Lithgow City Council
180 Mort Street
LITHGOW NSW 2790

Job No. DT550

Attn: Mr Sean Quick

23 March 2022

Re: 140 Mort Street Flood Impact and Water Quality Assessment

Dear Sir

As requested, we have undertaken an assessment into the impact that the construction of a new warehouse/store type building at No. 140 Mort Street, Lithgow would have on flood behaviour and also the quality of stormwater runoff discharging to the receiving drainage line.

1. Background

Lithgow City Council (**Council**) is proposing to construct the new warehouse/store type building on a vacant parcel of land that is currently used to temporarily store building materials. **Figure 1** (2 sheets) attached shows the location of the new building, as well as the layout of the existing stormwater drainage system that controls runoff from two relatively large catchments that lie to its south, while **Annexure A** of this letter contains several plates showing the unsealed nature of the area where the new building would be constructed.

The new building would comprise streel frame type construction with Colorbound wall and roof type cladding. The building would be constructed on a reinforced concrete slab which will be formed on compacted engineered fill. The finished floor level of the new building has been set at RL 992.925 m AHD. The reinforced concrete slab would be extended 10 m beyond the footprint of the new building to form a sealed area around its perimeter. Sealed access would also be provided to Mort Street to the south and Gas Works Lane to the north. A minor pit and pipe system would control runoff from the adjacent sealed area, as well as runoff from roofed areas. Flow conveyed in the new piped drainage system would discharge to the existing stormwater drainage system at the location of an existing inlet pit that is located in Gas Works Lane. **Annexure B** of this letter contains several drawings which show details of the new building, adjacent sealed area and the proposed pit and pipe drainage system.

Natural surface levels in the vacant parcel of land upon which the new building would be built fall from an elevation of about RL 992.5 m AHD along its southern boundary, to about RL 991.5 m AHD along its northern boundary, a grade of about 1 per cent. A key feature of the area is the Main Western Railway which has an elevation of about RL 923.5 m AHD immediately to the north of the vacant parcel of land.

2. Definition of Flood Behaviour under Present Day Conditions

The definition of flood behaviour in the vicinity of the new building is based on information that is presented in the *Lithgow Flood Study Review* (Lyall & Associates, 2017), noting that the findings of this study are presently being relied upon by Council for assessing development applications in Lithgow.

Figures 2 and **3** show the indicative extent and depth of inundation in the vicinity of the new building for design storms with Annual Exceedance probabilities (AEPs) of 10% (1 in 10) and 1% (1 in 100).

A key feature of the flooding in the vicinity of the new building is that floodwater which surcharges the existing stormwater drainage system will pond upslope (south) of the Main Western Railway where it will inundate the vacant parcel of land to depths exceeding 1 m in a 1% AEP storm event. Peak 10% and 1% AEP flood levels in the immediate vicinity of the new building are as follows:

- 10% AEP – RL 921.74 m AHD
- 1% AEP – RL 922.65 m AHD

3. Impact of New Building and Adjacent Hardstand Areas on Flood Behaviour

A 3D model of finished surface levels associated with the new building and its adjacent hardstand areas was developed as part of the present investigation based on information shown on the drawings contained in **Annexure B** of this letter. The left hand side of **Figure 4** shows the difference in levels between finished and natural surface levels associated with the new building and adjacent hardstand areas.

The structure of the hydraulic (TUFLOW) model that was developed as part of Lyall & Associates, 2017 was then updated to reflect the raised surface that would be associated with the new building and its adjacent hardstand areas.

Figures 5 and **6** show that the raised nature of the new building and its adjacent hardstand areas would result in a minor increase in peak 1% AEP flood levels, with the impacts extending into adjacent residential development. The reason for the increase in peak 1% AEP flood levels is that the raising of natural surface levels will reduce the volume of flood storage that is available in the ponding area that is present upstream of the Main Western Railway by about 1,400 m^3.

4. Assessment of Potential Flood Mitigation Measure

In order to mitigate the impact that the new building and adjacent hardstand areas would have on flood behaviour it would be necessary to provide compensatory flood storage in the ponding area that is present upstream of the Main Western Railway (i.e. it would be necessary to lower natural surface levels in order to replace the 1,400 m3 of flood storage that would otherwise be displaced by the new building and adjacent hardstand areas).

A 3D model was developed of an excavated area that would be located immediately to the north of the new building. The right hand side of **Figure 4** shows the depth and extent of excavation that would be required to mitigate the effects of the new building and adjacent hardstand areas, noting that it ranges in depth of between about 1.5-1.8 m. The excavated area would be drained by a new 225 mm diameter pipe to which a one-way valve would need to be fitted to prevent backflow during storms which pressurise the existing stormwater drainage system into which it would connect.

Figures 7 and **8** show that the recapture of the displaced floodplain storage would mitigate the impacts that the new building and adjacent hardstand areas would have on flood behaviour for all storms up to 1% AEP in intensity.

It is noted that based on the results of the flood modelling it would be feasible to reduce the depth of excavation that was assessed as part of the present investigation as the adoption of the assessed option would result in a reduction in peak flood levels when compared to present day conditions. It would also be possible to further reduce the depth of excavation if natural surface levels could be lowered over a larger area that shown on the right hand side of **Figure 4**.

5. Water Quality Considerations

The *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* **(SEPP 2011)** applies to land located within the Sydney Drinking Water Catchment. The stated aims of SEPP 2011 are:

> *a) to provide for healthy water catchments that will deliver high quality water while permitting development that is compatible with that goal, and*
>
> *b) to provide that a consent authority must not grant consent to a proposed development unless it is satisfied that the proposed development will have a neutral or beneficial effect on water quality, and*
>
> *c) to support the maintenance or achievement of the water quality objectives for the Sydney drinking water catchment."*

Before carrying out any activity on land located within the Sydney Drinking Water Catchment, SEPP 2011 requires that a public authority (such as Council) consider whether the activity would have a neutral or beneficial effect (**NoBE**) on water quality.

