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7th September 2018

Health Infrastructure
Level 14, 77 Pacific Highway,
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For the attention of: - Edward Doherty

Dear Edward,

Campbelltown Campus Redevelopment
Flood Mitigation

Introduction

This letter supports a Review of Environmental Factors submitted for the Enabling Works required for the redevelopment of the Campbelltown Hospital Campus site (Lot 6 in DP 1058047) at Therry Road, Campbelltown, NSW 2560.

Figure 1: Site Location Plan (Source: Six Maps NSW 2018)

Figure 1 shows the location of the site and associated lot numbers.

Background

Campbelltown City Council adopted a Flood Mitigation Scheme in 1984 which has been jointly funded by the State and Federal Governments and Council on an ongoing basis since that time. Construction of works as part of this scheme has occurred for the past 30 years. In 2014, Council endorsed the final draft of the Bow Bowing Bunbury Curran (BBBC) Creek Catchment Flood Studies, which comprises twelve separate sub catchment flood studies.

The site is part of the Birunji Creek catchment and immediately to the west of the site is a catchment detention basin. This catchment is part of the greater Georges River catchment, extending from its mouth at Botany Bay to upper river reaches near Appin and Royal National Forest.

Figure 2 shows the Campbelltown Local Environmental Plan in relation to the site which is labelled SP2 for 'Infrastructure'.

