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DOLTONE HOUSE GROUP

Redevelopment of Deepwater Motorboat Club Site, Milperra

Flood Impact Assessment
and
Flood Emergency Response Plan
(Webster St Upgrade Alternative)

Issue No. 3

2nd September 2014

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DOLTONE HOUSE GROUP

DOLTONE HOUSE DEEPWATER, MILPERRA
FLOOD IMPACT ASSESSMENT AND FLOOD EMERGENCY RESPONSE PLAN

Disclaimer

Project 301015-02379 - REDEVELOPMENT OF DEEPWATER MOTORBOAT CLUB SITE, MILPERRA
FLOOD IMPACT ASSESSMENT & FLOOD EMERGENCY RESPONSE MANAGEMENT PLAN

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1. INTRODUCTION

Doltone House Group (the applicant) plans to redevelop the existing Deepwater Motor Boat Club site at Milperra (the Site). The proposed redevelopment will involve alterations and additions to the existing two storey clubhouse to include a 900 person function centre and conversion of the existing pool and associated pool building to a 112 seat restaurant/café with adjoining organic garden.

It is also proposed that a boat shed be incorporated into the development, along with several gazebos and landscaped gardens. The Deepwater Motor Boat Club will continue to operate out of an expanded and upgraded area at the ground level of the main building.

The Site is situated within the Bankstown City Council Local Government Area (LGA) and is known as 30 Webster Street, Milperra. The site covers an area of 4.08 ha and comprises part Lot A in Deposited Plan (DP) 405225 and Lot D in DP 391154. It is located on the eastern bank of the Georges River and is situated approximately 500 metres downstream from the South Western Motorway (M5) crossing of the Georges River (refer **Figure 1**).

The Site is susceptible to flooding due to the low lying elevation of the land and its proximity to the Georges River. Accordingly, any proposal to redevelop the Site or expand existing facilities associated with the Deepwater Motor Boat Club needs to consider the potential for the proposed redevelopment to impact on existing flood characteristics. Consideration also needs to be given to ensuring that any increase in flood risk that patrons of the proposed development may be exposed to can be mitigated or managed.

In recognition of these issues, Doltone House engaged WorleyParsons to undertake a range of flood related investigations aimed at establishing the potential impact that the proposed development may have on existing flood characteristics. The engagement also involves a flood risk assessment for the proposed usage of the site and the associated development of a flood emergency response management plan.

This report incorporates a Flood Impact Assessment for the proposed development. It also addresses flood risk management issues associated with conversion of the existing development to a function centre and new restaurant, and includes a Flood Emergency Response Strategy that can be implemented to mitigate any risk to patrons during the onset of major Georges River floods.

301015-02379 – Deepwater Motorboat Club Site
fg301015-02379-140313-fig1 Location.doc

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ISSUE	DATE	ISSUE DESCRIPTION

N
NORTH

DEEPWATER MOTORBOAT CLUB SITE LOCATION

FIGURE 01

2. FLOOD CHARACTERISTICS AT THE SITE

2.1 Historical Floods

Major flooding of the Georges River has occurred on numerous occasions since European settlement. In particular, records gathered at Liverpool Weir indicate that 7 major floods occurred between 1873 and 1900 (*Public Works, 1991*). The largest of these occurred in 1873 and reached an elevation of 10.5 mAHD at the Liverpool Weir Gauge, which is located near the Newbridge Road crossing of the Georges River and about 15 kilometres upstream of the Site.

The largest flood in the last century occurred in February 1956. This flood reached an elevation of 8.3 mAHD at the Liverpool Weir Gauge. Since then, the two largest floods occurred in August 1986 and April 1988. These floods led to significant flooding of the Georges River as well as major flooding of nearby catchment drainage systems including South Creek (*WorleyParsons, 2014*).

The most recent episode of overbank flooding along the Georges River occurred in March 2012. This flood overtopped the banks of the Georges River at Deepwater Reserve and led to inundation of part of the Site. Data compiled by FloodMit Pty Ltd indicates that the March 2012 flood reached a peak level of 1.94 mAHD and inundated the western half of Webster Street which serves as the primary access to the Site from Henry Lawson Drive.