The "*Neutral or Beneficial Effect on Water Quality Assessment Guideline"* (Sydney Catchment Authority (**SCA**), 2015) was developed to support the implementation of SEPP 2011 by providing a clear direction on what a NoBE on water quality means and how to achieve it. SCA, 2015 states that a NoBE on water quality is satisfied if the planned development:

> *"a) has no identifiable potential impact on water quality, or*
>
> *b) will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site, or*
>
> *c) will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority."*

SCA, 2015 recommends the use of the Model for Urban Stormwater Improvement and Conceptualisation (**MUSIC**) to determine a NoBE on water quality for large developments where the impervious area is greater than or equal to 2,500 m^2.

While the total impervious surface associated with the new building and adjacent hardstand areas would total about 2,725 m^2, approximately 555 m^2 of this area would comprise roofed areas where pollutant loads would be minimal due to their non-trafficable nature. While the remaining 2,170 m^2 would comprise hardstand areas which would be trafficable, they replace a presently unsealed trafficable area that would be subject to erosion during intense storm events.

Based on the above understanding and by inspection, the construction of the new building and adjacent hardstand areas would result in a nett improvement in the quality of surface runoff discharging to the existing stormwater drainage system. That said, it is recommended that measures be incorporated in the design of the new pit and pipe system to intercept and store any oils or greases that may deposit on the newly sealed areas during normal operating conditions.

We trust that the findings of the present investigation will assist Council in its assessment of the new building and adjacent hardstand areas. However, please do not hesitate to contact the undersigned should you have any queries or wish to discuss any aspect of our submission.

Yours faithfully
Lyall & Associates Consulting Water Engineers

Scott Button
Principal

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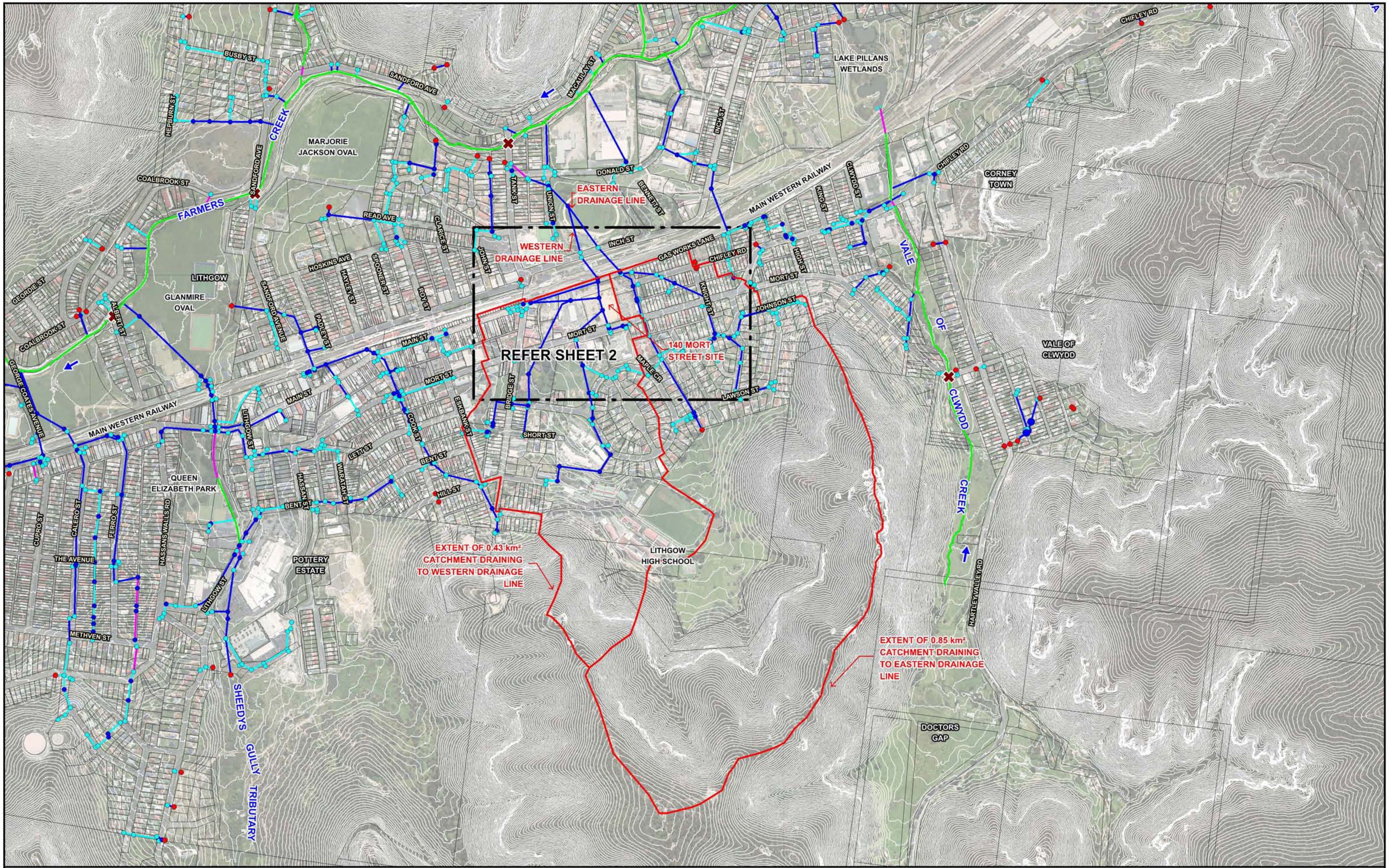

