ARUP

Level 5
151 Clarence Street
Sydney
NSW, 2000
Australia

t +612 9320 9320
f +612 9320 9321

arup.com

By email
5 November 2024

Tom Kennedy

Our ref 293588

Dear Tom

Powerhouse Ultimo Renewal

Stormwater and Flooding Response to SSDA Authority Comments

This letter has been prepared in response to comments received from authorities on the following report prepared by Arup for the Powerhouse Ultimo Renewal Project:

> *"Stormwater and Flooding, Response to State Significant Development Comments"*, PU2-REP-CI-00X03[B]

The comments received and responses are outlined in Table 1.

Table 1 – Agency Comments

Item	Agency Comment	Response
City of Sydney		
3.2 **Stormwater and Flooding**	A detailed flooding assessment has been submitted, with additional modelling being undertaken. A revised MUSIC-Link report is attached. The report advises that some entry points to the basement can adopt a flood planning level of 300mm above the adjacent gutter invert. As the site is flood affected, this is not appropriate. Entries 1 and 10-15 are proposed entries and the report states compliance is achieved using the 300mm above gutter invert. The new entry 11a uses the same flood planning level, however the report states that this is non-compliant. Entries 8 and 9 are proposed entries which advise a flood planning level of the 1% + 0.5 or probable maximum flood and are non-compliant.	- The report considers flood affectation at each door location. As such, some locations are not considered flood affected and the less onerous flood planning level of 300mm above adjacent gutter invert level has been applied in these locations. Based upon the architectural plans used to inform the flood planning compliance, Entrance 11a is a personnel entrance to the building and is currently not achieving compliance with the 300mm FPL. Footnote 2, below Table 3 in the report, identified a compliant solution to the 300mm FPL which was intended to be captured in the future design. Therefore, compliance is achievable, but not captured in the architectural design drawings at the time of reporting. Footnote states: *"^2 Current threshold level at building alignment is raised 0.27 m above adjacent gutter invert level. Internal steps to be*

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		provided to achieve 0.3 m in future design stages to achieve compliance" It is acknowledged that Entrances 8 and 9 do not achieve the applicable FPL criteria of the 1% AEP flood level + 0.5m or PMF (whichever is higher). At these locations, the PMF flooding does extend within the site boundary, but does not extend within the ground floor building envelope. Therefore, whilst the site is considered flood affected, the building is not. Achieving a threshold level equivalent to the 1% AEP + 0.5m would be detrimental to the activation of the public domain and equitable entry at the primary building access point from Harris Street. Applying a FPL of 300mm above the adjacent gutter invert achieves 60mm and 150mm freeboard to the PMF flood level at Entrances 8 and 9, respectively. Noting the constraints on floor levels at Entrances 8 and 9, it is considered justifiable that a floor level threshold of the PMF be used rather than the 1% AEP + 0.5m, based on the following: • The PMF levels at Entrances 8 and 9 are predicted to be 0.10 m and 0.13m higher respectively than the 1% AEP flood levels • The respective peak flows along the Harris Street road carriageway are 0.42 m^3/s in the 1% AEP event and 2.67 m^3/s in the PMF • The increase in peak water level in the PMF, compared to the 1% AEP, is small (between 0.10 - 0.13 m) despite a 6-fold increase in the peak flow rate along Harris Street in the PMF relative to the 1% AEP. This suggests that the sensitivity of peak water levels to the flow rate within Harris St is relatively small. • The upstream catchment area draining to Harris St is relatively small, consisting of the Harris Street road corridor, adjacent properties on the western side and part of the existing Wran building. In light of the above (small catchment area, insensitivity of peak water levels at Entrances 8 and 9 to changes in flow rate), it is considered the risk of the flood levels reaching the 1% AEP + 0.5m threshold in Harris Street is negligible. We therefore put forward that the current floor levels for Entrances 8 and 9, which have 0.06m and 0.15m freeboard to the PMF level, are sufficient to prevent ingress of floodwater into the new building.
	It is requested that the above non-compliances are clarified and justified.	-