2.2 Design Flood Characteristics

Flood characteristics for the Georges River are documented in the *'Georges River Flood Study'*, which was published by the NSW Department of Public Works in 1991. The Flood Study was prepared in response to the major flooding of the Georges River that occurred in August 1986 and April 1988. It was based on the results of physical modelling that was undertaken in the 1980s and documents design flood levels for that section of the Georges River between Liverpool and East Hills.

Peak flood levels for the 5%, 2% and 1% annual exceedance probability (AEP) events and the Probable Maximum Flood (PMF) have been extracted from the 1991 Flood Study for the section the Georges River that adjoins the Site. These peak flood levels and some additional levels documented in a report prepared by FloodMit Pty Ltd, are listed in **Table 2-1**.

In 2004, Bankstown City Council published the *'Georges River Floodplain Risk Management Study & Plan'*, which was prepared by Bewsher Consulting. A computer model of the Georges River was established as part of the study. The model extends from Botany Bay to upstream of Liverpool and was used to verify results derived from the previous flood study and to test the impact of development and other works that have occurred on the floodplain since the mid 1980s. The computer model was also used to define other flood characteristics including flow rates, flood flow velocities and flood hazard.

Table 2-1 Design Flood Levels in the vicinity of the Deepwater Motor Boat Club Site

DESIGN EVENT (AEP)	PEAK FLOOD LEVEL (mAHD)
Highest Annual Tide	1.1*
20%	2.4*
5%	4.2 (PWD, 1991)
2%	4.7 (PWD, 1991)
1%	5.1 (PWD, 1991)
PMF	10.3 (PWD, 1991)

* Flood data contained in FloodMit Report dated March 2012

Modelling undertaken as part of the Floodplain Risk Management Study was used to characterise flood risk for areas of the Georges River floodplain. The flood risk categorisation documented in the Floodplain Risk Management Study Report has been used in *Bankstown Development Control Plan 2005* (*DCP 2005*). DCP 2005 characterises the Site as part of a 'High flood risk precinct'.

Further flood related information is contained in a letter from FloodMit Pty Ltd to Bankstown City Council dated 29th March 2012. This letter is titled *'Proposed Development the Deepwater Motor Boat Club Site by Doltone House - Review of Floodplain Management Issues'*, and was prepared following a peer review of a Flood Impact Assessment Report that was lodged with a Development Application for an earlier development proposal for the Site.

3. STATUTORY AND DEVELOPMENT CONTROL REQUIREMENTS

The Deepwater Motor Boat Club site is zoned **6(b) Private Recreation** under *Bankstown Local Environmental Plan 2001* (BLEP 2001). It is located adjacent to Deepwater Reserve which is zoned **6(a) Open Space** and extends along the frontage to the Georges River downstream from the M5 Motorway crossing.

The hierarchy of relevant environmental planning instruments and guidelines that inform the development proposal on matters relating to flooding include the following:

- *Greater Metropolitan Regional Environmental Plan No 2-Georges River Catchment 1999* (the Deemed SEPP)
- *Bankstown Local Environmental Plan 2001*
- *NSW Government Flood Prone Land Policy*
- *Bankstown Development Control Plan 2005*

The *Greater Metropolitan Regional Environmental Plan No 2 - Georges River Catchment* (*1999*) indicates that the following matters related to flooding need to be recognised:

(a) the benefits of periodic flooding to wetland and other riverine ecosystems;

(b) the pollution hazard posed by development on flood liable land in the event of a flood; and,

(c) the cumulative environmental effect of development on the behaviour of flood water and the importance of not filling flood prone land.

Only Item (c) is considered to be of relevance to the proposed redevelopment of the Site.

Bankstown LEP 2001 specifies development standards for the regulation of development across the LGA. Clause 26 of the BLEP 2001 addresses flood liable land and states the following:

> *"Before determining an application for consent to carry out development on flood liable land, the consent authority must consider the provisions of any relevant development control plan and the requirements of any floodplain development manual published by a public authority that the Council considers relevant to the assessment of the development."*

In effect, Clause 26 directs matters which involve development on flood liable land to any development control plans that address flooding and to a certain extent, places emphasis on the need for development on flood liable land to conform to the requirements of the NSW Government's *'Floodplain Development Manual'* (*2005*).

Flood related development controls for the Georges River floodplain are outlined in *'Bankstown Development Control Plan 2005 – Part E3 Flood Risk Management'* (*DCP 2005*). The DCP identifies recommended planning provisions for the Georges River floodplain based on "flood risk

precinct" mapping documented in the *'Georges River Floodplain Management Study & Plan'* (*2004*) and the proposed land use category of the development under consideration.