100 0 100 200 300 m

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LEGEND

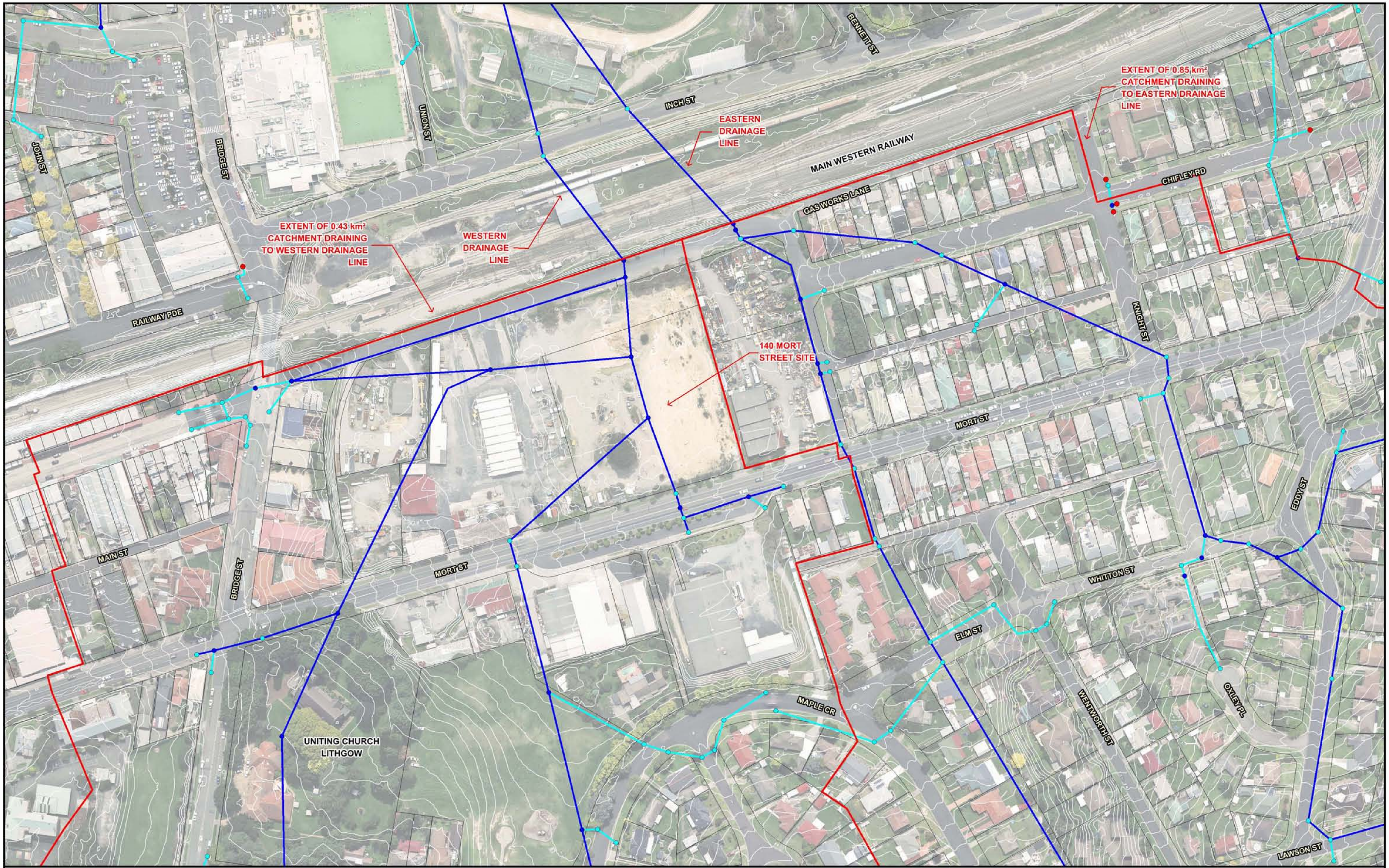
Inlet Pit	Pipe < 450 mm Diameter
Junction Pit	Pipe ≥ 450 mm Diameter
Headwall	Box Culvert
Bridge	Unlined Channel
	Catchment Boundary

Lyall & Associates

140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 1
(Sheet 1 of 2)

