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21 Feb 2023

Our Ref: A20442-C1/nh

Liverpool City Council
33 Moore Street
Liverpool, NSW 2170

Attn: Brianna Van Zyl

Dear Madam,

Re: PROPOSED HEALTH CARE FACILITY
61-71 GOULBURN STREET, LIVERPOOL
FLOOD IMPACT ASSESMENT

PLANNING PROPOSAL REF: PP-2021-7276

Pursuant to condition 1.g outlined in the At Gateway Determination (RZ-62021) received by Liverpool Council on the 7th December 2022, a flood impact assessment has been conducted regarding the proposed health care facility located on 61- 71 Goulburn Street, Liverpool.

Specifically, the flood impact assessment will address the following flooding issues:

- The proposals consistency with Ministerial Direction 4.1: Flooding
- Relevant findings and recommendations of the 2022 NSW Flood Inquiry
- Assessment of evacuation routes

Ministerial Direction 4.1: Flooding

The Ministerial Direction 4.1: Flooding applies to all planning proposals located in "flood prone land". The objective of the direction to ensure such developments are consistent with the principles of NSW Government's Flood Prone Land Policy:

4.1 Flooding

Objectives

The objectives of this direction are to:

(a) ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005, and

(b) ensure that the provisions of an LEP that apply to flood prone land are commensurate with flood behaviour and includes consideration of the potential flood impacts both on and off the subject land.

Application

This direction applies to all relevant planning authorities that are responsible for flood prone land when preparing a planning proposal that creates, removes or alters a zone or a provision that affects flood prone land.

Figure 1- Direction objectives & application [Ministerial Direction 4.1: Flooding]

It should be noted that the proposed development is not categorised as flood prone land on the 2008 Liverpool LEP Flood Planning Map. See figure 2 below.

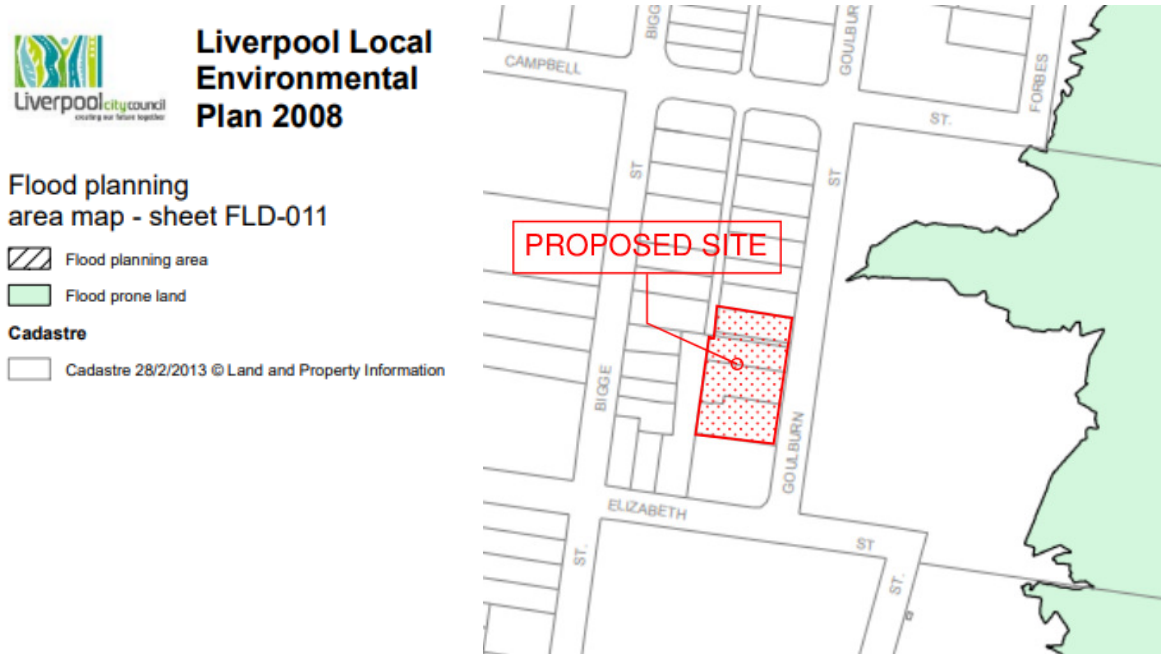

Figure 2- Flood Planning Map [Liverpool LEP 2008]