The DCP defines three separate types of flood risk precincts for land located within the Probable Maximum Flood (PMF) extent. The three flood risk precincts are defined as "High", "Medium" and "Low", and are shown on Map 1 of the DCP. Map 1 of the DCP indicates that the entire Site is categorised as a "High Flood Risk" precinct.

The proposed redevelopment of the Site will involve alterations and additions to the existing two storey clubhouse so that it can continue to operate as a motor boat club as well as a function centre. A 'function centre' is not a defined use in the BLEP 2001 but could be considered to fall within the definition of a 'recreation facility.' A 'function centre' is also not a defined use in the DCP 2005. In accordance with definitions outlined in DCP 2005, the redeveloped function centre is considered to be a commercial land use.

The proposed development will also involve conversion of the existing pool and associated pool building to a restaurant/café with organic garden. DCP 2005 indicates that this land use could be classified as either commercial or recreation.

Strict application of Schedule 3 of Part E of DCP 2005 indicates that the siting of a commercial land use within a high flood risk precinct, as defined by Map 1 of the DCP, is a "potentially unsuitable land use". However, Item 3 under the General Notes and Controls within Schedule 3 indicates that:

> *"Council can consider a DA for a "potentially unsuitable use" that clearly complies with the objectives of this DCP and with the performance criteria. In this case, prescriptive controls will be applied on a DA specific basis"*

The objectives of Part E3 of DCP 2005 are:

(i) to reduce the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods;

(ii) to apply a "merit-based approach" to all development decisions which takes account of social, economic and environmental as well as flooding considerations in accordance with the principles contained in the NSW Floodplain Development Manual;

(iii) to control development and any other activity within each of the individual floodplains within the LGA having regard to the characteristics and level of information available for each of the floodplains; and,

(iv) to assess applications for development on land that could be flood affected in accordance with the principles included in the Floodplain Development Manual, issued by the State Government.

Accordingly, it follows that a proposal to site a commercial land use in a high flood risk precinct can be considered on a merits basis provided:

- any risk to human life caused by flooding can be managed;
- any risk of increased property damage due to flooding can be minimised; and,
- the proposed development has been designed to accommodate the typical flood characteristics in the vicinity of the site including the depth and velocity of flow, and the proximity to high ground.

4. FLOOD IMPACT ASSESSMENT

4.1 Description of the Site

The Site is located about 750 metres downstream of the M5 Motorway crossing of the Georges River at Milperra. The Site is situated at the western end of Webster Street, which is accessed from Henry Lawson Drive near Kelso Park.

The Site adjoins Deepwater Reserve and fronts the Georges River. It is currently used by the Deepwater Motor Boat Club which operates out of a two storey brick building located on the Site. A swimming pool with outbuilding and a paved car parking area are also located on the Site. The two storey building comprises a non-habitable storage on the ground level and offices and function facility on the first level. The existing paved car parking area is located immediately north-east of the building.

The Site is generally flat and falls with a gentle grade in a southerly direction toward the Georges River. Ground levels vary from an elevation of 3.5 mAHD at the northern end of the site, to an elevation of 1.5 mAHD at the top of the bank of the Georges River. Ground levels in the vicinity of the existing two storey building range from 2.5 to 2.8 mAHD.

4.2 Description of Proposed Development

The proposed development is shown schematically in **Figure 2** and is described as follows:

- Alterations and additions to the existing two storey clubhouse building (*main building*) for use as a function centre with an 800 seat capacity and 900 person cocktail function capacity (*part ground level and all of the first floor*) and expansion of the existing motorboat club area at ground level.
- Conversion of the existing swimming pool and associated pool building into a new 112 seat restaurant with proposed internal service road.
- Construction of a new boat shed with capacity to store 30 small craft in the area between the southern and western boat ramps as well as eight car parking spaces and four coach/bus parking spaces.
- Upgrade to the existing car parking area to provide permanent formalised parking for up to 272 vehicles and provision of spill over parking for 60 vehicles.
- Upgrade to the existing access road inside the site boundary, provision of a flood emergency access route from the site and construction of ancillary infrastructure and services.
- Landscaping of the site.
- Demolition and tree removal as noted on the architectural and landscape plans.