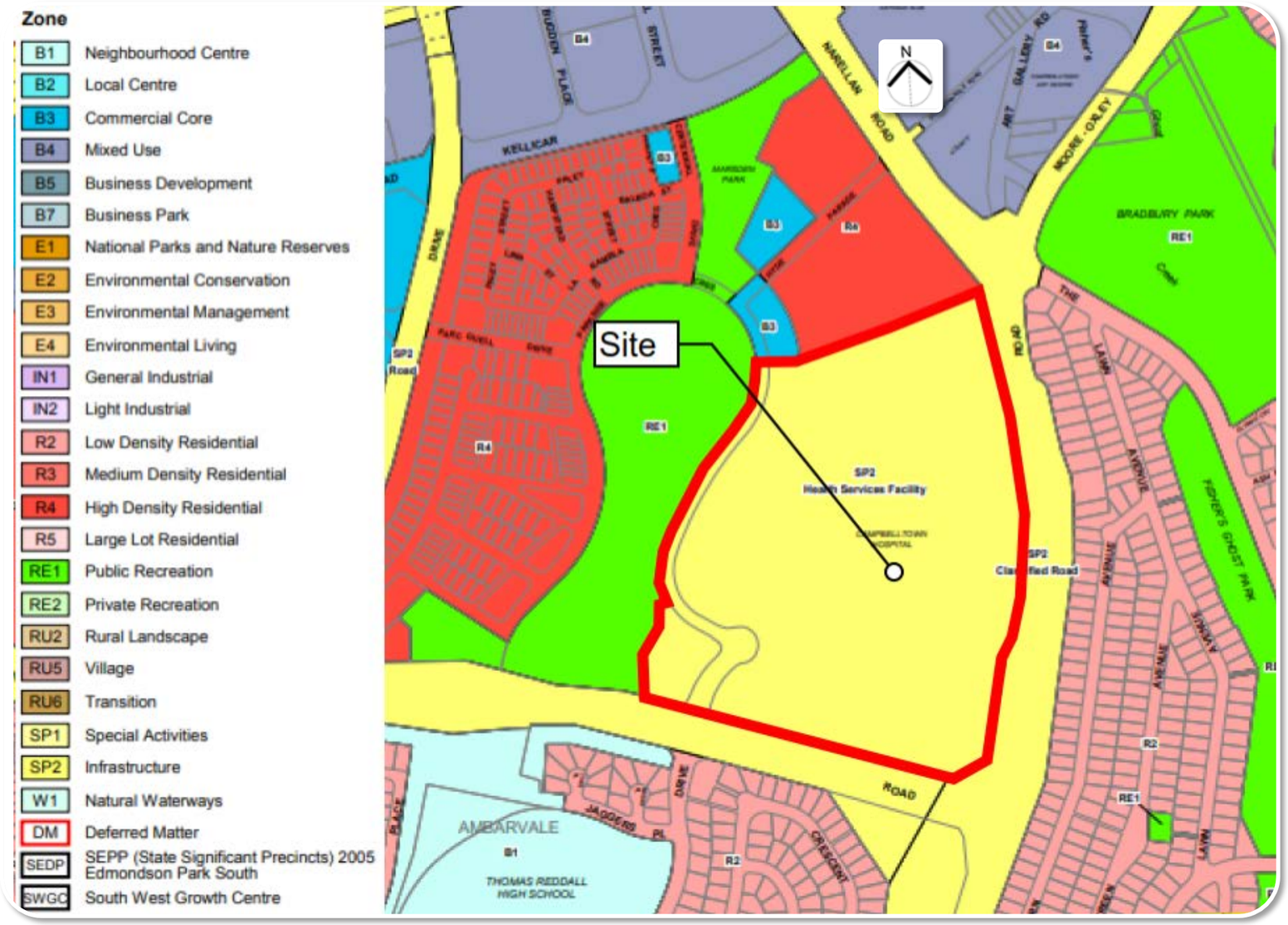

Figure 2: Extract from Campbelltown Local Environment Plan 2015

The development can be considered appropriate for the site with regards to the Local Environmental Plan, the site is not currently utilised as flood storage/detention within the catchment and there is no localised flooding.

Existing Flood Maps

The flood model results show no significant flood affectation for these facilities in any probability events, with the exception of the PMF.

In 2018 Molino Stewart, on behalf of Campbeltown City Council, issued the Bow Bowing Bunbury Curran Creek Strategic Floodplain Risk Management Study and Plan. The analysed area comprehend the Campbelltown Locality, Ingleburn Locality and Remainder Bow Bowing Bunbury Curran Creek projects. The study assess and address flood risk to people and assets within the study area, which comprises twelve separate sub catchment flood studies.

Figure 3 presents an extract from the Risk to Critical Infrastructure indicating flood risk on the vicinity of the site. As per the mentioned study*, the flood model results show no significant flood affectation for these facilities in any probability events, with the exception of the PMF*.

