

1 April 2019

Brian Booth
Executive Design Manager
Paynter Dixon
Level 2, 2 Richardson Place
Riverside Corporate Park
North Ryde, NSW 2113

Dear Brian

Re: Parramatta RSL Club Development – Flood Risk Assessment

This letter sets out a flood risk assessment for the development which is being undertaken at Parramatta RSL Club. The assessment has been requested by Paynter Dixon Construction in light of a foreshadowed amendment to consent conditions proposed by Parramatta City Council in response to a proposed development modification. The currently approved development and proposed modified development comply with the intent of the existing consent conditions but cannot practically comply with the foreshadowed conditions.

This assessment details the flood hazards at the site and assesses the risks which they pose to property and people, taking into account how the hazards vary between different magnitude flood events.

Approved Development

Parramatta RSL Club has development consent for redevelopment of the existing club at the corner of O'Connell and Macquarie Streets. Construction of a new club house with a single level basement car park has commenced where the club's bowling greens were formerly. When that is completed it will be possible to demolish the existing club house and on that part of the site a multideck car park is proposed where the existing club house stands.

The consent for the development included two conditions to respond to flood risks. Specifically:

“52. *It is essential for the development that an additional measure in terms of a flood proof gate shall be installed at the basement ramp entrance crest level (100-year Flood Level plus 500mm). The purpose of this flood proof gate shall be to address impact measures from flooding events reaching towards PMF event flood inundation which will potentially fill the basement car park with flood water. In addition, detailed design of the flood proof gate and maintenance plan shall be submitted to the satisfaction and subsequent approval by i) Certifying Authority and ii) Council, prior to issue of the Construction Certificate and the Final approved copy of Flood Proof Gate Detailed Design & Maintenance Plan shall be submitted to Council for compliance and record purposes.*

Reason: *To ensure satisfactory measures in place for the basement car park from being filled with floodwater during storm events leading to Probable Maximum Event (PMF) event inundation.*

92. *Prior to issue of the Occupation Certificate, the Principal Certifying Authority shall ensure that all the basement car parking flood evacuation measures have been implemented on site, as per the Council's "Flood Plain Matrix". This shall also include the Flood Warning Systems & Response Systems and Evacuation Strategy and Procedures whilst displaying of the laminated Evacuation Plan at a prominent location within each unit, for the residents to be aware of the potential flooding of the basement, in the event of major flooding. The Flood Emergency Response Plan shall also include the Strata Manager and the people nominated as part of the flood warden group (members of the Body Corporate) to monitor the drainage system of the property in the basement as well as pay attention to the weather reports during heavy rainfalls. A Certificate of Compliance for the satisfactory implementation of the flood related basement evacuation strategy, from the Consulting Civil/Flood Engineer shall be submitted to the Principal Certifying Authority, prior to the issue of the Occupation*

Certificate. A copy of the above Compliance Certificate shall be attached to the Occupation Certificate, when forwarded to Council for record.

Reason: *To ensure the property owners / occupants are aware of the procedure in the event of basement flooding."*

Parramatta RSL is committed to developing a flood emergency response plan for the club (Condition 92) and has designed, and is constructing, the development to comply with the intent of Condition 52.

Proposed Condition for Consent Modification

An application for modification to consent was recently submitted to Council to permit the provision of a function room on the first floor of the new club house and relocation of administration offices to Basement 1. The Basement 1 level is currently under construction. Council has advised that, in its opinion, the addition of the function room will greatly increase the number of people at risk from flooding and accordingly is proposing modification to Condition 52.

In an email of 4th February, 2019 to Think Planners, Jonathan Cleary of Council stated:

"Council now requires that basement car parks be protected from inundation by floodwaters up to the PMF and that facilities be provided for occupants of buildings to easily escape from basements by means of flood protected staircase to a refuge or shelter in place located above the PMF Level inside the building, which for this purpose may be assumed to be RL 13m AHD.

To achieve this the following measures will be required:

- 1. Provide self-actuated flood gates such as 'Floodbreak' or equivalent plus wing walls to each entrance to the two basement car park driveway ramps to exclude floodwaters up to a min. level of RL 13m AHD.*
- 2. Provide a continuous stairway from the basement car park levels up to a level within the building greater than the PMF (RL 13m AHD).*
- 3. Ensure floodwaters will not enter the basement by means of the stairwells/s and any other penetration in the ground floor slab with the use of flood doors steps and other measures as needed.*
- 4. Ensure flood-proof construction and structural integrity in floods up to RL 13m AHD for the building as a whole."*

When asked for the basis of this new requirement Council quoted from Principle P14 from Section 2.4.2.1 of Parramatta DCP 2011 which says:

"Council strongly discourages basement car parks on properties within the floodplain. Where site conditions require a basement car park on a property within the floodplain, development applications must provide a detailed hydraulic flood study and design demonstrating that the proposed basement car park has been protected from all flooding up to and including the PMF event. An adequate emergency response and evacuation plan must also be provided where basement car parks are proposed in the floodplain."