Location and Catchment Plan



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Scale: 1:2,000

Lyall & Associates

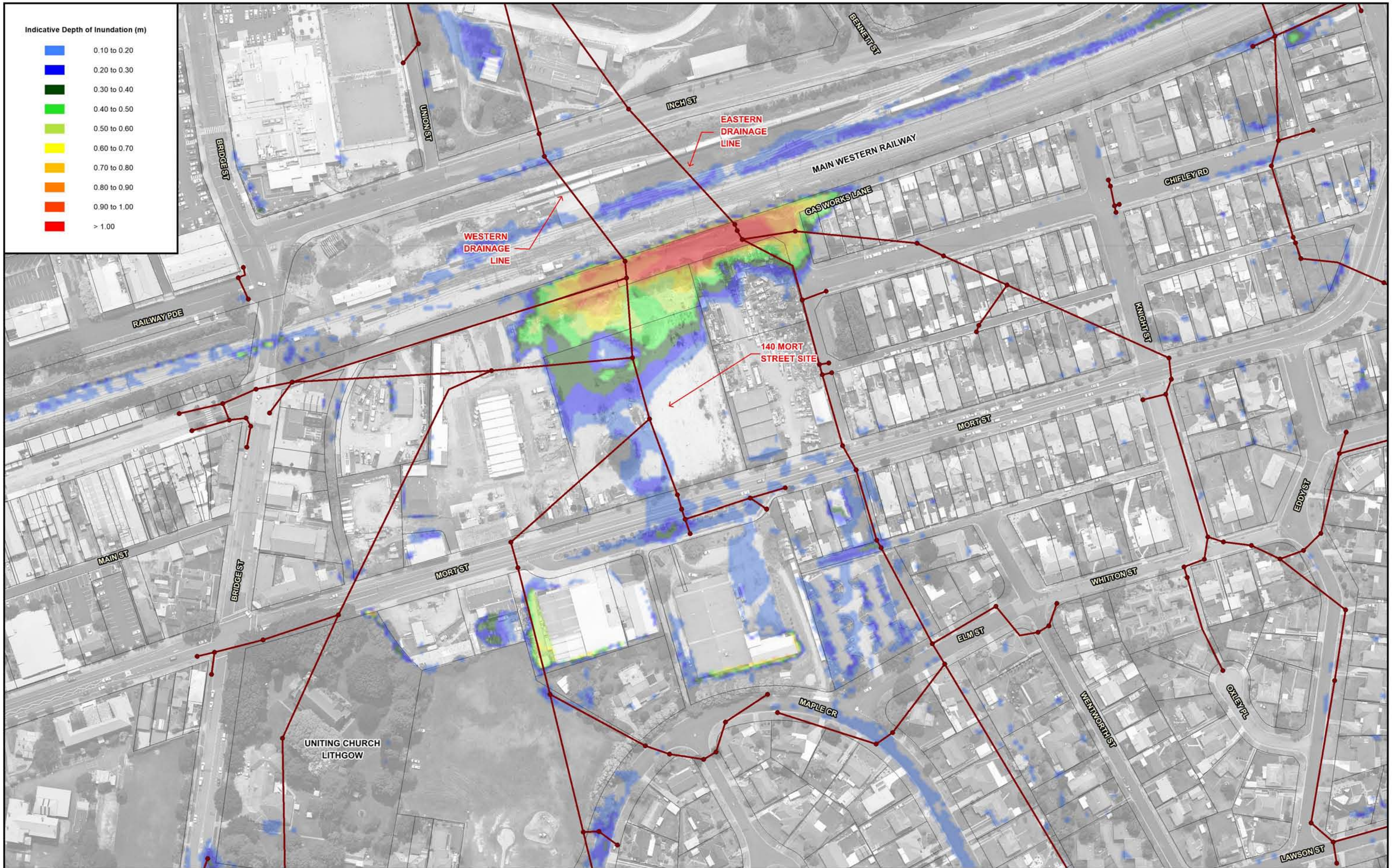
LEGEND

Inlet Pit	Pipe < 450 mm Diameter
Junction Pit	Pipe ≥ 450 mm Diameter
Headwall	Catchment Boundary

140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 1
(Sheet 2 of 2)

Location and Catchment Plan



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Scale: 1:2,000

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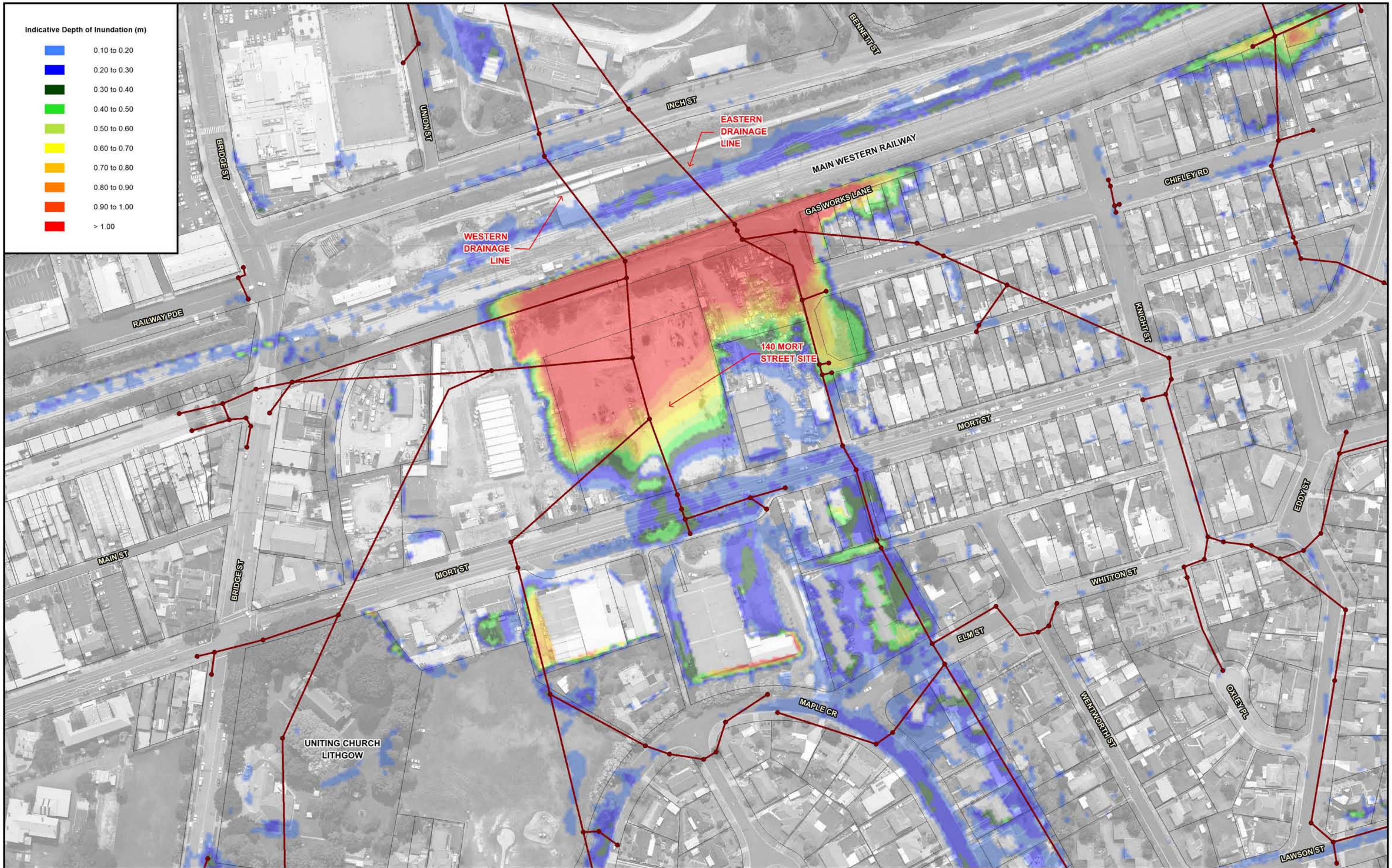
LEGEND