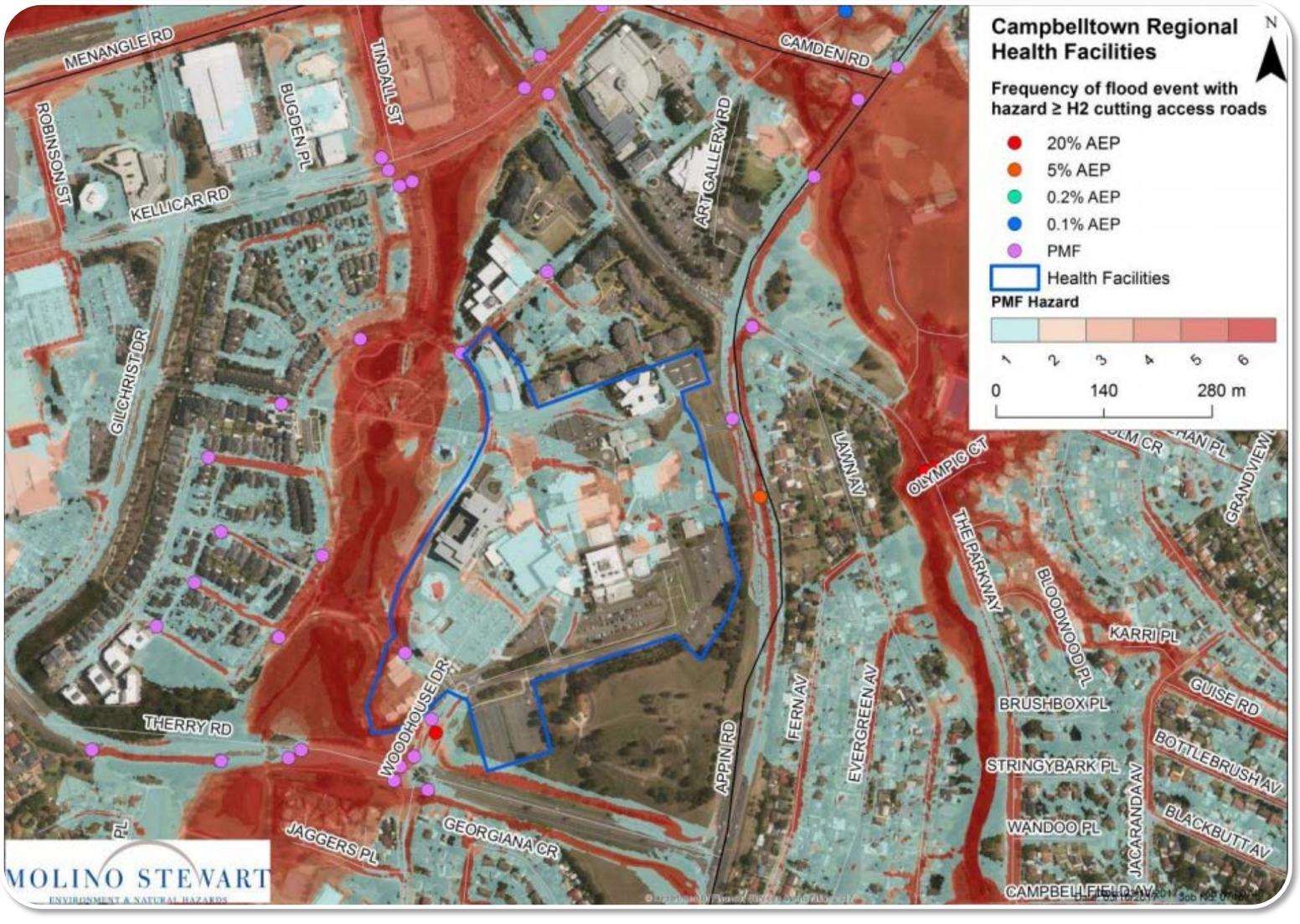

Figure 3: Extract from Bow Bowing Bunbury Curran Creek Strategic Floodplain Risk Management Study and Plan

Climate Change Consideration

Increased Rainfall Intensity

Office of Environment and Heritage (OEH) recommends that its guideline, Practical Considerations of Climate Change (DECC, 2007), be used as the basis for examining climate change induced increases in rainfall intensities in projects undertaken under the State Floodplain Management Program, according to procedures set out in NSW Government's Floodplain Development Manual (NSWG, 2005).

The principal issue regarding climate change is the potential increase in peak flood levels adjacent to the proposed development and how this will impact on the available freeboard to finished floor levels.

The guideline recommends applying sensitivity analysis based on increases in rainfall intensities ranging between 10 and 30 percent. On current projections, the increase in rainfalls within the service life of developments or flood management measures is likely to be around 10 percent, with the higher value of 30 percent representing an upper limit. Under present day climatic conditions, increasing the 1% Average Exceedance Probability (AEP) design rainfall intensities by 10 percent would produce a 0.5% AEP flood; and increasing those rainfalls by 30 per cent would produce a 0.2% AEP event.

The site is not affected by the PMF event which is greater than the 1% AEP event + 30% for climate change (or 0.2% AEP event). It is therefore reasonable to state that the site will not be affected by increased flooding generated by climate change.

Sea Level Rise

Climate change is expected to have adverse impacts upon sea levels and rainfall intensities, both of which may have significant influence on flood behaviour at specific locations.