Council went on to say in an email of 5th February, 2019:

"In what is a concession to facilitate development, Council does permit basement car park construction in flood prone land where flood risks can be acceptably managed.

Over several years an approach has emerged that is practical and cost effective and provides a reasonable level of risk management. This involves a two tier approach whereby passive flood exclusion measures such as driveway crests are used to exclude floodwaters up to the flood planning level (100 year + 500mm). Above this, up to the Probable Maximum Flood Level, active, more mechanical, flood exclusion measures such as flood gates and doors are used.

This approach is now implemented routinely across the CBD and the LGA and is supported by Senior Management and the two determining Panels."

Flood Affectation on the Site

A flood certificate from Parramatta City Council (Attachment 1) shows that the site is directly affected by flooding in the 1 in 20 chance per year flood, the 1 in 100 chance per year flood and the probable maximum flood (PMF).

The flood levels on the corner of O'Connell Street and Macquarie Street are:

- 1 in 20 chance per year 9.14m AHD
- 1 in 100 chance per year 9.22m AHD
- PMF 12.91m AHD

The flood levels at the northern boundary to the site are:

- 1 in 20 chance per year 7.94m AHD
- 1 in 100 chance per year 8.25m AHD
- PMF 13.18m AHD

The reasons for the differences in flood levels on either side of the development are that in the 1 in 20 and 1 in 100 chance floods, the flood levels are caused by water ponding at the intersection as it builds up sufficient head to push through the stormwater pipes which carry the water north under the RSL Club. The flood levels on the northern side reflect the loss of head as the water flows through the pipes.

In the PMF however, flooding is coming from the Parramatta River and the water level is higher on the northern side of the premises as it flows from the north towards the south east and its flow path is partially obstructed by the RSL Club.

Compliance with Existing Condition 52

The approved development includes the following features in relation to the requirements of Condition 52. These are highlighted in the Basement 1 and Ground Floor plans which are Attachments 2 and 3 respectively.

Basement 1 Fire Exit Door

On the northern side of the car park there is an at-grade fire escape door at 8.75m AHD. This is the lowest opening through which floodwaters could enter the basement. This is 0.5m above the applicable 1 in 100 chance per year flood level on that side of the premises.

Club Ground Floor Level

The new clubhouse has been designed to have a minimum floor level of 11.15m AHD which places it almost 2m above the 1 in 100 chance per year flood level and nearly 1.5m higher than the applicable flood planning level (1 in 100 chance per year level plus 0.5m freeboard). Floodwaters exceeding this level would enter the basement through floor slab penetrations for the stairs and lifts inside the clubhouse as well as on the forecourt. The basement air supply intake would also permit water to enter the basement through a door into this area.

Basement Driveway Crest

The crest to the basement driveway will be at 12.0m AHD placing it 2.8m higher than the 1 in 100 chance per year flood level.

It is noted that Condition 52 requires that a flood proof gate be installed at the driveway crest to provide protection to a higher level than the crest of the driveway which it implies is at "100-year Flood Level plus 500mm". However, the driveway crest is actually at 100-year Flood Level plus 2800mm. While installation of a gate on the driveway crest would be physically possible, it would offer no greater flood protection than an ungated crest because when floodwaters exceed 11.15m AHD they would cover the ground floor and enter the basement car park via the lift shafts and stair wells.

Furthermore, the fire exit door on the northern side of the building itself is only 0.5m above the 1 in 100 chance per year flood level that applies in that location. Unless that door is sealed against water entry, then the basement car park will start flooding at flood levels exceeding 0.5m above the 1 in 100 chance per year flood level. As it is a fire door, the sealing of the door would have to take place manually after the basement has been evacuated as part of the flood emergency response procedures.

Compliance with Proposed Modified Condition

Council is proposing that the PMF level be assumed to be 13m AHD all around the building and that floodwaters must be completely excluded from the basement car park up to the PMF level.

