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Cardno
Shaping the Future

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PLANS AND DOCUMENTS
referred to in the ULDA
APPROVAL dated 30 / 8 / 2012

Attention: Mr Tony Blackshaw

Dear Sir

**PROJECT WATERS**
**CORNER OF WATER STREET AND BRUNSWICK STREET, FORTITUDE VALLEY**
**REVIEW OF LOCAL FLOODING ISSUES FOR DEVELOPMENT APPLICATION**

As requested, a review has been completed with respect to the impact of the Project Waters development on local flooding.

The Project Waters site is located within the Water Street catchment, a highly urbanised catchment with an inadequate stormwater drainage system. As a consequence of the inadequate existing drainage, significant overland flow occurs within Water Street, resulting in the flooding of properties fronting the street.

To allow for an assessment of flooding constraints and to allow a solution that provides for no worsening of flooding, Cardno has developed a 2D hydraulic model of the Water Street catchment in support of the RNA redevelopment further downstream. The previous modelling has been approved by the ULDA and has been accepted by Council. It therefore provides a good basis for the consideration of flooding issues.

The model was used as the basis of the current assessment. However, as the Project Waters site is located some distance upstream of the RNA development, the level of detail in the model is not as fine as that provided closer to the RNA site. Further analysis of the site will be required in support of subsequent applications.

The findings of the flood assessment are presented below.

- **Development Levels**

  Prior to the area being made part of an Urban Development Area, Council treated the Water Street catchment as a local catchment. As a consequence, minimum development levels are, with the exception of basement car parks, based on the flood levels produced by the 50 year flood event. For basement car parks, Building Code of Australia requirements necessitate the consideration of the 100 year flood level. The site is not affected by flooding from the Brisbane River.

The attached plans show the flood levels and depths calculated in the vicinity of the site. With reference to the plans, the 50 year level applicable to Phase 1 varies from 10.8 mAHD at Baxter Street to approximately 12.2 mAHD at the boundary of Phase 1 and Phase 2. The 50 year flood level applicable to Phase 2 of the development varies from 12.2 mAHD to 15.2 mAHD at Brunswick Street.

The predicted depth of flooding at the site is generally shallow, increasing to a depth of the order of 0.5 metres or more at the boundary of Water Street.

When setting development levels, the ULDA typically defers to the standards adopted by Council. Prior to the occurrence of the 2011 flood, minimum development levels for a site were set according to Part A of Chapter 1 of the Brisbane City Council *Subdivision and Development Guidelines* (February 2008, hereafter referred to as the guidelines).

Following the flooding that occurred in January 2011, Brisbane City Council invoked the *Temporary Local Planning Instrument 01/11- Brisbane Interim Flood Response.* Although nominally relating to residential development, the planning instrument (TLPI) also contains provisions for commercial development.

In general, the TLPI only results in the adoption of flood levels higher than those applicable under the guidelines in areas affected by Brisbane River flooding. However, the TLPI does adopt a number of increased freeboard requirements compared to the guidelines depending on the land use being considered.

It is important to note that the TLPI is not applicable to the site as it only relates to sites that are affected by river or waterway flooding. Accordingly, the 2008 guidelines can be used to set development levels for the site. However, it is uncertain whether the flood immunity requirements nominated in the guidelines will be modified following the completion of the current Flood Commission of Inquiry.

Given the evidence presented to the Flood Commission to date, it is anticipated that the flood immunity requirements currently nominated in the TLPI will be adopted throughout the city. For this reason, for planning purposes the flood immunity requirements nominated in the TLPI have been considered for the Project Waters site.

With reference to the development plan prepared to date, the development levels applicable to the site are detailed in Table 1. The levels nominated in the table reflect the highest flood level applicable to each stage of development. It may be possible to adopt lower levels for particular areas if they are located away from the point at which the highest flood level occurs.