EXISTING MAXWELL AVENUE

PROPOSED FLOOD EVACUATION ROUTE

WEBSTER STREET

PROPOSED SPILLOVER CAR PARKING AREA

PROPOSED RECEVELOPED CAR PARK
272 CAR SPACES

BOUNDARY

OVERFLOW OUTLET

BIO RETENTION BASIN

NEW GATE

SHALLOW OVERFLOW VIA CONCRETE CAUSEWAY ACROSS ACCESS ROAD

EXISTING PATH

CONCRETE CULVERT

VIP PARKING

PROPOSED NEW SERVICE ROAD

PROPOSED ORGANIC GARDEN AREA

LAWN

NEW PORTE COCHERE

EXISTING RAMPS

(EASTERN BOAT RAMP)

GEORGES RIVER

BOAT SHED CAR PARK
8 SPACES

WASTE STORAGE AREA

EXISTING BUILDING

REMOVE POOL

NEW RESTAURANT

EXISTING BUILDING

NEW EXTENSION

NEW BOAT SHED

STAGE 2

MOTOR BOAT CLUB CARPARK

PROPOSED COACH / BUS PARKING 4 SPACES

NEW GAZEBO

RIVERSIDE LAWN

REFURBISH EXISTING RACE CONTROL SHED

EXISTING RAMPS

(WESTERN BOAT RAMP)

REMOVE 2 DEAD TREES

33600
23000
27300
21400
28100
23000
20280
18300
14700

LEGEND

- NEW BUILDINGS & STRUCTURES
- EXISTING BUILDINGS
- NEW PAVED AREAS

SOURCE: AXIL ARCHITECTS DRAWING 266-13 A 1.01 REVISION DA-2 (29.08.14).

10 0 10 20 30 40 50m

1:500 (A1) 1:1000 (A3)

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A	28.02.14	ISSUED TO CLIENT

NORTH

DOLTONE HOUSE DEEPWATER LAYOUT AND EXTENT OF PROPOSED DEVELOPEMENT

FIGURE 02

PLOT DATE & TIME: 3/9/2014 4:01:56 PM
USER NAME: philcornish
LOCATION: W:_INFRASTRUCTURE\PROJECTS\300105\02379 - DEEPWATER MOTOR BOAT CLUB REDEVELOPMENT\110 DRAWINGS\SKETCHES\FIA REPORT\300105-02379-FIA FIGURE 02_B.DWG

The proposed development is to be constructed in two stages. Stage 1 will involve works to upgrade the existing buildings for use of the site as a function centre, restaurant and continued use of the Site as a motor boat club.

These works will include retrofitting of the existing buildings, upgrading of the existing car parking and internal service roads, construction of a flood emergency evacuation route and upgrades to existing services and associated landscaping.

The proposed main building will consist of two storeys including the undercroft area which will be retained at ground level. The proposed restaurant will be a separate building located to the north-west of the function centre and will be constructed on the site of the existing derelict swimming pool outbuilding (*refer* **Figures 1** and **2**).

The proposed floor levels for the main building are:

- Pedestrian entry level via a new Porte Cochere to be located on the eastern side of the function centre and with an elevation of 2.7 mAHD. This is close to the existing ground level in this area which is typically at 2.6 mAHD.
- A first floor with a floor level elevation of 5.8 mAHD.

The restaurant will have a floor level of 3.5 mAHD.

The main building will be constructed around the existing building footprint which covers an area of 1811 m^2 (*comprising existing ground floor 870 m² and existing first floor 941 m²*). The ground floor of the existing building is fully enclosed.

The proposed redevelopment will involve extensions at the northern and southern ends of the existing building at first floor level, with the area beneath these extensions screened but left open as undercroft areas that will house four 20,000 litre rainwater tanks. The area of each extension at first floor level is 279 m^2 (*excluding the external terrace*). However, as the undercroft below these areas will remain open, the net change in the footprint of the existing building will be relatively small.

Similarly, the proposed gross floor area of the restaurant will mirror the footprint of the existing swimming pool outbuilding. Hence, any associated loss of flood storage due to the buildings that are proposed as part of the development will be small.

The existing car parking area will however be modified to accommodate a greater number of vehicles and to more closely align with minimum car parking area surface levels specified in DCP 2005. This will result in the importation of some fill across the carparking area in order for it to be suitably graded for drainage purposes.