Stormwater Drainage System

140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 2

INDICATIVE EXTENT AND DEPTH OF INUNDATION IN VICINITY OF NEW BUILDING AND ADJACENT HARDSTAND AREAS
PRESENT DAY CONDITIONS - 10% AEP



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LEGEND

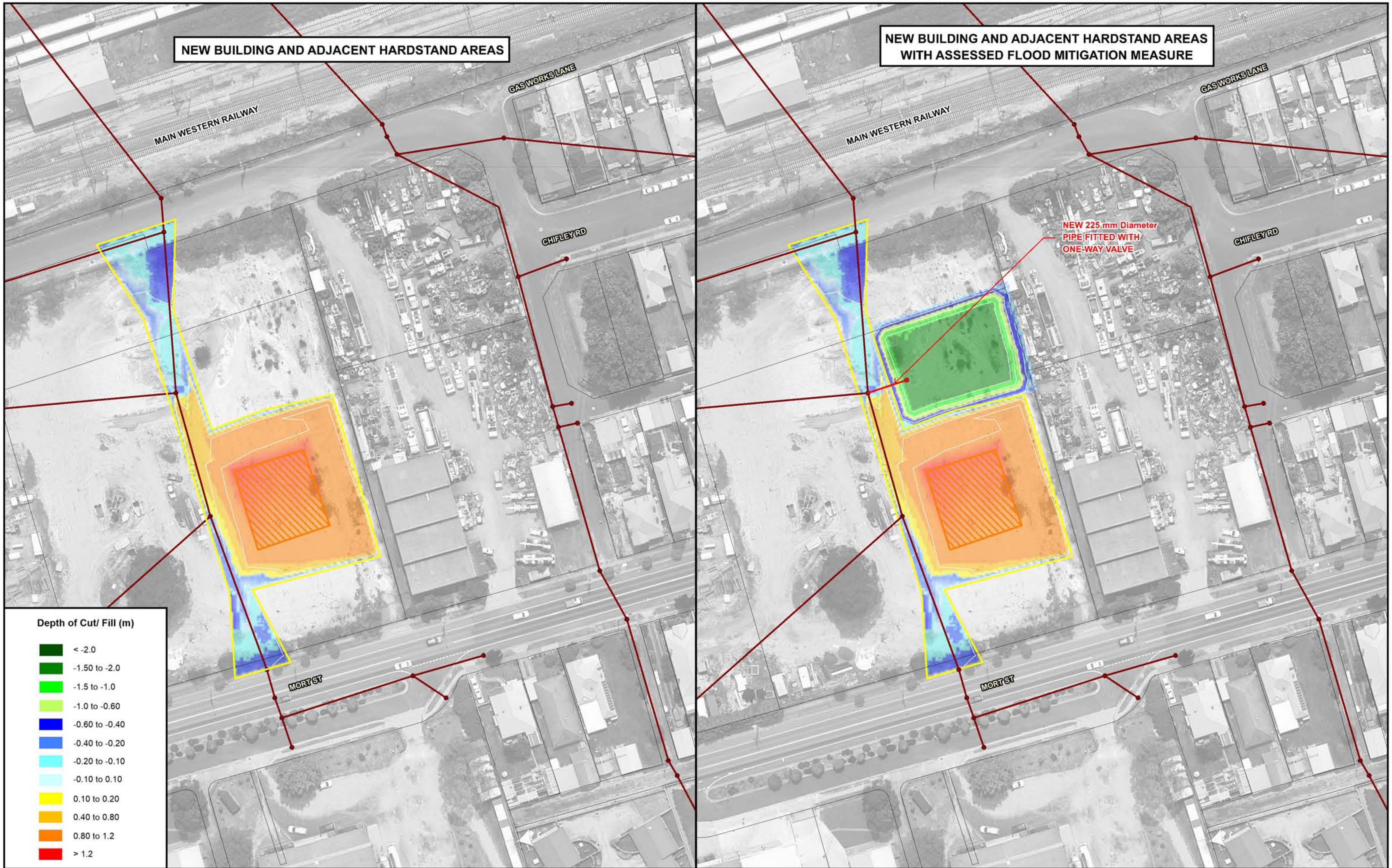
Stormwater Drainage System

Lyall & Associates

140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 3

INDICATIVE EXTENT AND DEPTH OF INUNDATION IN VICINITY OF NEW BUILDING AND ADJACENT HARDSTAND AREAS
PRESENT DAY CONDITIONS - 1% AEP