It is understood that electrical and communications equipment for the buildings will not be located in basement areas. Recent advice received from Energex has indicated a preference for these areas to be located at the ground floor or higher. In the case of residential areas, the TLPI requires that essential electrical equipment be set at the level of habitable rooms. For the commercial building, a level of 15.7 mAHD would be applicable for essential electrical services.

Finally, wherever possible it would be strongly recommended that the entry to basement car parking areas not be directly off Water Street. The current design achieves this by providing basement access off the extension of Diggles Close.

**Table 1 Development Levels**

| Case | Requirement | Minimum Level (mAHD) |
|---|---|---|
| ***Residential Areas*** | | |
| Habitable Areas | 50 Year Level + 0.5 m | Stage 1: 12.1 mAHD<br>Stage 2: 12.5 mAHD<br>Stage 3: 12.3 mAHD<br>Stage 5: 13.8 mAHD<br>Stage 6: 15.7 mAHD |
| Non-Habitable Areas (foyers etc) | 50 Year Level + 0.3 m | Stage 1: 11.9 mAHD<br>Stage 2: 12.3 mAHD<br>Stage 3: 12.1 mAHD<br>Stage 5: 13.6 mAHD<br>Stage 6: 15.5 mAHD |
| Undercroft and open car parking | 50 Year Level | Stage 1: 11.6 mAHD<br>Stage 2: 12.0 mAHD<br>Stage 3: 11.8 mAHD<br>Stage 5: 13.3 mAHD<br>Stage 6: 15.2 mAHD |
| Entry to basement car parks | Higher of 100 Year Level and 50 Year Level + 0.3 m | Stage 1: 11.9 mAHD<br>Stage 2: 12.3 mAHD<br>Stage 3: 12.1 mAHD<br>Stage 5: 13.6 mAHD<br>Stage 6: 15.5 mAHD |
| ***Commercial Areas*** | | |
| Building Floor Level | 50 Year Level | Stage 4: 15.2 mAHD |
| Undercroft and open car parking | 50 Year Level | Stage 4: 15.2 mAHD |
| Entry to basement car parks | 100 Year Level | Stage 4: 15.3 mAHD |

**Note: Levels subject to review with detailed modelling.**

- **Review of relief drainage works proposed by Council**

In 1998, Council completed modelling of the Water Street catchment to determine flood levels and the requirement for flood mitigation works. As Council typically has limited funds for flood relief work, the emphasis of relief drainage works is on minimising the potential for flooding in lesser events. The reduction in water level achieved for larger floods is typically limited.

In the case of the site, the report completed in relation to the modelling indicated that the road reserve width and the location of existing services precluded the completion of augmentation works. The report recommended the removal of the existing stone-lined drain and its replacement with a 2.1 m diameter pipe from Brunswick Street to Baxter Street. The proposed location of the pipe is shown on the attached plan.

The modelling undertaken by Council indicated that the proposed relief drainage works would provide some benefit with respect to the 10 year flood event, providing 10 year flood immunity to an additional seven properties. However, the benefit obtained for larger events (specifically the 50 year event used to define development levels) was found to be limited.

- **Initial assessment of development impacts**

To assess the potential impact of development, the current model was modified to more accurately reflect the anticipated blockage to flow afforded by the existing buildings. The model

was then rerun to provide a revised base case for the consideration of development impacts (as noted above, detailed modelling of the site will be required for future applications).

The updated base case was then revised to reflect filling of the site to the limits of the buildings shown on the development plan.

The predicted increase in flood level for the 50 year event produced by development of the site is shown on the attached plan. With reference to the plan, the more accurate modelling of the existing buildings will allow Phase 2 of the development to proceed with relatively small impact.

The filling of the site associated with Phase 1 of the development is predicted to produce a relatively localised increase in level of up to about 100 mm in Water Street and the surrounding area.

Given that the depth of flooding in Water Street is already in excess of the desirable limit and that properties are inundated, it will be necessary to complete sufficient ameliorative works to reduce the predicted impact of development to the order of 10 mm or less to achieve a no worsening outcome.