The proposed development is not affected by the George's River, Cabramatta Creek or Anzac Creek mainstream flooding and hence is not located on flood prone land. As such, it is deemed that the requirements outlined in Ministerial Direction 4.1: Flooding are not applicable to the proposal.

The proposal is however subject to overland flows in the Liverpool CBD floodplain due to existing undersized stormwater systems. Please refer to the below map for the extent of overland flooding on site.

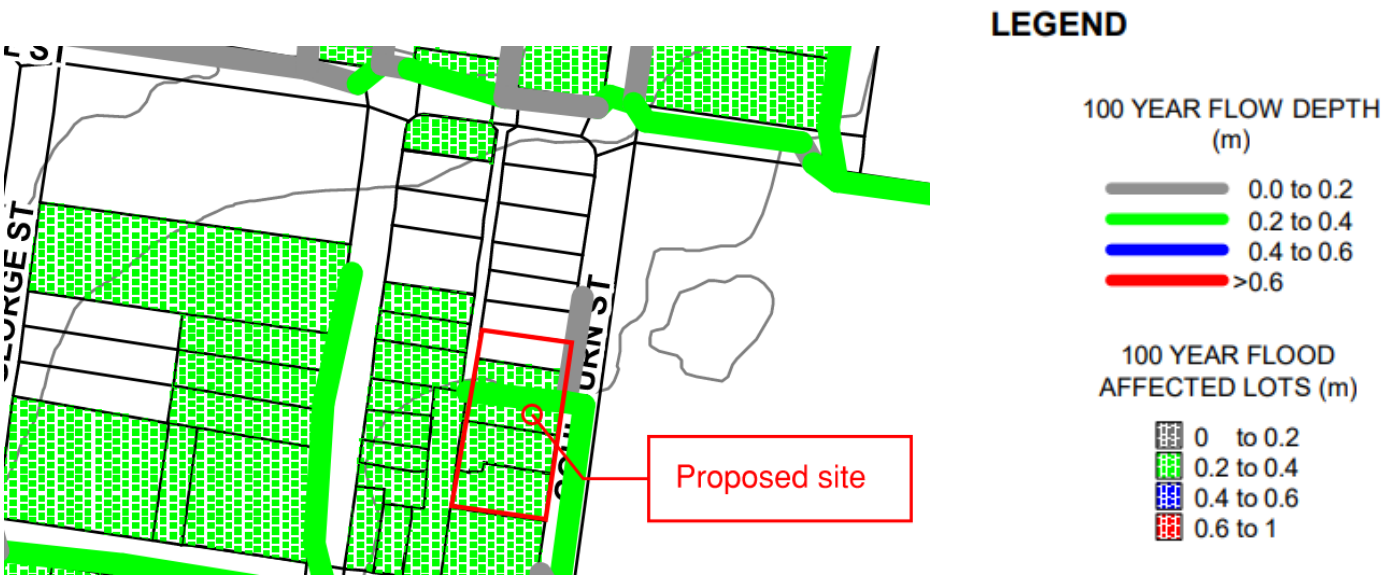

Figure 3- Extent of 1 in 100 year overland flow [Liverpool CBD Floodplain Management Study 2007]

As a result it is believed that the flooding requirements of the proposal should adhere to the Liverpool Council CBD Floodplain Management Study guidelines and LCC DCP 2008 flood controls rather than the Ministerial Direction 4.1: Flooding guidelines, whilst still keeping in mind the principles and intent of the Ministerial Direction, to prevent inundation of the proposed development during significant storms.