Specifically it is proposing that the development:

1. *Provide self-actuated flood gates such as 'Floodbreak' or equivalent plus wing walls to each entrance to the two basement car park driveway ramps to exclude floodwaters up to a min. level of RL 13m AHD.*
2. *Provide a continuous stairway from the basement car park levels up to a level within the building greater than the PMF (RL 13m AHD).*
3. *Ensure floodwaters will not enter the basement by means of the stairwells/s and any other penetration in the ground floor slab with the use of flood doors steps and other measures as needed.*
4. *Ensure flood-proof construction and structural integrity in floods up to RL 13m AHD for the building as a whole."*

Given that the floodwaters will have low velocities in this location and that the development is of concrete and masonry construction, the building will easily be able to satisfy Item 4 above.

It would also be physically possible to install 1m high flood gates to satisfy Item 1 above but they would be superfluous if items 2 and 3 are not also satisfied because the building ground floor level is lower than the driveway crest level.

Meeting the requirements of items 2 and 3 however are not practical for a number of reasons:

- Basement Level 1 at-grade fire escape on the northern side of the building - RL 8.75m AHD – this is not technically covered by any of the items above and yet is the lowest point at which water can enter the basement. The options for sealing this are limited because it is a fire exit so this can only be achieved by a flood proof seal which is locked in place after the basement has been evacuated in a 1 in 100 chance per year flood.
- Forecourt lifts and stairs - RL 11.15m AHD – Item 3 is only achievable by removing these access points all together
- Basement air supply intake – RL 11.15m AHD - This includes 3m high louvered panels on the sides of a room with a door onto the forecourt. To meet the requirements of Item 3 the door would have to be fitted with a flood proof seal and the structure would have to be built 5m high with the bottom 2m being water proofed and the top 3m being louvered.
- Club lifts and stairs – 11.15m AHD – any lifts or stairs which provide direct access between the ground floor and the basement would have to be redesigned so that they provide access via the first floor to meet both items 2 and 3. In other words, you would have to catch a lift from the basement to the first floor in a lift which is in a shaft which is sealed at the ground floor then change lifts to take a lift from the first floor to the ground floor in a lift which is in a shaft which doesn't penetrate the ground floor slab. A similar arrangement would be required with stair wells. Alternatively, the whole ground floor of the building would need to be sealed from water entry up to 13m AHD.

Risk Considerations

It is worth considering the risks which the proposed revised condition is meant to manage and what has changed with the proposed modification.

- All of the routes for floodwaters to enter the basement in the currently proposed design existed in the original design which was previously approved by Parramatta City Council with only a need for the driveway crest to be 0.5m above the 1 in 100 chance per year flood level and a flood gate to be atop this approaching the PMF level.
- The only thing which has changed in the development design is the provision of a function room which would increase the maximum capacity of the premises by about 10% and the provision of some administration offices in the basement car park level 1. It does not increase the number of cars parked on site, just the absolute maximum number of people who could be in the building.
- If the basement fire exit door is sealed manually during floods then no water should enter the basement until flooding exceeds 11.15m AHD. This is almost 2m higher than the 1 in 100 chance per year level.
- There is no flood data available for Parramatta for events between the 1 in 100 chance per year level and the PMF level but the following is noted:
 - The 1 in 100 chance per year level at site (9.2m AHD) is created by local flooding ponding at the intersection of O'Connell and Macquarie streets while the PMF level (13m AHD) is created by water overflowing from the Parramatta River to site.
 - Where O'Connell Street crosses the Parramatta River the 1 in 20 chance per year flood level is 7m AHD, the 1 in 100 chance per year flood level is 8.1m AHD compared to a PMF level of 13.1m AHD (Attachment 4).
 - When these are plotted on a log-linear graph, assuming a 1 in 1,000,000 chance per year probability for the PMF, it suggests that a level of 10.65m AHD (0.5m freeboard below 11.15m AHD) would have a probability of about 1 in 10,000 (Attachment 5). The car park can practically be protected up to at least this flood event by the current design.
- The Flood Plain Matrix in the DCP permits any parking space at grade with multiple cars to only have protection up to the 1 in 100 chance per year flood level plus 0.5m freeboard. The proposed development will protect all cars on site up to the 1 in 10,000 chance per year flood plus 0.5m freeboard.
- It is accepted that basement car parks are a special type of car park which have additional risks due to the way in which they can fill. However, this does not increase the risk to vehicles and other property in the car parks, just the risk to people who may be in the car park when flood waters begin to enter because of the potential faster rate of rise than might be experienced in an at grade car park.
- As stated above, the proposed modified development does not increase the number of vehicles in the car park and therefore it does not increase the number of people potentially in the car park or trying to access the car park when flood waters are entering.
- The risk to people can be reduced by reducing the probability of people being in, or accessing, the car park when flood waters enter.
- The proposed consent condition proposes to achieve this by reducing the chance of floodwaters entering the car park but a similar outcome can be achieved by reducing the chance of people entering the car park
- The car park has a limited number of access points and these can all be locked to prevent entry to the car park. This can be triggered well in advance of floodwaters threatening to enter the car park. In fact, there would be value in doing this whenever the intersection of O'Connell St

