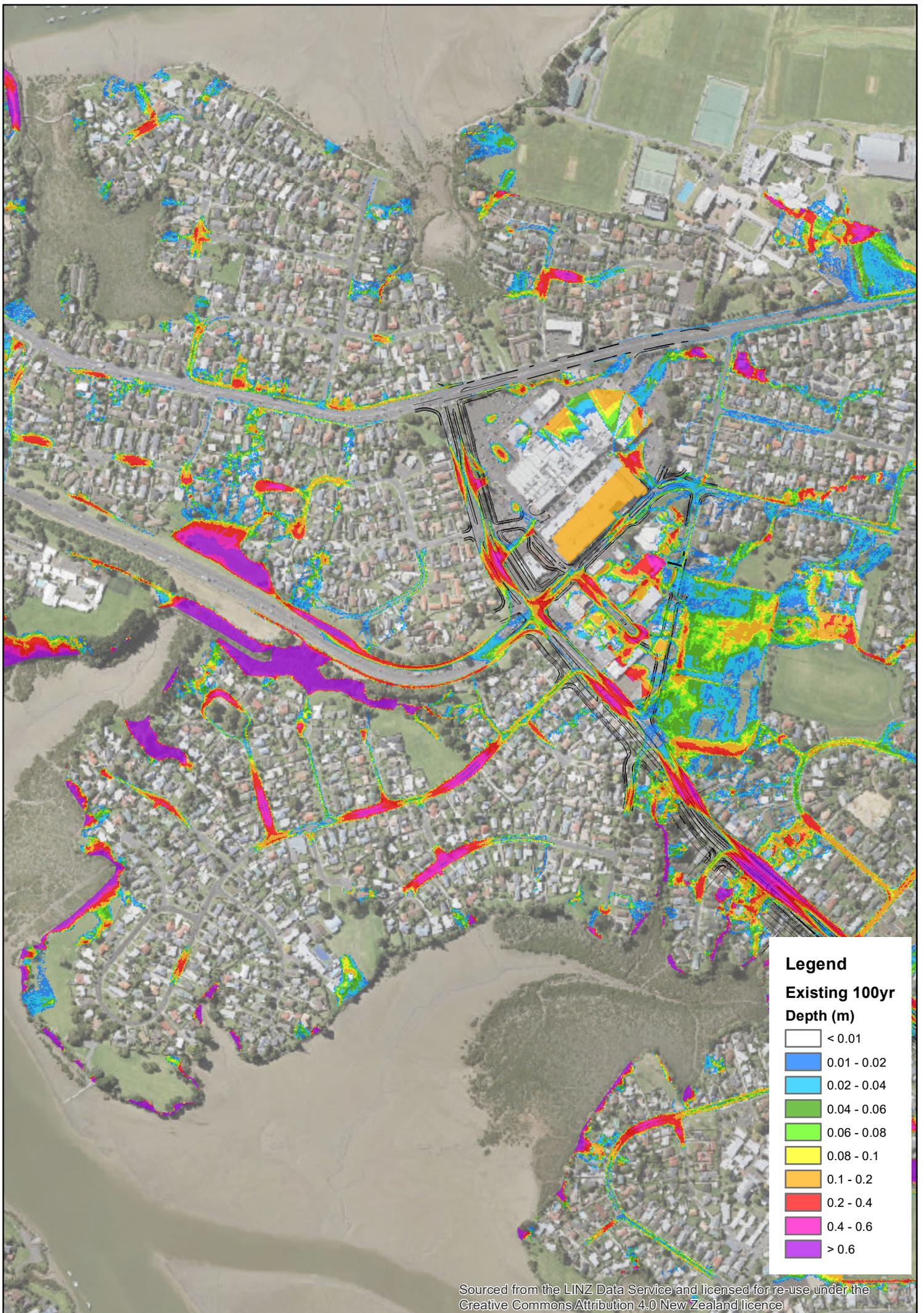
The analysis and interpretation of the results will be included in the stormwater effect assessment documents for each consent package and design reports. The maps will be updated as each consent package is completed and during the detailed design progresses (preliminary detail design and completed detail design).