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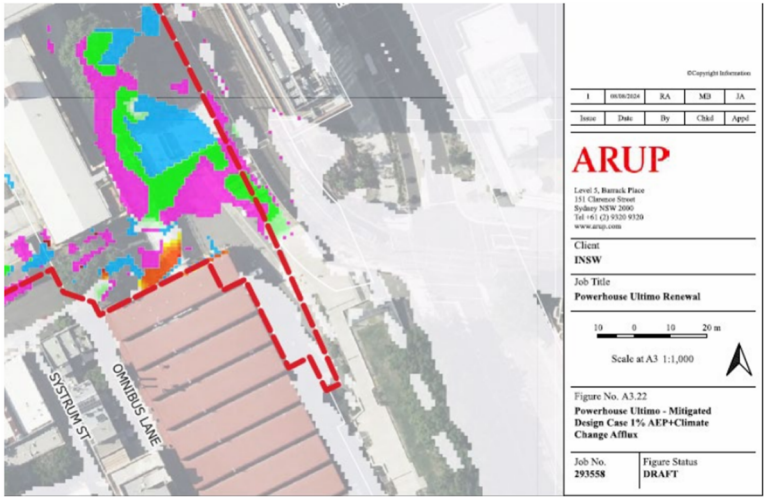
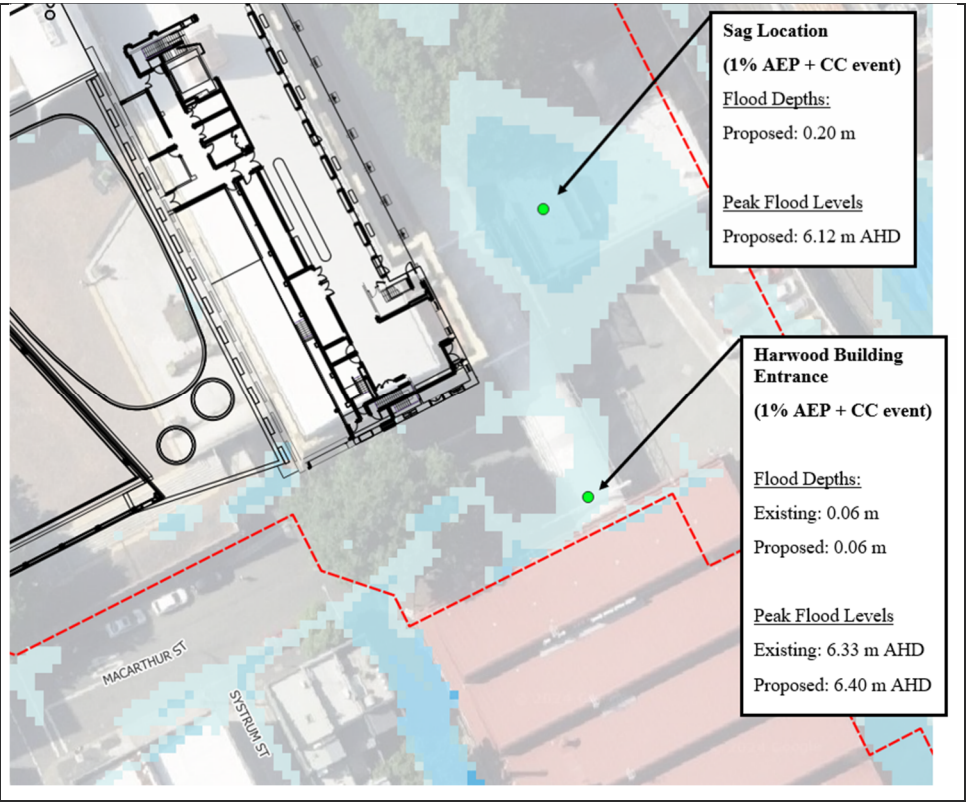
Biodiversity, Conservation and Science		
1 **Flood impacts north of the Harwood Building**	BCS notes significant flooding outside the roller doors on the north side of the Harwood Building, as shown in dark orange below. BCS requests additional information on the impacts at this location, which have been observed during multiple flood events. It is crucial to avoid any flood impacts that could create or exacerbate over-floor flooding in neighbouring properties. 	• The increases in peak flood levels outside the Harwood Building referred to in the BCS Comment 1 are due to the proposed road surface level being raised from existing, rather than an increase in flows outside the Harwood Building. • Whilst the peak flood levels reported in the flood model are higher than existing (6.33 m AHD in existing vs. 6.40 m AHD in proposed), peak flood depths are similar between existing and proposed (0.06 m in both existing and proposed). • Whilst the proposed surface level is higher than existing outside the Harwood building, the proposed surface grades away from the Harwood building (as per existing), towards the sag point approximately 30m north of the Harwood Building. • The localised sag point approximately 30m to the north of the Harwood Building entrances (which is drainage by an inlet pit) has a ground elevation of 5.90 m AHD and the peak flood level in the 1% AEP + CC is 6.12 m AHD. • The grading of the design surface maintains the surface flows draining along Macarthur Street, noting these are relatively shallow, will drain away from the Harwood Building entrances towards the adjacent sag point. Noting the above, we believe the proposed does not materially increase the existing flood risk to the Harwood Building.

	Recommended action: • Provide additional details on the anticipated flood impacts at the roller doors, specifically regarding the proposed increase in water levels. The figures alone don't provide a clear understanding of the proposed flood levels at this location.	