The proposed development will also involve raising Webster Street to allow it to function as a flood evacuation route. The raising of Webster Street will involve filling of up to 1.2 metres to construct a raised road formation with batters at 1(V) in 3(H). The potential impact of the filling proposed for the car parking area and the flood emergency evacuation route is discussed in **Section 4.3**.

Approval to construct the new boat shed will form Stage 2 and will be the subject of a separate Development Application (Stage 2).

4.3 Assessment of Potential Flood Impacts

As outlined above, Stage 1 of the proposed redevelopment of the Site will involve retrofitting and extension of the existing club house building, retrofitting of the swimming pool outbuilding, regrading and expansion of the existing car parking area, landscaping of the surrounds and upgrading of Webster Street to enable it to function as a flood emergency evacuation route.

Some of the works associated with these components of the proposal have the potential to impact on flood characteristics along the Georges River. These include:

- the potential for a reduction in flow conveyance due to the increased footprint of the function centre main building;
- a reduction in flood storage associated with filling of the floodplain due to the proposed carpark; and,
- changes to flow conveyance due to the raising of Webster Street so that it can function as a flood evacuation route.

A concept grading plan has been prepared for areas of the site where filling is proposed (*refer* **Figure 3**). This plan indicates that the proposed regrading of the car parking area will increase the general elevation of the car parking area and that a net volume of 4,500 m^3 of fill will need to be imported to the site to achieve the design surface.

Works associated with the proposal to upgrade Webster Street to serve as a flood evacuation route will require the existing road pavement to be raised. The associated filling will involve the importation of an additional 3,500 m^3 of fill.

4.3.1 Impact of Proposed Main Building Upgrade

Plate 1 shows the existing Deepwater Motor Boat Club building viewed looking to the south-east along the alignment of the northern bank of the Georges River. As shown, the existing building is fully enclosed at ground level. Therefore, the existing building would effectively "block out" an area of flood storage equivalent to the plan area or footprint of the building.

The proposed modifications to the building will involve extension of the first floor, which is above the predicted peak level of the 1% AEP flood. The extensions include increasing the floor area of the first floor by approximately 550 m^2. However, the extensions will be supported on columns and the ground floor, whilst screened, will be an unenclosed undercroft. The undercroft area will house four rainwater tanks. The rainwater tanks will result in a minor reduction in flood storage but their proposed position adjacent to the existing structure will mean they will not have any impact on floodwater conveyance capacity.

In that regard, it needs to be recognised that the Site would be classified as a flood storage area. The Site and Deepwater Reserve are located downstream and therefore in the "shadow" of the M5 Motorway embankment (refer **Figure 1**).

PROPOSED CAR PARK

ENTRY ROAD

LEGEND

- F2.40 FINISHED SURFACE
- EXISTING CONTOURS (INTERVAL 0.1m)
- 2.00 PROPOSED CONTOURS (INTERVAL 0.1m)
- PROPOSED BATTER
- CONCRETE CAUSEWAY

NOTE

1. ALL BATTERS ARE 1:3
2. ALL LEVELS IN METERS AHD

5 0 5 10 15 20 25m

1:250 (A1) 1:500 (A3)

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A	28.02.14	ISSUED TO CLIENT

NORTH

DOLTONE HOUSE DEEPWATER
PROPOSED CAR PARK GRADING PLAN

FIGURE 03

PLOT DATE & TIME: 3/9/2014 3:34:05 PM
LAST DATE & TIME: 3/9/2014 3:33:40 PM
USER NAME: phil.cornish
LOCATION: W:_INFRASTRUCTURE\PROJECTS\301015\02379 - DEEPWATER MOTOR BOAT CLUB REDEVELOPMENT\11.0 DRAWINGS\SKETCHES\301015-02379-FIGURE 03_.DWG

Plate 1 View looking south towards the existing Deepwater Motor Boat Club Building

Floodwaters would typically enter the site by overtopping the banks of the Georges River and "backing-up" into the site along the river frontage. There are no known floodways or flood runners that run through the site.

Therefore, the proposed retrofitting and expansion of the building will not result in a material change to conveyance of floodwaters through the site. Nor will it materially reduce the flood storage afforded by the site.