## Appendix 1. EB2 flood assessment maps

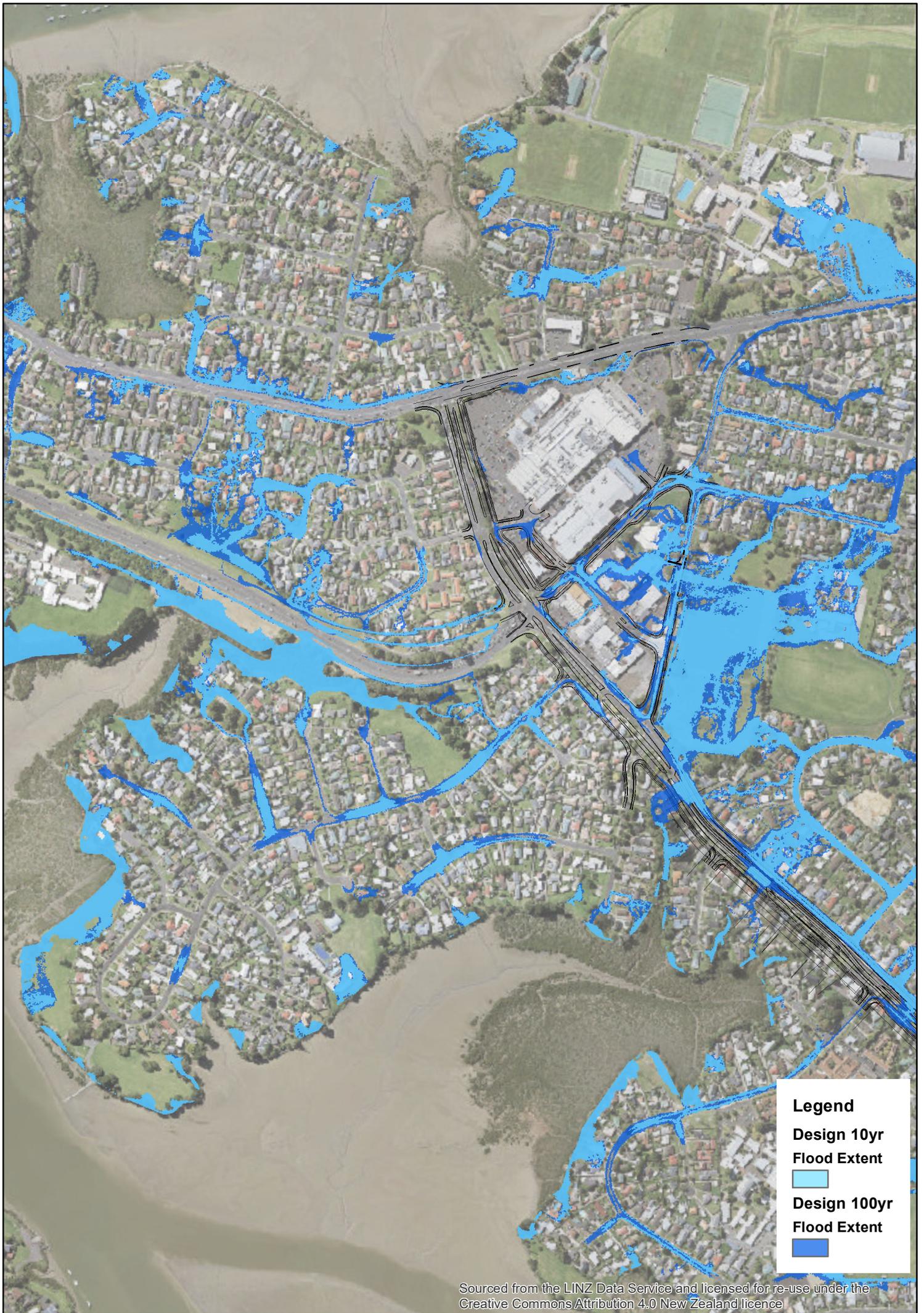




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