		 Sag Location (1% AEP + CC event) Flood Depths: Proposed: 0.20 m Peak Flood Levels Proposed: 6.12 m AHD Harwood Building Entrance (1% AEP + CC event) Flood Depths: Existing: 0.06 m Proposed: 0.06 m Peak Flood Levels Existing: 6.33 m AHD Proposed: 6.40 m AHD MACARTHUR ST SYSTRUM ST

Item	Agency Comment	Response
2 **Flood impacts at basement entries**	BCS requests further consideration on the following basement entries identified in Table 3 of the Stormwater and Flooding Report:	
	• Location 8 – Harris Street (proposed): This location has a freeboard of 180 millimetres (mm) to the 1% Annual Exceedance Probability (AEP) flood and is above the Probable Maximum Flood (PMF). **Recommended action:** BCS recommends increasing the freeboard to at least 300 mm for the 1% AEP flood.	Noting the constraints placed on floor levels at Entrance 8 (limited building setback from kerb/ boundary, accessible and equitable entrance for all patrons), it is considered justifiable that a floor level threshold of the PMF be used (as opposed to the suggested 1% AEP + 0.3m freeboard), on the basis that: • The PMF level at Entrance 8 is predicted to be 0.10 m higher than the 1% AEP flood level • The peak flows along the Harris Street road carriageway are 0.42 m^3/s in the 1% AEP event and 2.67 m^3/s in the PMF • The increase in peak water level in the PMF, compared to the 1% AEP, is relatively small (0.10 m) despite a 6-fold increase in the peak flow rate along Harris Street in the PMF relative to the 1% AEP. This suggests that the sensitivity of peak water levels to flow within Harris St is relatively small. • The upstream catchment area draining to Harris St is relatively small, consisting of the Harris Street road corridor, adjacent properties on the western side and part of the existing Wran building. In light of the above (small catchment, relative insensitivity of peak water levels at Entrance 8 to changes in flow rate), it is considered that the risk of the flood level reaching a 1% AEP + 0.3m threshold level is negligible. It is therefore put forward that the current floor levels (having 0.06 m freeboard to the PMF level) is sufficient to prevent the ingress of floodwater into the building.
	• Location 11a – Macarthur Street (proposed): This location has marginal freeboard to the 1% AEP flood and is above the PMF. **Recommended action:** BCS recommends that freeboard should be increased to at least 300 mm to the 1% AEP flood.	Macarthur Street frontages (Entrances 10-15) are not considered flood affected based upon the CoS Interim Floodplain Management Policy. Therefore, the applicable FPL is 0.3 m above surrounding ground levels (ie gutter invert level). The non-compliance at Entrance 11a was a result of the architectural plans used to inform the flood planning compliance checks which indicated a FFL 0.27 m above surrounding ground level. Entrance 11a is a personnel entrance to the building. Footnote 2, below Table 3 in the report, identified a compliant solution to the 300mm FPL which was intended to be captured in the future design. Therefore, compliance is achievable, but not captured in the architectural design drawings at the time of reporting. Footnote states: *"^2 Current threshold level at building alignment is raised 0.27 m above adjacent gutter invert level. Internal steps to*

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	• Locations 16-24 – Gathering Terrace (existing): These locations are above the 1% AEP flood but approximately 400 mm below the PMF. • **Recommended action:** Due to the heritage status of the existing building, raising floor levels to improve passive protection to the basement may not be feasible. However, considering alternative means of protecting the basement is required due to the high risk to life associated with basement flooding.	*be provided to achieve 0.3 m in future design stages to achieve compliance"* Locations 16-24 are existing entrances to an existing heritage listed building. The proposal does not intend to alter the existing flood risk to Museum facilities. Options to protect the basement were considered during the design development, including flood barriers and stormwater augmentation. However, the ability to incorporate these options into the scheme were restricted due to the limitations around the integration and preservation of the heritage façade, preventing off-site flood impacts and the scope of the project works. In considering the risk to life associated with flooding of the basement, it is noted that floodwater entering the existing building will drain through the building and pond within the basement level, which houses building plant and is not publicly accessible. The plant areas will only be accessible to staff conducting maintenance activities for the Powerhouse building. Staff operating within the basement will be working under a safety management system, to be managed by the building operator, which will cover any conditions under which it is unsafe for staff to access the basement levels (including flooding). It is expected the flood risk associated with floodwater entering the existing building at Gathering Terrace can be managed through the safety management plan, noting the limited number of personnel who will access the basement level and the infrequency of personnel accessing the basement.

Yours sincerely

KSeeto

Karen Seeto
Associate

d 02 9320 9470
e karen.seeto@arup.com