and Macquarie St is flooding to reduce the risk of patrons driving through hazardous floodwaters immediately off site.

- Club staff, including security staff, can sweep the car park to ensure everyone has exited when required.
- The provision of the function room on the first floor actually increases the floor area above the PMF level in which people can take refuge should floodwaters enter the club.

It is my opinion therefore, that the currently approved development has a sufficiently low probability of flooding if the basement fire escape is sealed after the basement has been evacuated during floods. Risks to people in the car park can be further reduced if the Flood Emergency Response Plan includes measures to clear people from the car park, and lock it against entry, well in advance of floodwaters threatening to enter it.

Yours faithfully

For Molino Stewart Pty Ltd



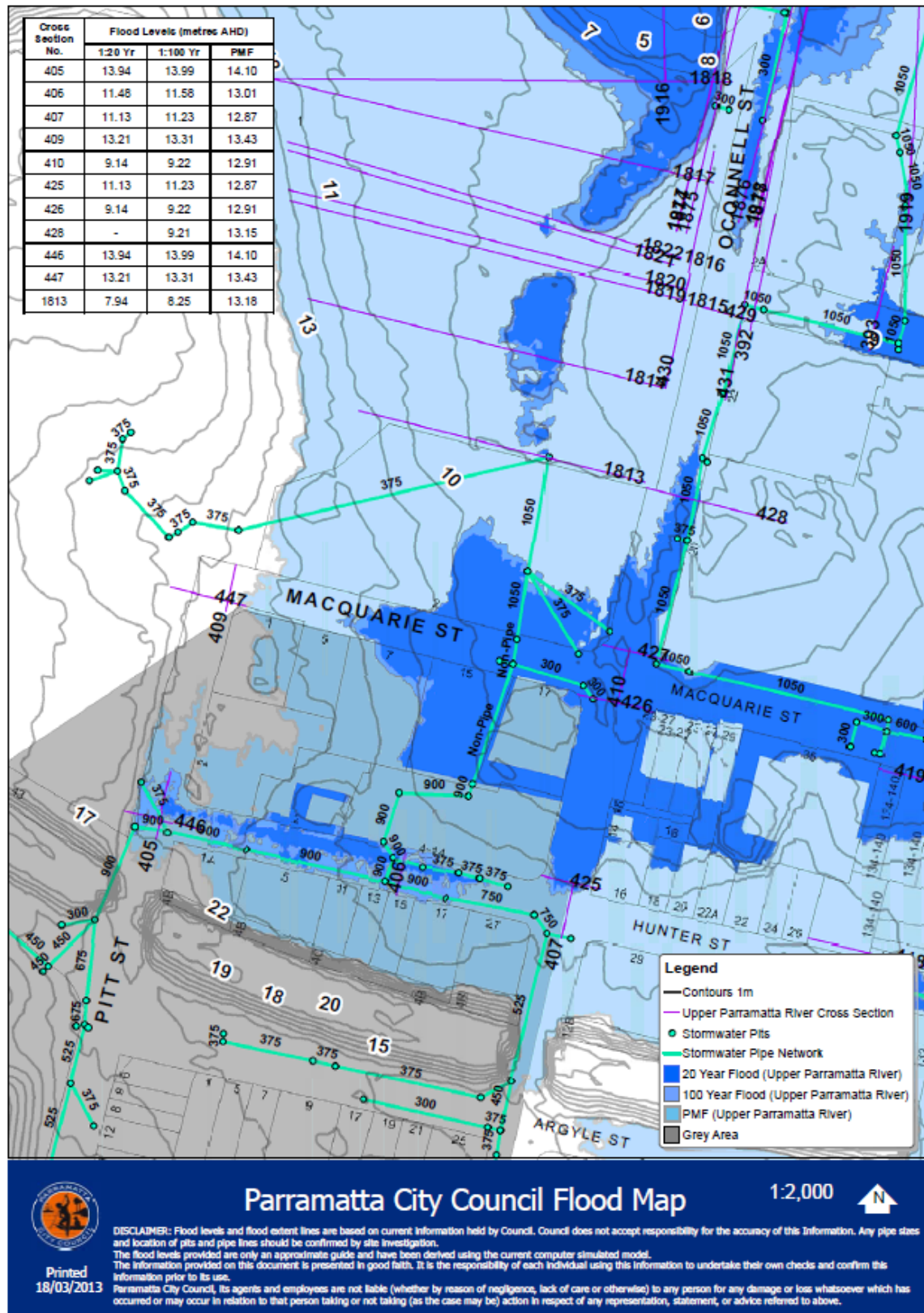
Steven Molino BSc BE MIEAust NPER 3 1053737