**Legend**

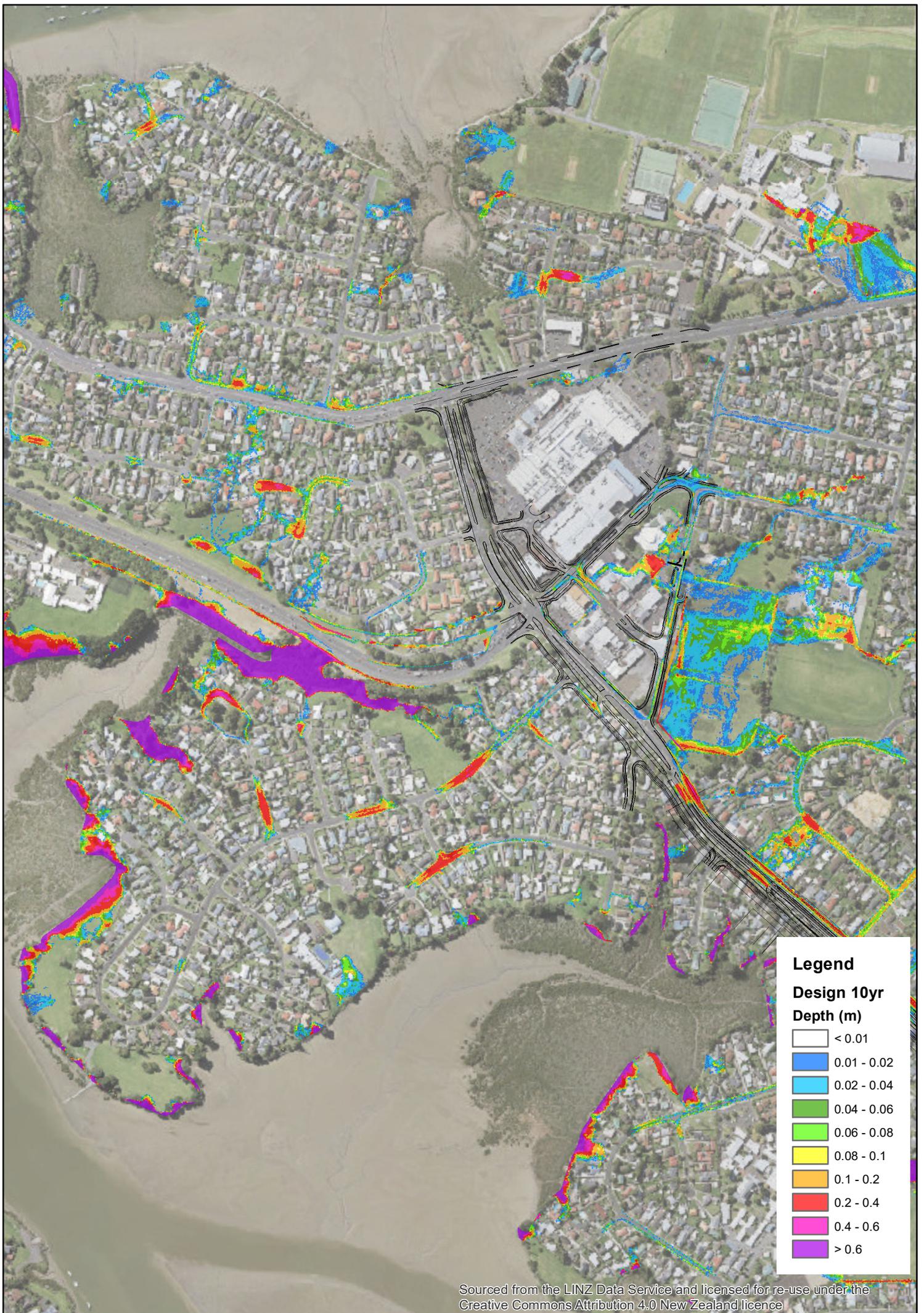
**Design 10yr  
Flood Extent**