Liverpool Council CBD Floodplain Management Study recommendations included the implementation of a flood planning level (plus freeboard) and evacuation measures of which will be examined later in this report. However since the site is at risk from inundation from overland flows and not mainstream flooding, it is proposed that any flood planning level should not be dictated by a separate site specific flooding assessment (refer to “20442 Liverpool Hospital WSUD and Stormwater” report). As evident in the aforementioned report, the appropriate freeboard of habitable levels to the calculated flood planning level has been achieved.

Flooding controls for overland flows were ascertained from Liverpool Council, based off the development's land use category as a critical facility. Refer to the Figure 3 and the below summary of flood controls applicable to this development:

Floor level to be no lower than the PMF unless justified by a site specific assessment
All structures to have flood compatible building components below the PMF level
Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a PMF
The flood impact of the development to be considered to ensure that the development will not increase flood affection elsewhere having regard to changes in flood levels and velocities caused by alteration of conveyance of flood water
Basement car parking shall be protected from inundation by the 1% AEP flood
Evacuation requirements of the development are to be considered up to the PMF level
Applicant to demonstrate that are is available to store goods above the 1% AEP flood level plus 500mm freeboard
No storage of materials below the design level which may cause pollution or be potentially hazardous during any flood
Fencing to be constructed in a manner that does not obstruct the flow of floodwaters so as to have an adverse impact on flooding
Fencing shall be constructed to withstand the forces of floodwaters

Table 1- Relevant flood controls for critical use developments affected by overland flooding [LCC DCP 2008]

Table 5 Local Overland Flooding

Flood Risk Category	Land Use Risk Category	Planning Controls							
		Floor Level	Building Components	Structural Soundness	Flood Effects	Car Parking & Driveway Access	Evacuation	Management & Design	Fencing
Local Overland Flood Risk	Critical Uses & Facilities	13	4	5	3	4, 7, 8	7	3, 5	2, 4
	Sensitive Uses & Facilities	13	4	5	3	4, 7, 8	7	3, 5	2, 4
	Subdivision				3		5	1	2, 4
	Residential	3, 5	1	6	3	4, 7, 8	5		2, 4
	Commercial & Industrial	10	1	6	3	4, 7, 8	5	3, 5	2, 4
	Tourist Related Development	3, 5	1	6	3	4, 7, 8	5	3, 5	2, 4
	Recreation & Non-Urban	3, 5	1	6	3	4, 7, 8	5	3, 5	2, 4
	Concessional Development	14	1	6	3	4, 7, 8	5	3, 5	2, 4

Key:

	Not Relevant
1, 2, 3	Control reference number relevant to the particular planning consideration.

Figure 4 – Planning Controls for Local Overland Flow affected developments [LCC DCP 2008]

A freeboard of 300mm to the top water level set at the overland flow path has been adopted in lieu of the PMF (which is not applicable in this instance, given that the site is affected by overland flows and not mainstream flooding). This appears to be consistent with LCC DCP and engineering guidelines.

HEC-RAS modelling of the post developed site indicates that overland flows are contained within a stormwater easement located on the eastern side of the site. Please refer to the below drawing for the extent of overland flow on the proposed site. Retaining walls are proposed within the stormwater easement set at a minimum of 300mm above the top water surface level, providing effective freeboard to the finished floor level of the health care facility (set at FFL 11.90). The proposal adequately meets the Liverpool Council's freeboard requirements with the retaining walls within the swale providing effective freeboard to the habitable floors.

Refer to the report "20442 Liverpool Hospital WSUD and Stormwater report" for further details on the HECRAS modelling.