Principal

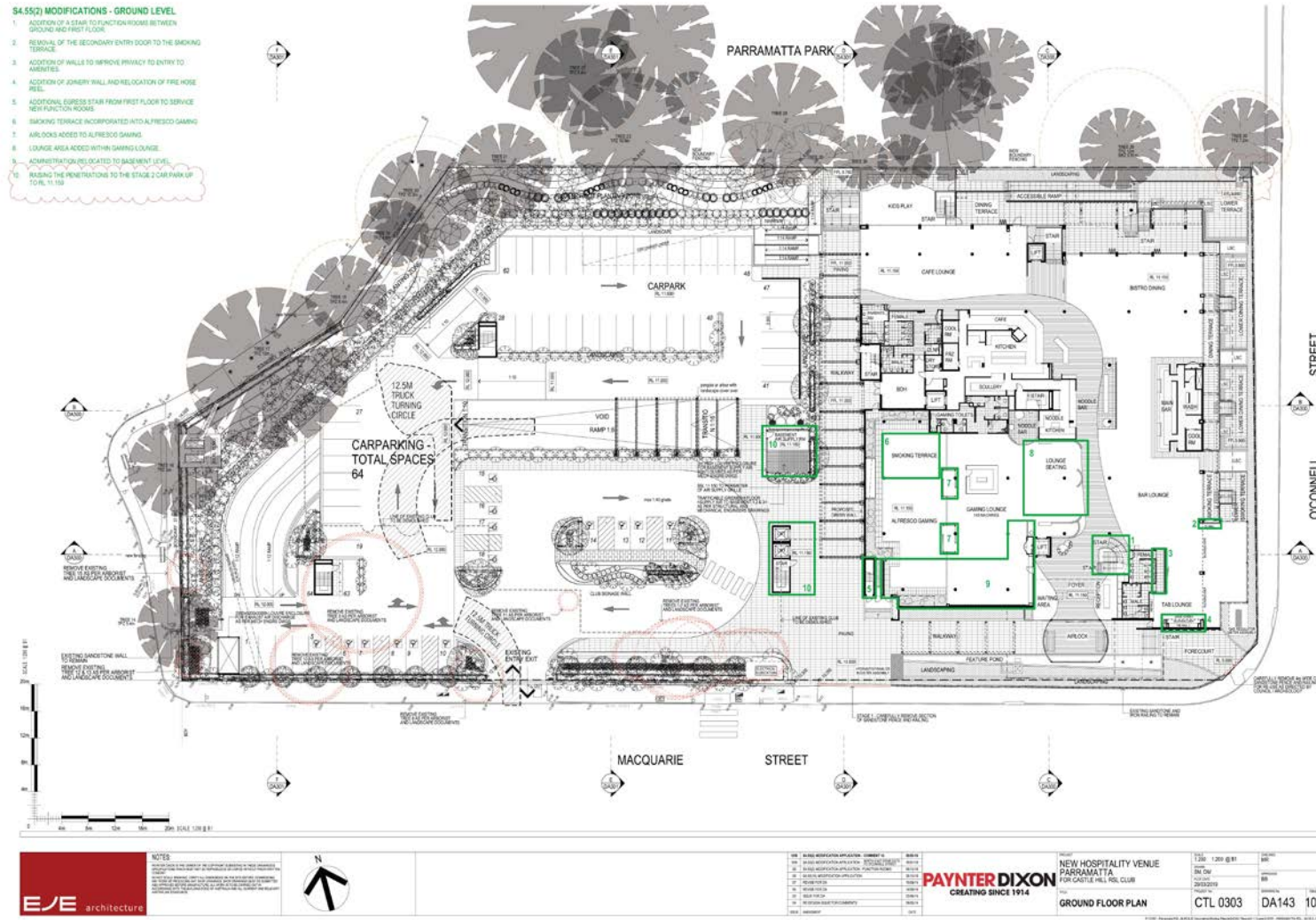
Enclosures: 5

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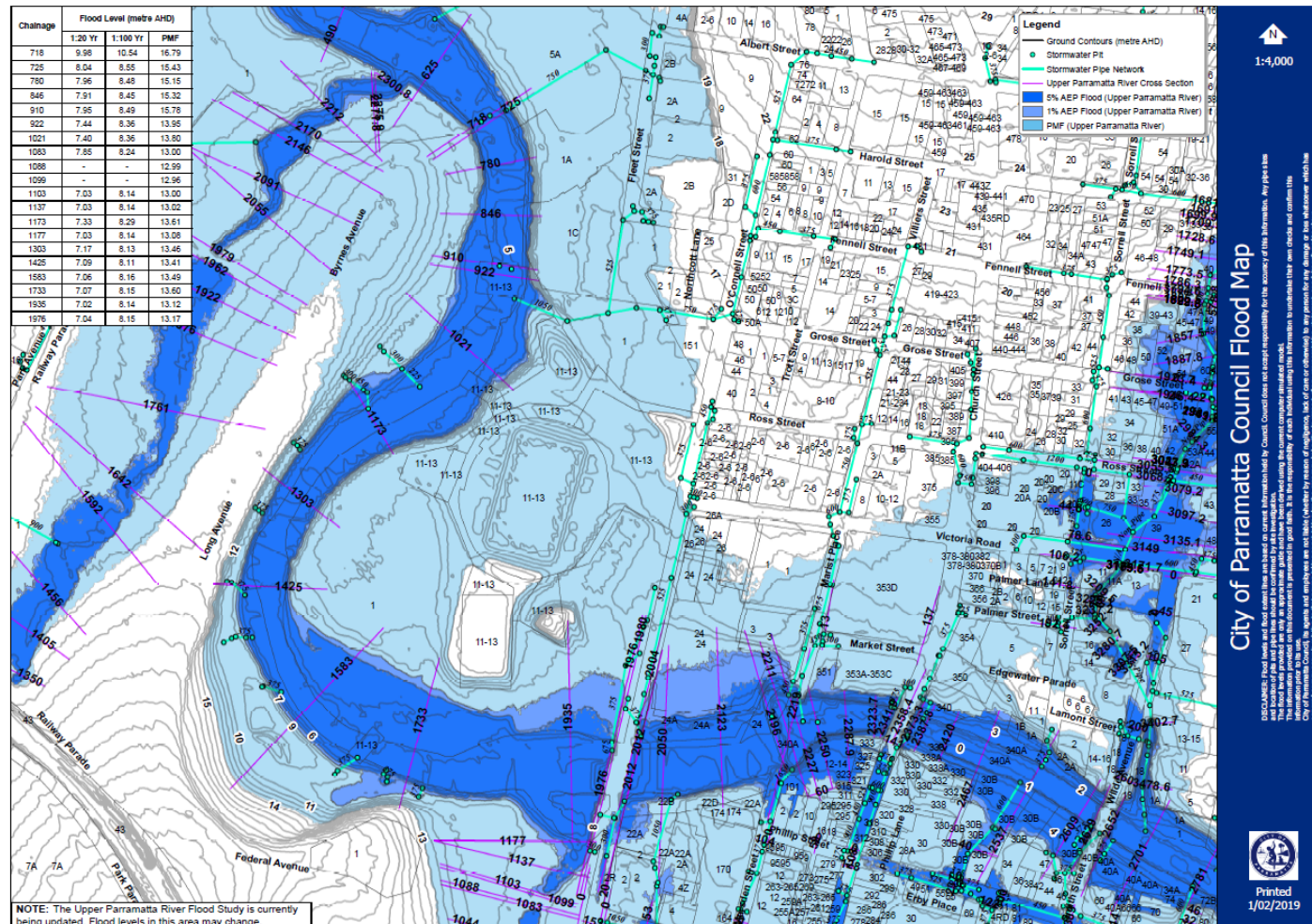
Attachment 1: Flood Extent and Levels in the Vicinity of the Club



Attachment 3: Ground Floor Plan



Attachment 4: Flood Extent and Levels in the Parramatta River



Attachment 5: Plot of Flood Levels and Probabilities in the Parramatta River at O'Connell Street