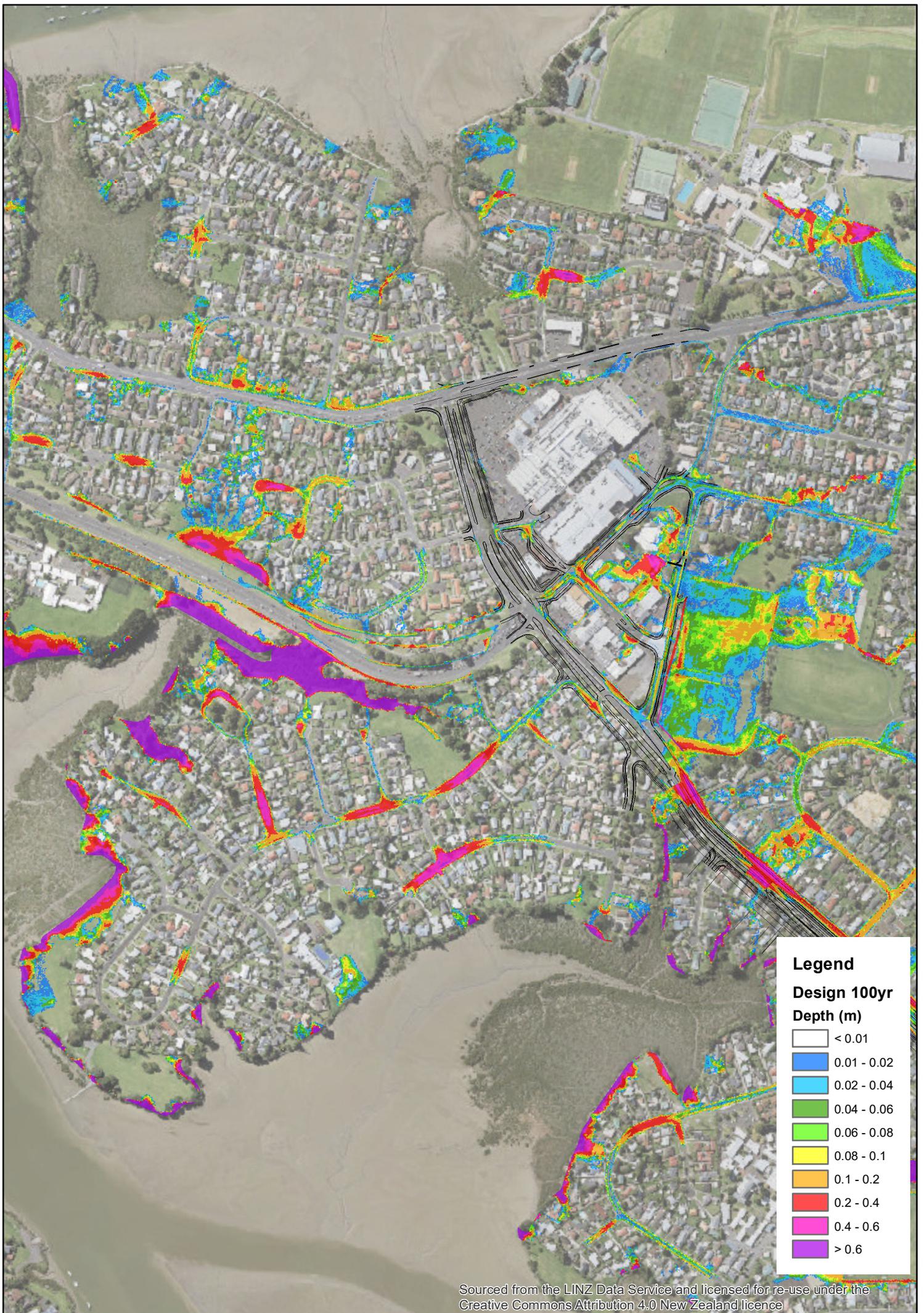
**Design 100yr  
Flood Extent**



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