- **Development potential of site and anticipated drainage works**

  Based on the review presented above, it is considered that the site can be developed as planned. While it will be necessary to set levels that provide for immunity against flooding, it is considered that the proposed form of the development (with internal road) is such that it will achieve an acceptable design outcome.

  As noted above, filling of the site would, in isolation, cause an unacceptable flood level impact. However, a number of flood mitigation options are available for the development. In particular, the 1.6 ML detention storage proposed in the basement of the Stage 1 building will offset to a significant degree the impact of filling the site.

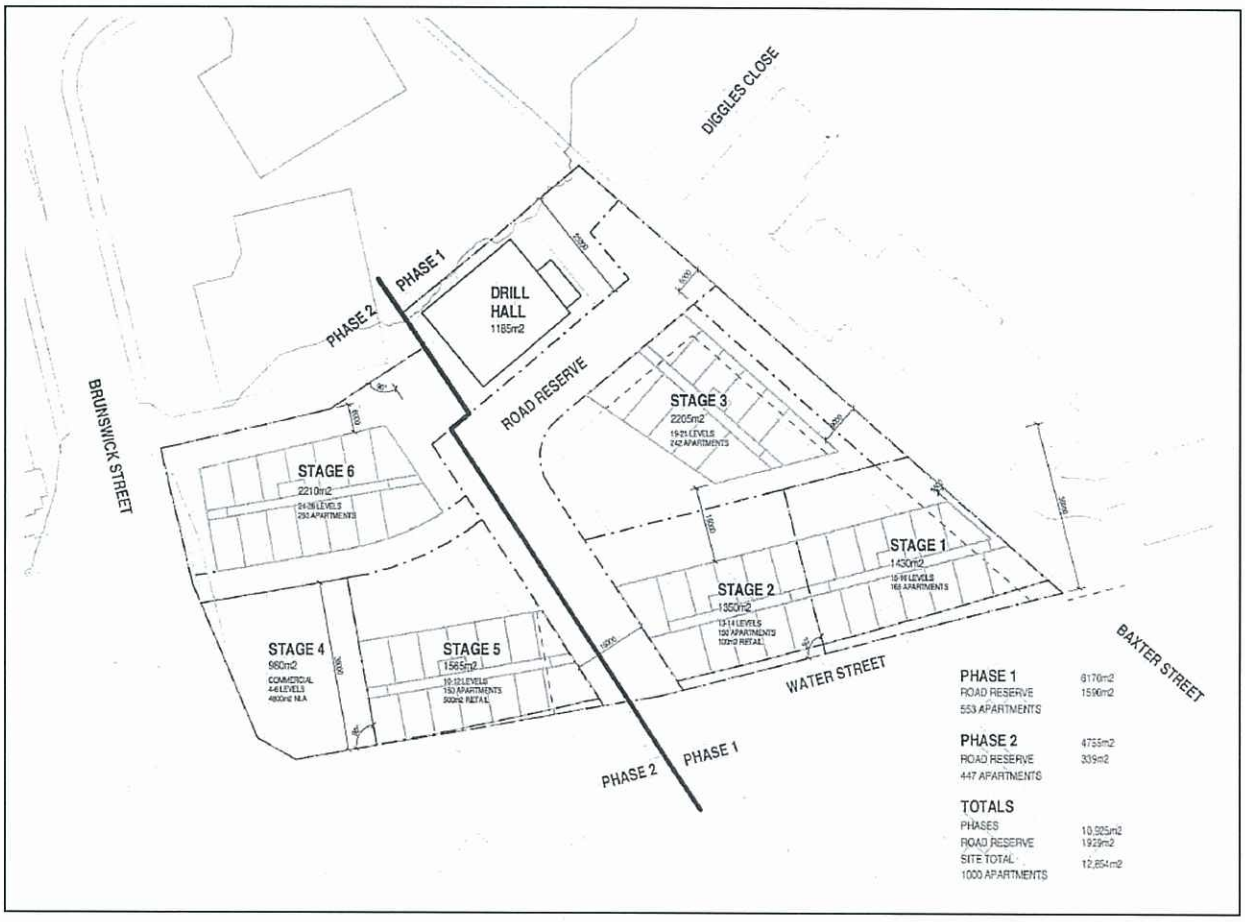
  It is considered that detailed modelling will confirm that the storage, together with drainage and other works on the footpath of Water Street, will achieve a satisfactory outcome and result in no worsening of flood levels.