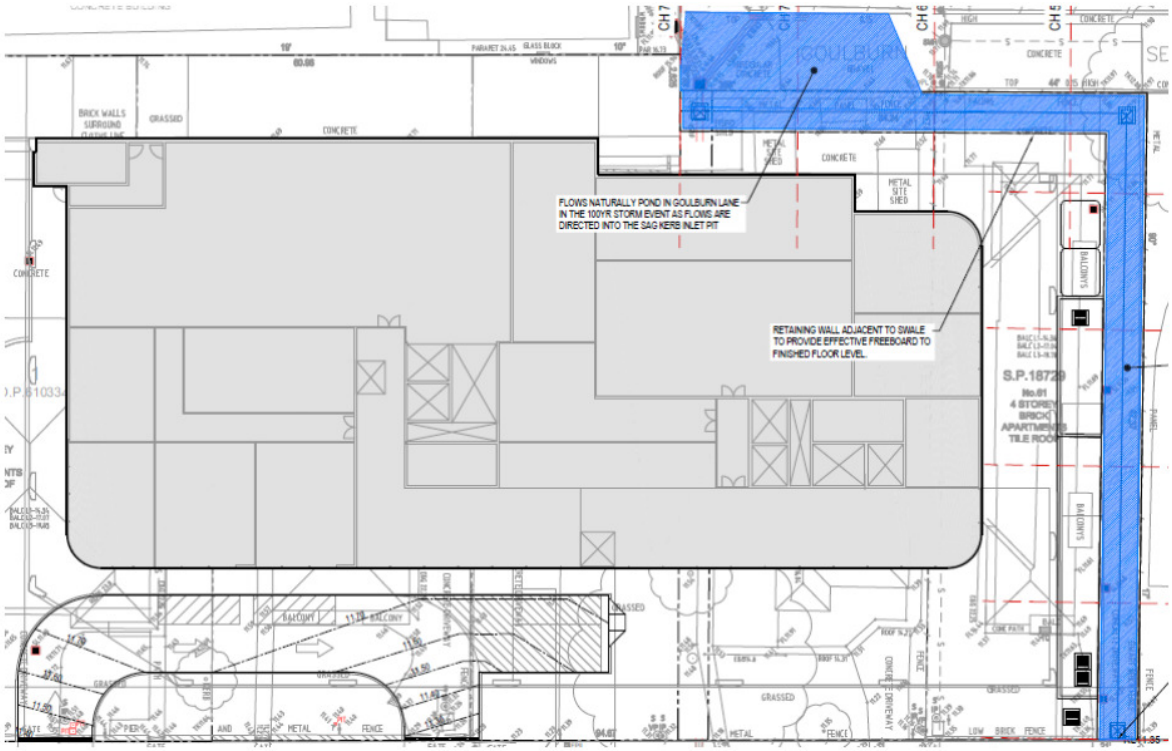

Figure 5- Post Developed flood extent plan

2022 NSW Flood Inquiry

The 2022 NSW Flood Inquiry is not directly relevant towards individual developments, rather its recommendations are generally directed to local government to help guide Council DCPs, flood maps, flood modelling and response to flood emergencies

The proposal has given adequate consideration to the relevant recommendations shown in the 2022 NSW Flood Inquiry. The below will showcase the recommendations applicable to the proposal and the corresponding responses.