The United Nation (UN) Intergovernmental Panel on Climate Change (IPCC) 2007;

'trends indicate that average global sea level rise (ignoring ice flow melt) may be between 0.18m to 0.59m by between 2090 and 2100. Add to this the ice flow melt uncertainty of up to 0.2m gives an adjusted global range of 0.18 to 0.79m. IPCC 2007 (0.1m) and recent CSIRO modelling (up to 0.12m) by McInnes et al indicate that mean sea level along the NSW coast is expected to rise by more than the global mean. Combining the relevant global and local information indicates that sea level rise on the NSW coast is expected to be in the range of 0.18 to 0.91m by between 2090 and 2100.'

– Floodplain Risk Management Guideline, NSW Government Department of Environment & Climate Change

The site is located approximately 24 km from the nearest coastline, therefore it is reasonable to state that sea level rise will not have an impact on the site.

Development Control Plan Conditions

Section 7.2 of the Campbelltown Local Environmental Plan 2015 states the following performance criteria with regards to flooding:

1) The objectives of this clause are as follows:
   a) to minimise the flood risk to life and property associated with the use of land,
   b) to allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change,
   c) to avoid significant adverse impacts on flood behaviour and the environment.
2) This clause applies to land at or below the flood planning level.
3) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:
   a) is compatible with the flood hazard of the land, and
   b) will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and
   c) incorporates appropriate measures to manage risk to life from flood, and
   d) will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and
   e) is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.
4) A word or expression used in this clause has the same meaning as it has in the Floodplain Development Manual (ISBN 0 7347 5476 0) published by the NSW Government in April 2005, unless it is otherwise defined in this clause.
5) In this clause:

   land at or below the flood planning level means land at or below the level of a 1:100 ARI (average recurrent interval) flood event plus 0.5 metre freeboard.

Conclusion

Based on information contained in Bow Bowing Bunbury Curran Creek Strategic Floodplain Risk Management Study and Plan (Molino Stewart 2018), the site is not subject to inundation due to backwater flooding from Birunji Creek in events up to and including the 1% AEP (100 ARI) rainfall event. In addition to mentioned study, Catchment Simulation Solution, with the support of Campbelltown City Council and Enstruct, has completed a flood study for the site.

Figure 1 shows the results of the TUFLOW MODEL simulation for the 1% AEP event with the incorporation of the existing drainage network in the hospital site. This figure reinforces what was previously established, that the site is not affected by backwater flooding from Birunji Creek. However, it also shows that the site is affected by flooding due to overland flow from the local catchment traversing the property during the 1% AEP event.