We trust that this advice is of assistance. Should you have any queries in relation to the advice, please do not hesitate to contact us.

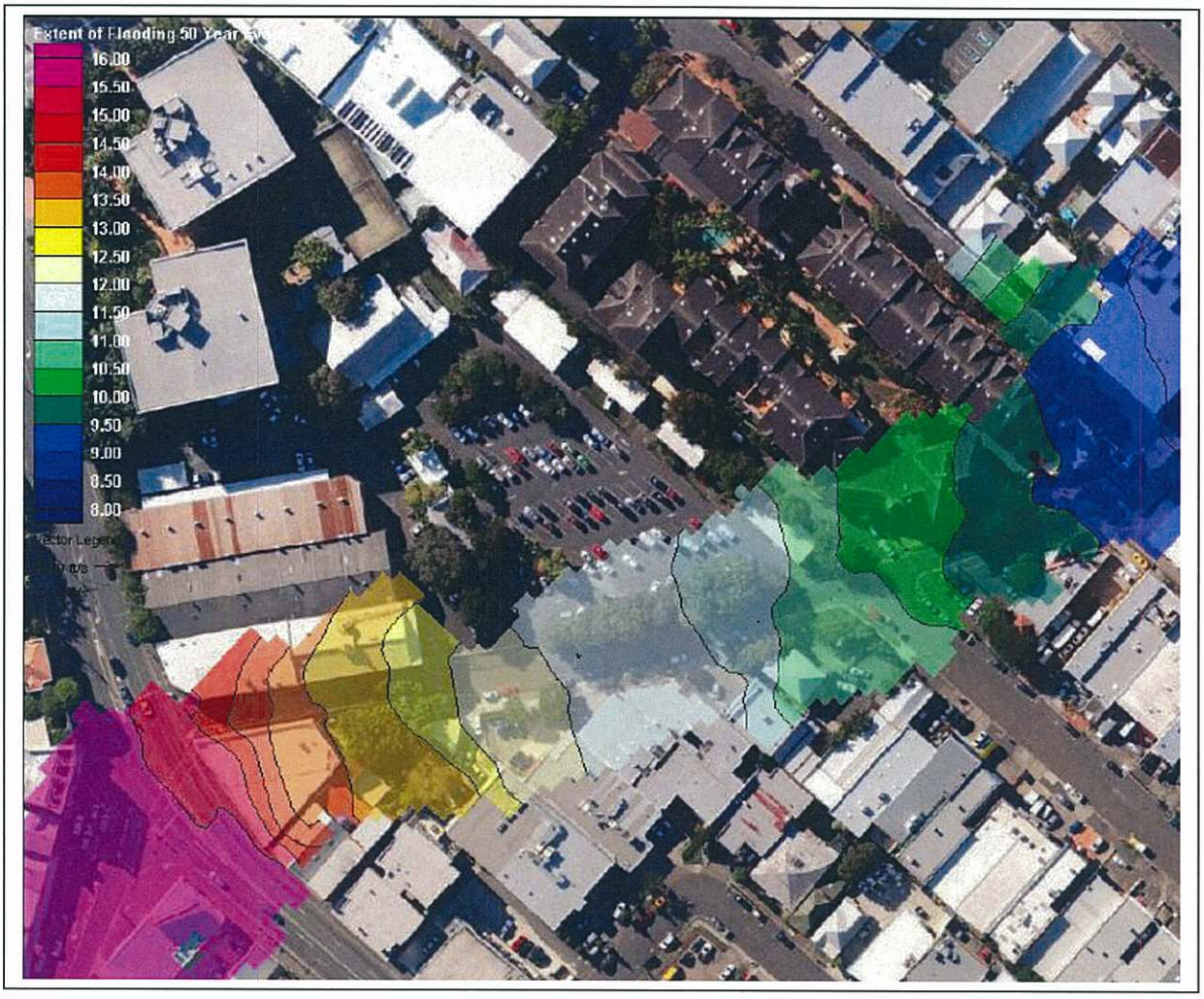
Yours faithfully

*Martin Giles*
*Manager, Water Resources & Coastal*