18	**Risk-based Approach to Calculating Flood Planning Level** That, to take account of greater knowledge of climate change, Government reinforce its adoption of a risk-based approach to calculating the flood planning level for planning purposes and, through the NSWRA, immediately start a process of revising all flood planning level calculations in the state's high-risk catchments. Flood planning level re-determinations for all high-risk catchments should be completed within 3 years. These revised flood planning levels will need to be factored into all development applications (in-progress and new) in those high-risk catchments. The risk profile of high-risk catchments should be revisited at appropriate time intervals to check that levels are current. A review should take place if there has been a significant trigger event (i.e. changed rainfall, development) or at least every 5 years. As well as reviewing the flood planning level, this 5-yearly review should include reviewing any floodplain lease conditions and adjusting them as necessary in the light of better knowledge of climate change impacts. In working out a tolerable, risk-based flood planning level, consideration should be given to the PMF, 1%AEP, 0.02%AEP, existing development, approved but not yet constructed developments, and existing and approved but not yet constructed evacuation routes. In coordinating this flood planning level re-determination process, NSWRA should work closely with local councils, DPE, communities, state water authorities and state and national engineering and research organisations. In doing so, the NSWRA should also: • extend and then maintain the DPE state-wide flood database and associated visualisation interface. This database, which should link to LandiQ, would support: • monitoring of the flood warning and sensing environment • monitoring of trends in rainfall activity and impacts, including timing, cause, extent and intensity • tracking trends and identifying patterns in associated weather and climate signals that contribute to severe floods • evaluation of the cost and effectiveness of risk mitigation efforts, including land preparation, planning use and management, to enable a better understanding of what works • simulation of extreme rainfall events and resultant flooding • identification of 'at risk' river and catchment systems for flash flooding • rapid and effective deployment of resources during a flash flood event • act as the main coordination point for all NSW hydrological modelling, working with local government, other state agencies, universities, professional bodies (e.g. Engineers Australia) and the Australian Government (especially the Bureau of Meteorology and CSIRO) to improve future NSW flood risk assessment (and hence accuracy and timeliness of flood prediction) by building more formal connections between the extensive existing physical hydrological modelling (done by various NSW agencies) with the Bureau's meteorological and climatological research and riverine flood models • support local councils to improve modelling of and ensure adequate and appropriate alarm systems for flash flooding.

Figure 6- Recommendation No.18 [2022 NSW Flood Inquiry]

Response: It should be noted that the recommendations for item 18 appears to be directed at local government to ensure that flood planning levels adequately allow for extreme rainfall events. This does not directly apply to this development, as it is not affected by mainstream flooding.

2022 NSW Flood Inquiry recommends simulating extreme rainfall events in a risk based method to account for fluctuations in current rainfall modelling caused by climate change. The proposal has undertaken this approach, the HEC-RAS flood modelling and the proposal's flood planning level were based off extreme rainfall events i.e 1 in 100 year storm. Rainfall modelling was undertaken from the latest data from Australian Rainfall & Runoff (ARR) Data Hub, which appropriately considers the latest Climate Change practices.

28	**Essential Services and Floodplain Infrastructure** That, to minimise disruption to essential services (power, communications, water, sewerage) and to ensure flood infrastructure is fully serviceable before flooding, Government ensure: • essential services infrastructure (communications, water, power and sewerage) is situated as much as possible above the flood planning level. And to minimise disruption to medical services, aged care services and the police, Government ensure hospitals, medical centres, nursing homes, aged care facilities and police stations are situated above the probable maximum flood level • floodplain infrastructure (drains, levees, flood gates) items are all assigned to an appropriate lead agency which has responsibility for ensuring they are fully maintained and functioning especially when floods are likely.

Figure 7- Recommendation No.28 [2022 NSW Flood Inquiry]

Response: Due to the proposed health care facility role as an essential service, it is critical that such developments remain operational during times of flooding. As mentioned previously the development is not affected by mainstream flooding and as such consideration of the PMF is not appropriate for this development. The key principle of the 2022 NSW Flood recommendation, is to prevent disruptions to essential services in times of flooding. The proposal has implemented measures to prevent significant overland flow from inundating the proposed health care facility, of which was investigated previously. Refer to the report "20442 Liverpool Hospital WSUD and Stormwater report" for further details on the HECRAS modelling which addresses any concerns over overland flows through the site.

Evacuation Measures

As overland flow is wholly contained within the stormwater easement located east of the site, evacuations from the site during times of flooding are relatively simple. Since the flood extent in the 100 year storm event is contained within the swale/stormwater easement site itself, flood-free evacuation is possible, users can either seek refuge on site to avoid flood waters or evacuate the site towards Goulburn Street. Users should not egress via the stormwater easement side or Goulburn Lane as it may be inundated from overland flows during significant storms. Please find below a drawing of possible evacuation routes for the proposed development.