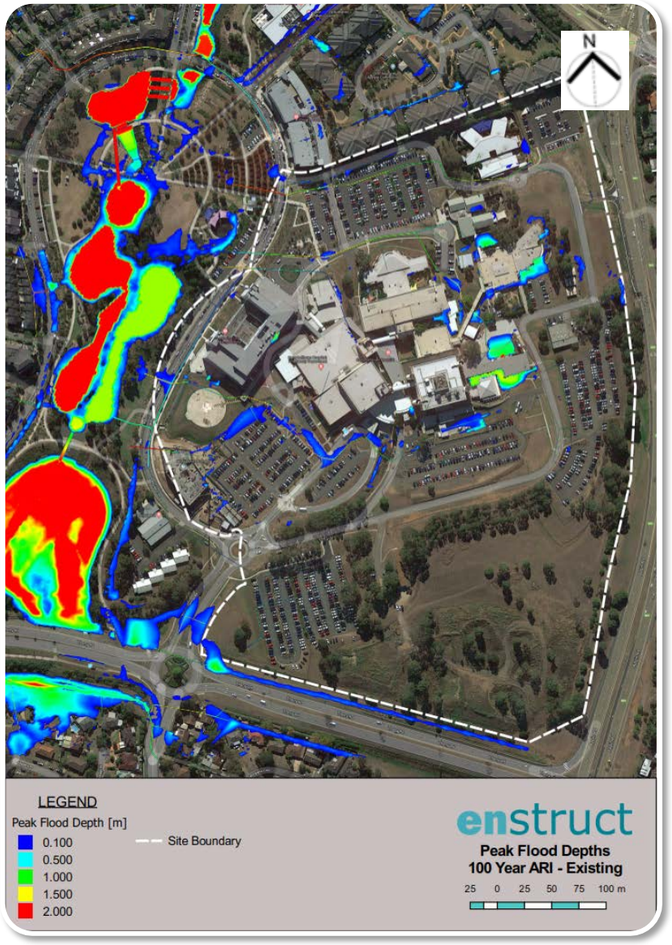

Figure 6: TUFLOW Modelling. Existing scenario 1% AEP.

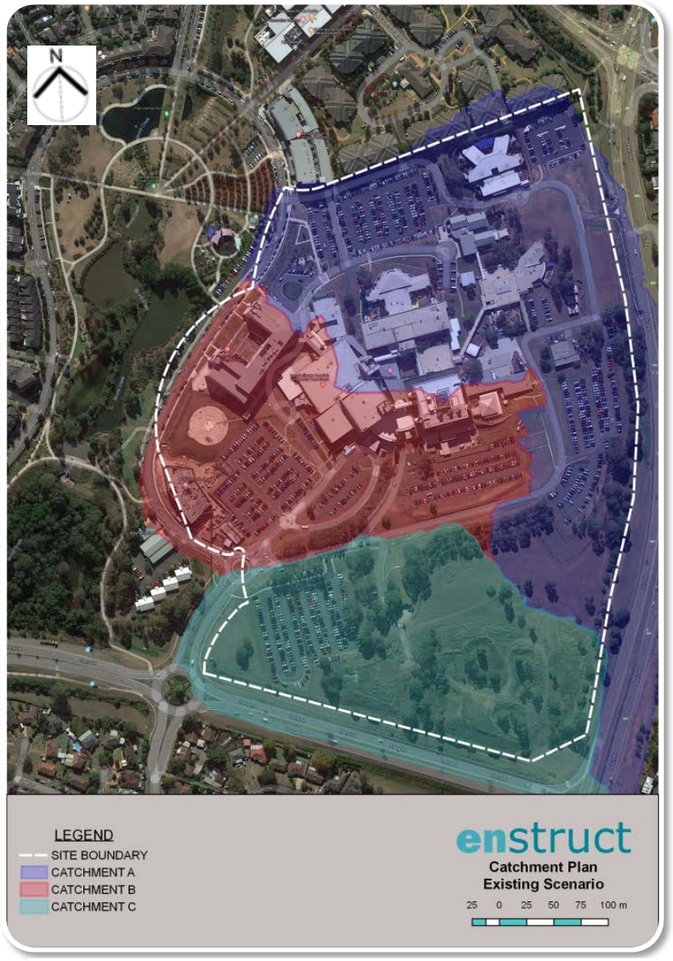

Figure 5: Existing catchment.

In regards to overland flow flooding, three mains catchment have been identified based on the natural topography and existing drainage networks (figure 5). The proposed strategy aims to mitigate flood risk within the site though various measures in each catchment as detailed in table 1.

Table 1: Proposed measures.

Zones	Catchment A	Catchment B	Catchment C
	Refer to Figure 7 for details	Refer to Figure 7 for details	Refer to Figure 7 for details
Actions	Incorporation of a 200 m^3 detention basin, 50 m^3 detention tank & upgrade of pipelines.	Redistribution of catchment & upgrade of pipelines.	Redistribution of catchment, incorporation of an 800 m^3 detention basin & upgrade of pipelines.

A TUFLOW model will be undertaken to verify the efficiency of the proposed measures by comparing pre and post-development conditions.