*for* **Cardno**

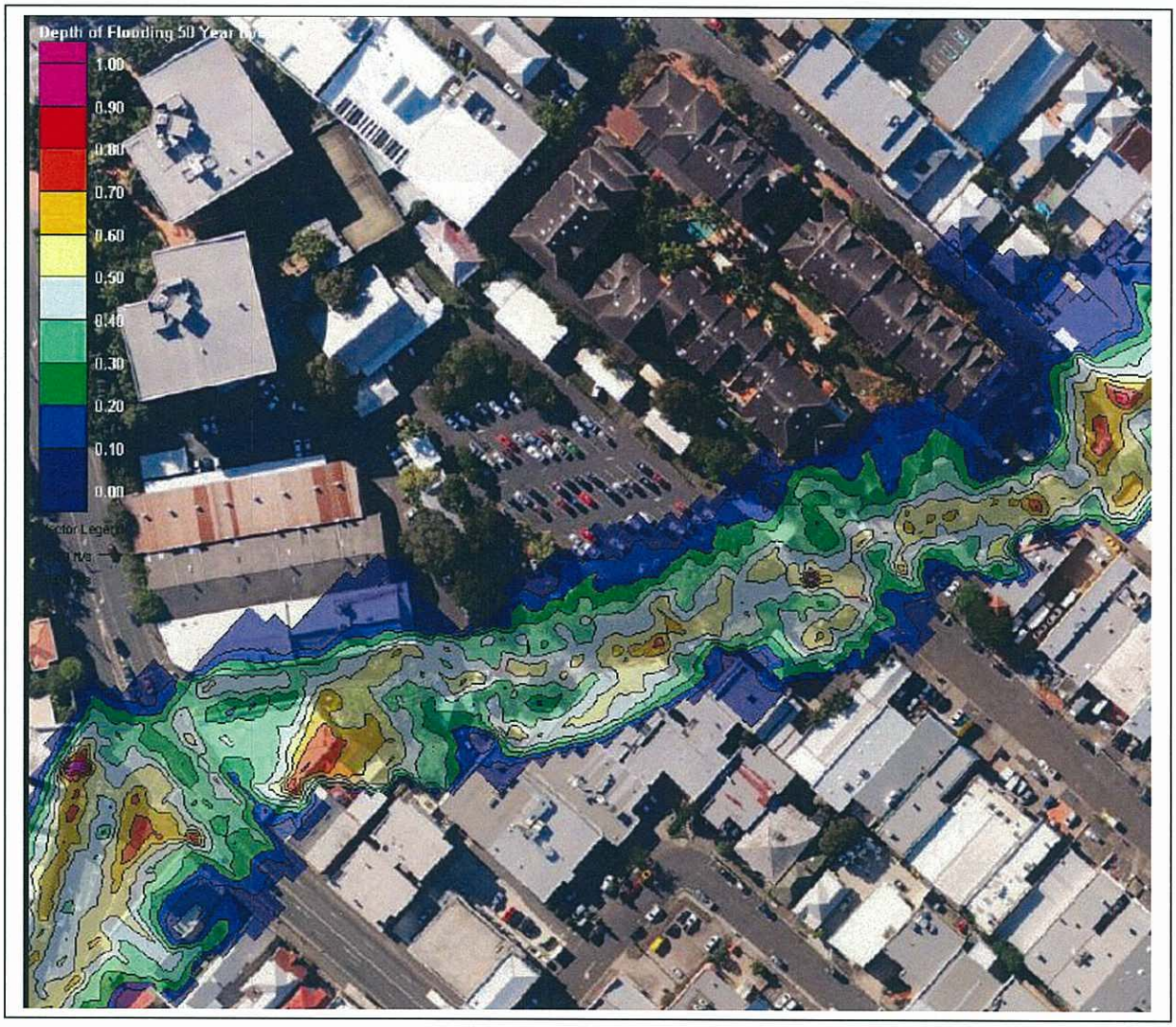
Enc: Flood Level Plan, 50 Year Event
Flood Depth Plan, 50 Year Event
Proposed Council relief drainage works
Impact of development of the site (no mitigation works)