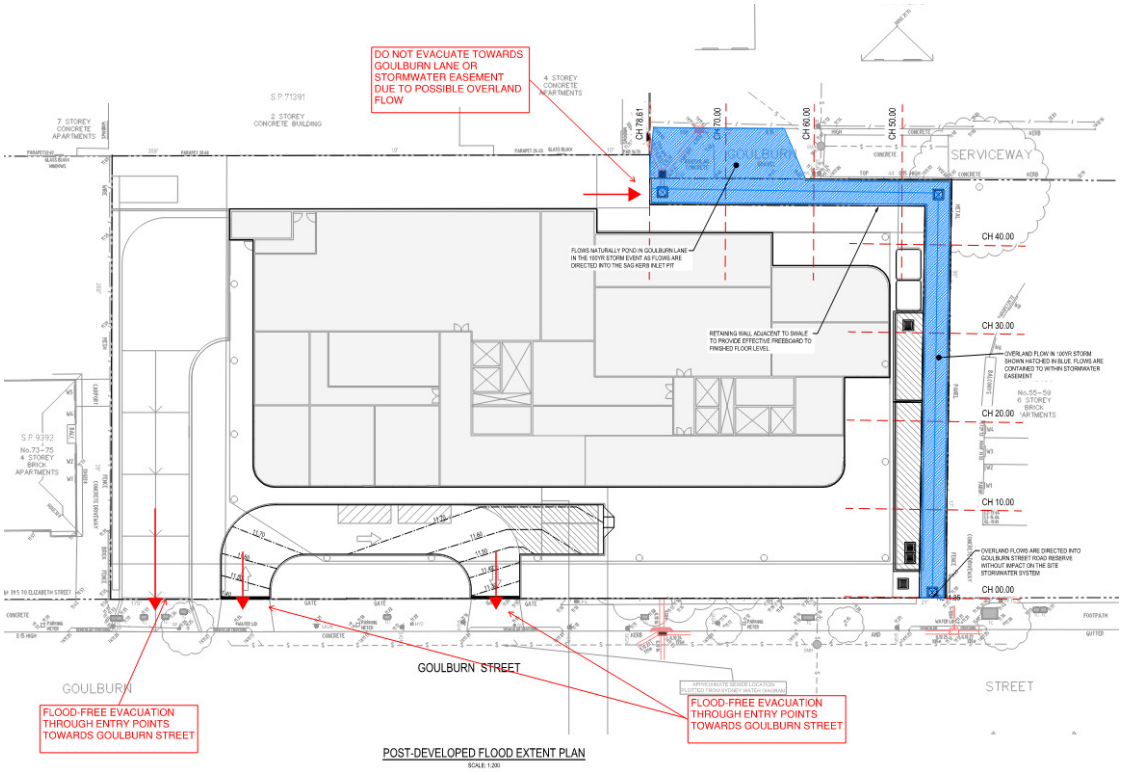

Figure 8 – Proposed Evacuation Routes

Conclusion

A flood impact assessment has been carried out in response to the At Gateway Determination received by Liverpool City Council. The proposed health care facility is not considered to be within "flood prone land" but instead affected by local overland flow. Whilst the proposal is not applicable to the Ministerial Direction 4.1: Flooding, the principles of such guidelines has still been considered in the proposals design along with adherence to Liverpool City Council's flooding requirements. Furthermore the proposal's design has shown that it has considered the recommendations and intents of the 2022 NSW Flood inquiry. Flood-free evacuation routes have been detailed with a 1 in 100 year overland flow and user convenience in mind.

Regards,

ADRIAN MARTANO
For, and on behalf of,
H & H Consulting Engineers Pty Ltd