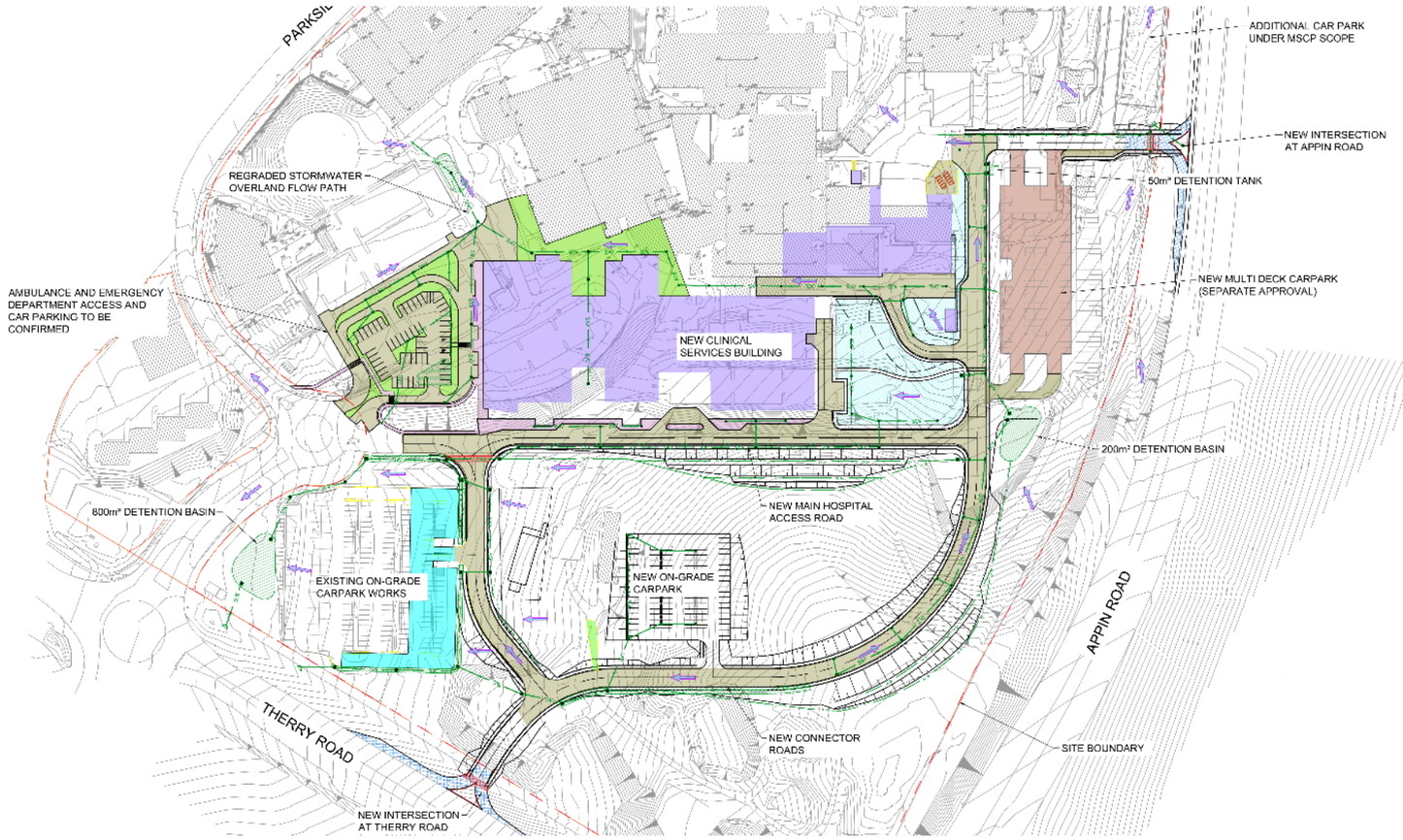

Figure 7: Site Plan showing proposed measures

This plan addresses the management of stormwater for the entire redevelopment, part of which has been addressed in an Environmental Impact Statement as part of a State Significant Development Application.

Yours Sincerely,

for
enstruct group pty ltd

Philip Richmond
Associate