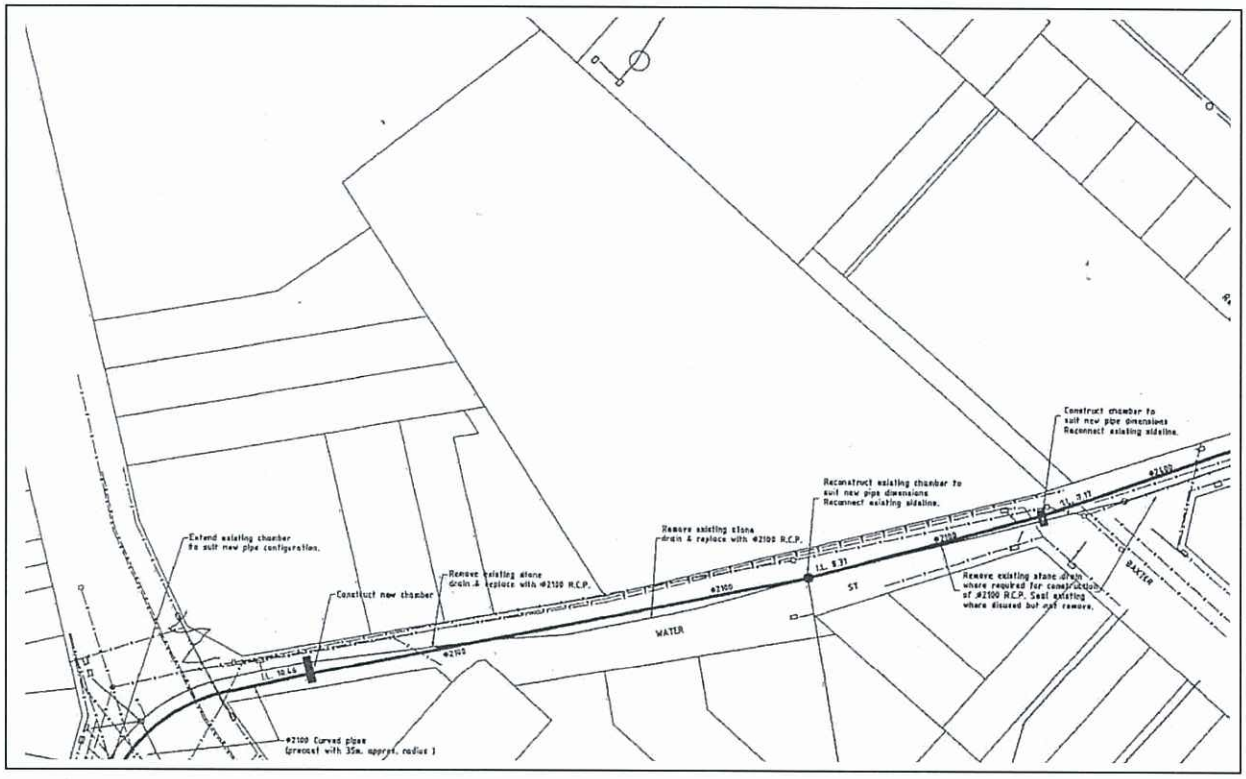

## Initial Development Layout



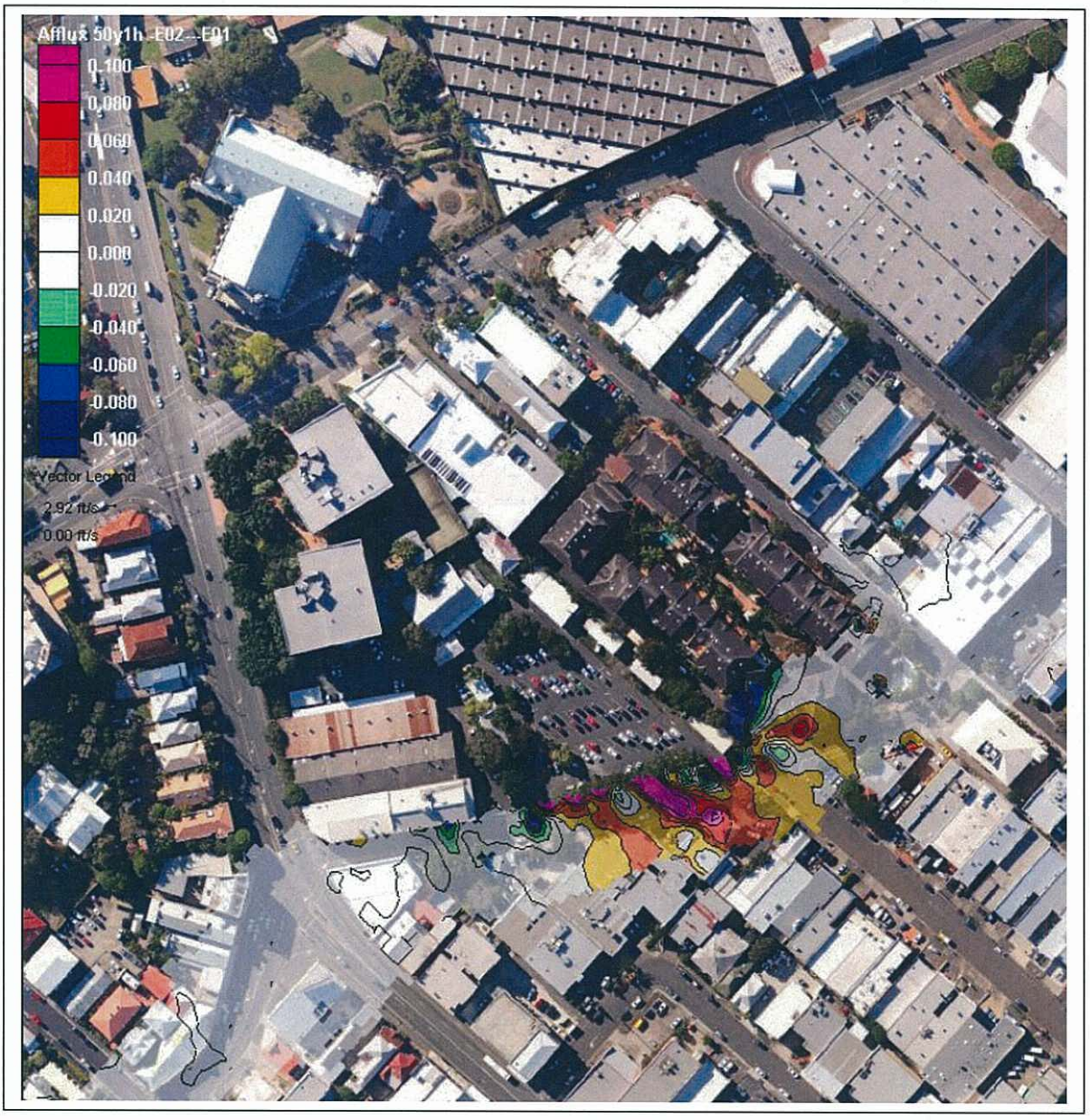

**Peak Flood Levels, 50 Year Event**




**Peak Flood Depths, 50 Year Event**




**Relief Drainage Works Proposed by Council**




**Predicted Flood Level Impacts Due to Development (Without Mitigation Measures in Place)**