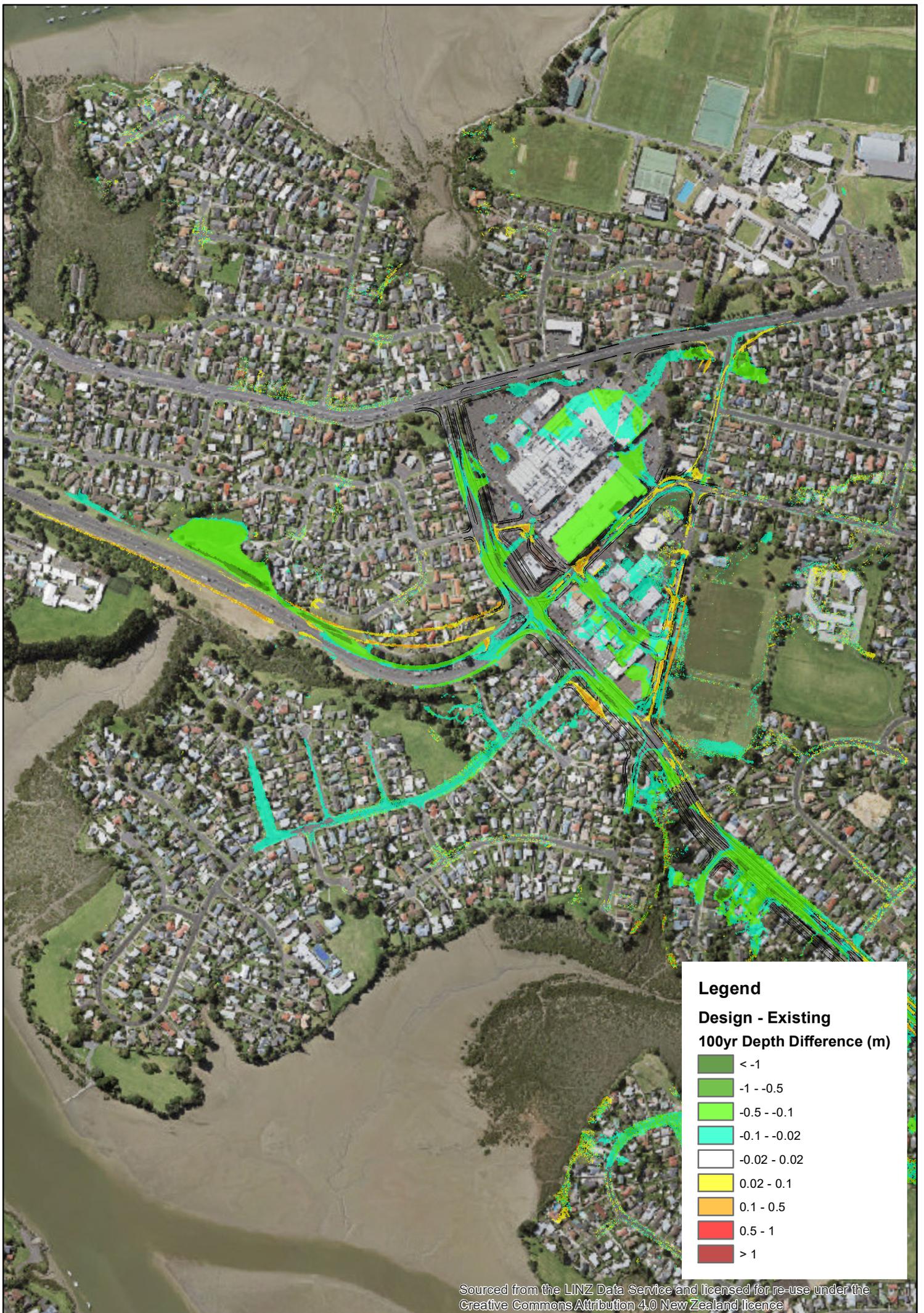
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## Appendix 2. WRR flood assessment maps