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Scale: 1:1,000

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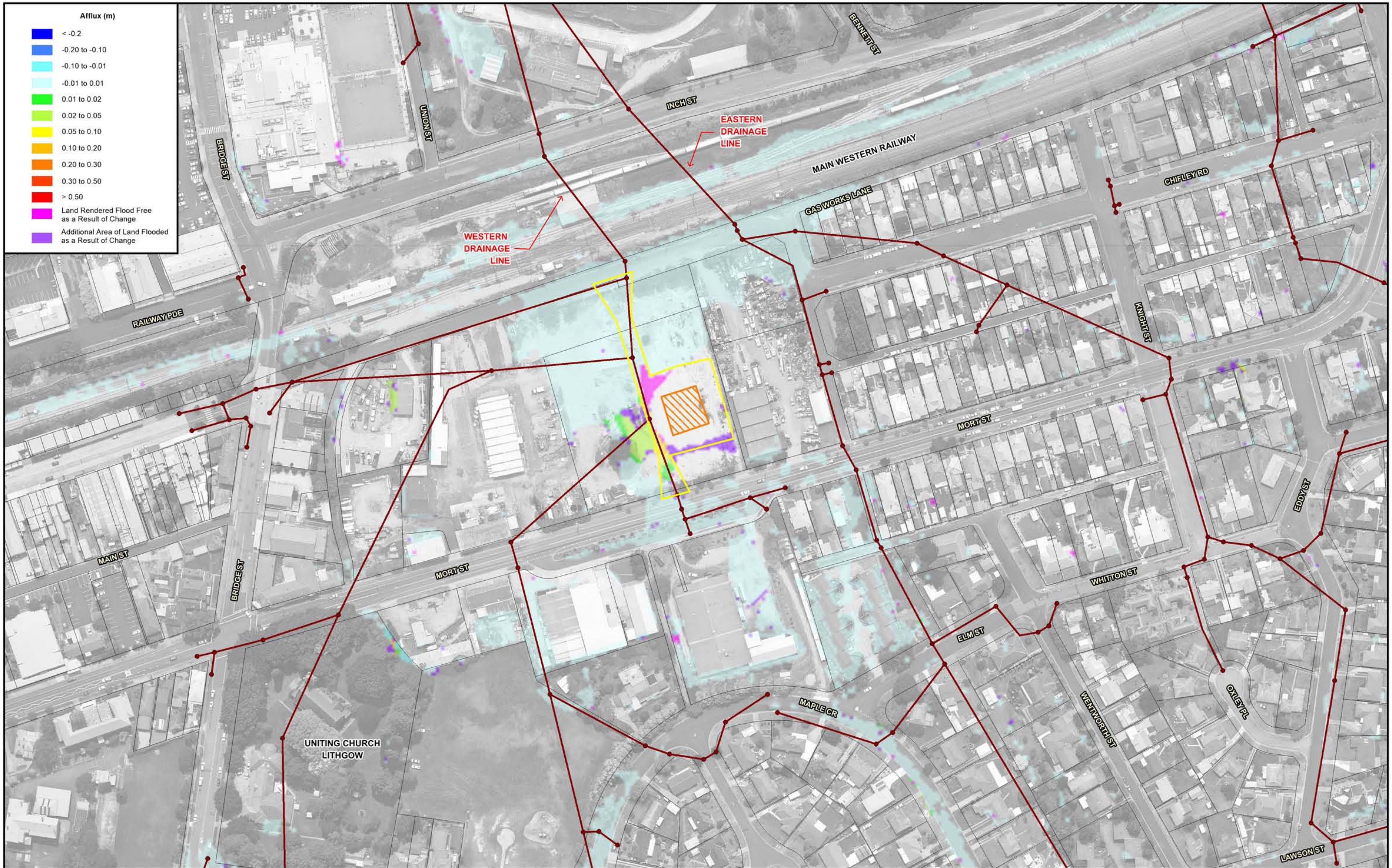
LEGEND

- Stormwater Drainage System
- Outline of Adjacent Hardstand Areas
- Extent of New Building

140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 4

COMPARISON OF NATURAL AND FINISHED SURFACE LEVELS



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Scale: 1:2,000

LEGEND
Stormwater Drainage System
Outline of Adjacent Hardstand Areas
Extent of New Building

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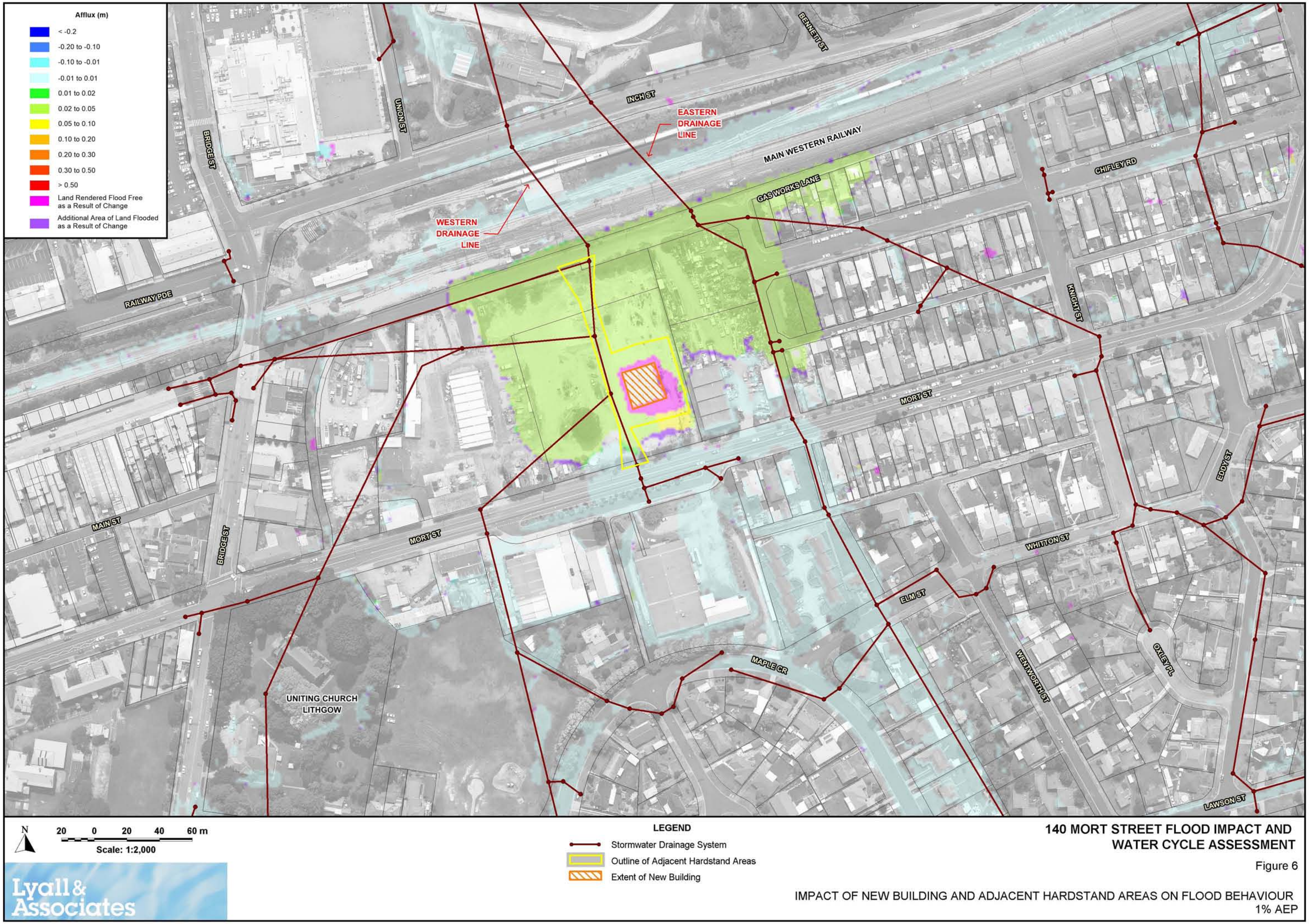
140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 5

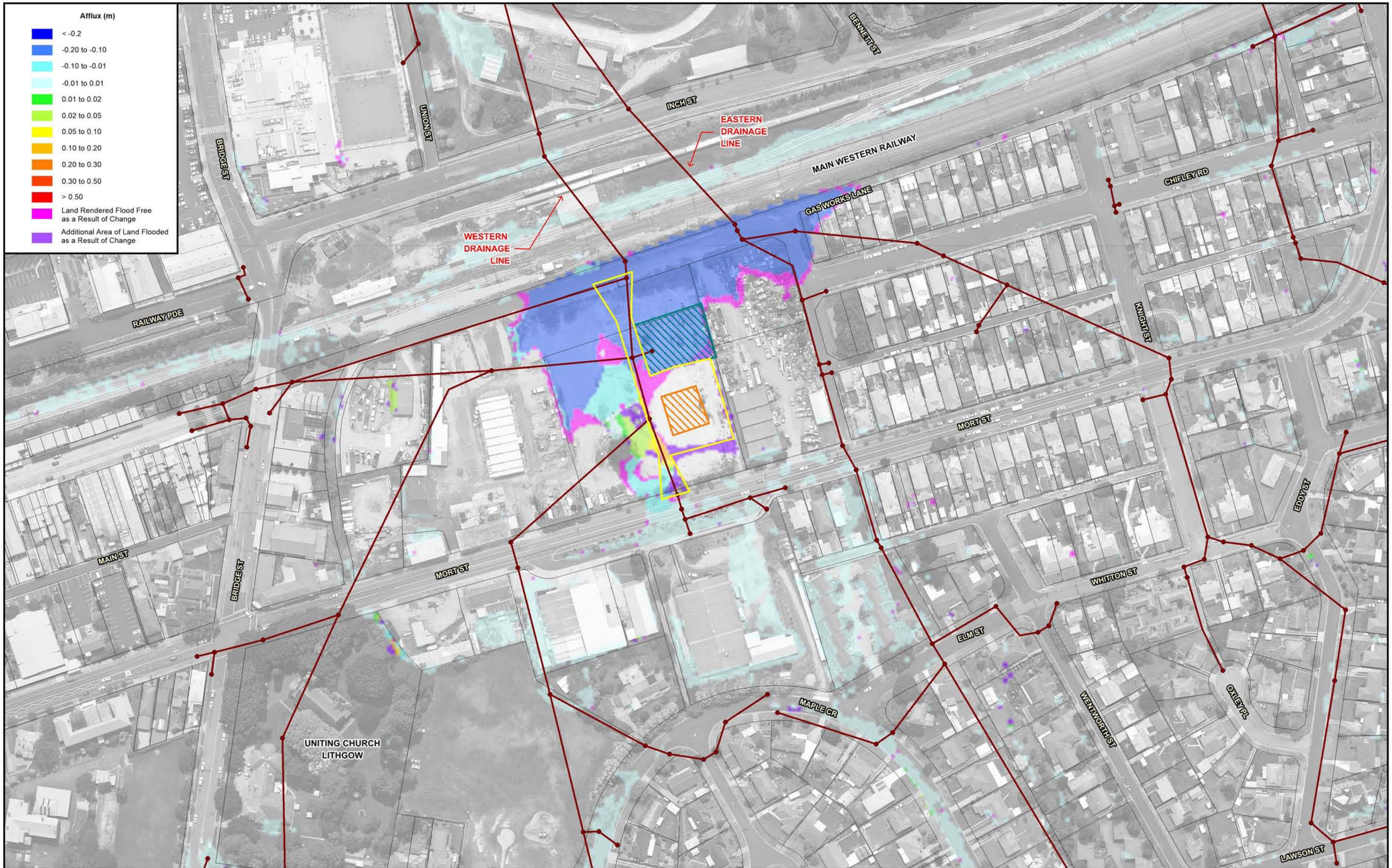
IMPACT OF NEW BUILDING AND ADJACENT HARDSTAND AREAS ON FLOOD BEHAVIOUR
10% AEP



140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 6

IMPACT OF NEW BUILDING AND ADJACENT HARDSTAND AREAS ON FLOOD BEHAVIOUR
1% AEP



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Scale: 1:2,000

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LEGEND

Extent of New Building

Extent of Excavated Area

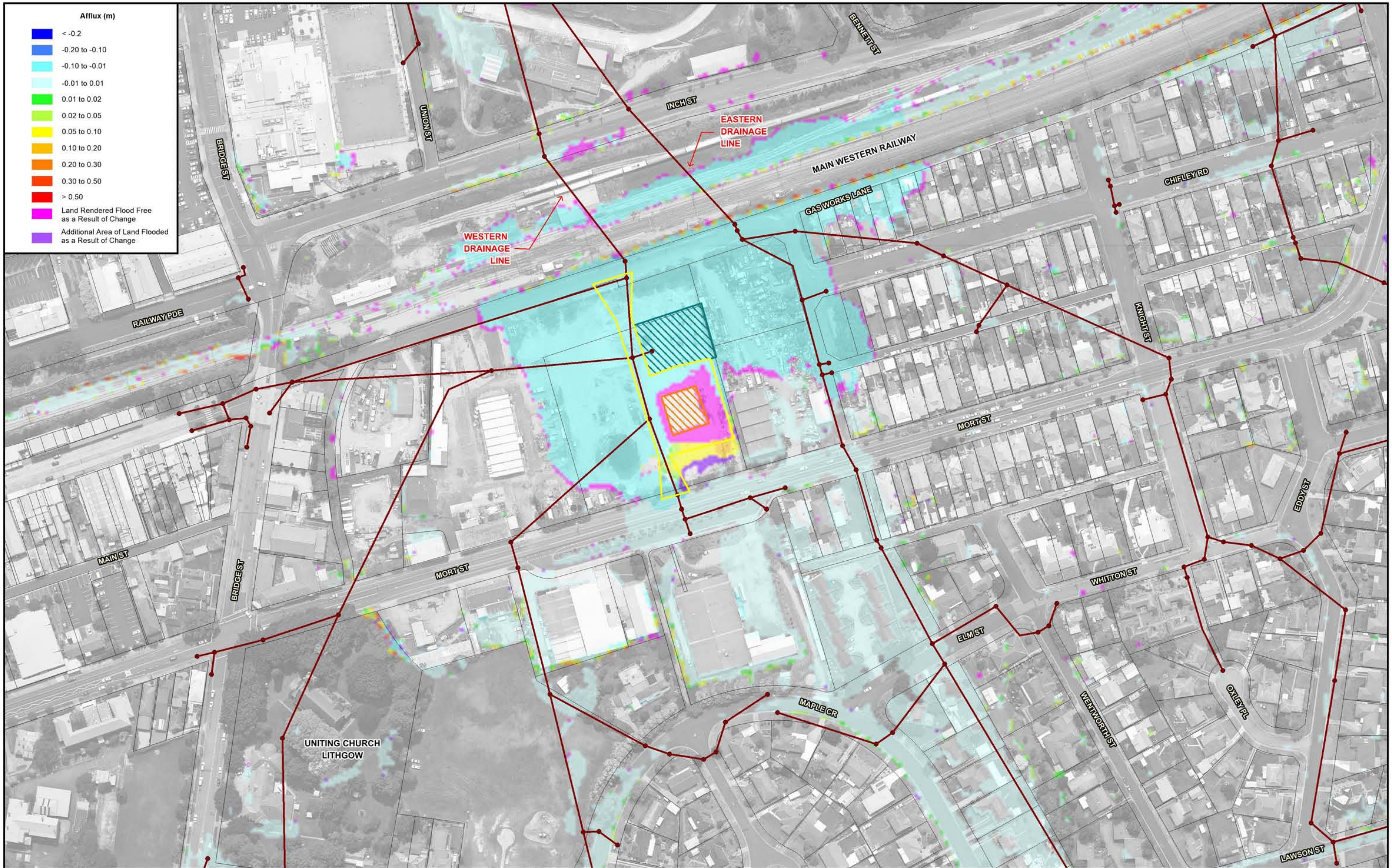
Stormwater Drainage System

Outline of Adjacent Hardstand Areas

140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 7

IMPACT OF NEW BUILDING AND ADJACENT HARDSTAND AREAS WITH ASSESS FLOOD MITIGATION MEASURE ON FLOOD BEHAVIOUR
10% AEP



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Scale: 1:2,000

LEGEND

Extent of New Building

Extent of Excavated Area

Stormwater Drainage System

Outline of Adjacent Hardstand Areas

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140 MORT STREET FLOOD IMPACT AND WATER CYCLE ASSESSMENT

Figure 8

IMPACT OF NEW BUILDING AND ADJACENT HARDSTAND AREAS WITH ASSESS FLOOD MITIGATION MEASURE ON FLOOD BEHAVIOUR

1% AEP

ANNEXURE A

PLATES SHOWING UNSEALED AREA WHERE NEW BUILDING AND ADJACENT HARDSTAND AREAS WOULD BE CONSTRUCTED

ANNEXURE B

DESIGN DRAWINGS