4.3.2 Impact of Filling on Flood Characteristics

Impact of Loss of Storage

Filling of both the car parking area and sections of Webster Street is proposed as part of the redevelopment. The combined volume of fill is estimated to be in the order of 8,000 m^3.

The introduction of this fill to the site will reduce the available flood storage and therefore has the potential to impact on flood characteristics elsewhere in the floodplain.

A volumetric assessment was carried out to determine the impact that the proposed filling would have on flood storage at the site. The volumetric assessment considered the peak 1% AEP flood level at the site, detailed topographic data for the site and fill profiles for the proposed upgrade to the car parking area and the proposed raising of Webster Street. The objective was to estimate the change in available flood storage volume at the peak of the 1% AEP flood.

The volumetric assessment established that the site itself provides approximately 124,000 m^3 of storage at the peak of the 1% AEP flood. This is based on a site area of approximately 4 hectares and an average surface level across the site of 2 mAHD. The total fill volume associated with upgrading the carparking area is estimated to be only 4,500 m^3. Therefore, works associated with upgrading the car parking area represent a 3.6% reduction in the flood storage available at the site at the peak of 1% AEP flood.

This loss of flood storage is not significant relative to the flood storage afforded by the site and the overall flood storage available along this section of the Georges River floodplain. Any impacts will be minor and will be contained within the boundary of the development site. Therefore, the minor loss of flood storage associated with the proposed upgrade to the car parking area will have no measurable impact on flood characteristics along the Georges River.

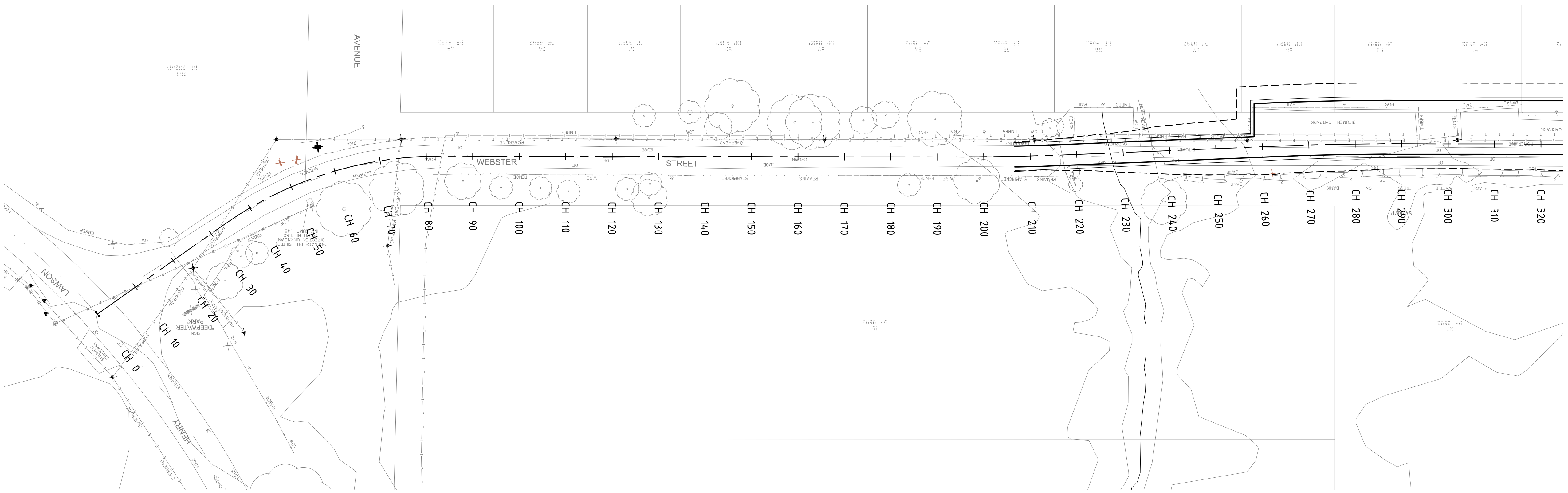
Notably, the Georges River Floodplain Risk Management Study & Plan (*2004*) highlights that filling to form the existing car parking area at the Deepwater Motor Boat Club Site occurred in 1998. The Study indicates that a flood impact assessment was undertaken prior to placement of the fill and that this assessment determined that the filling would result in no greater than a 10 mm increase in peak 1% AEP flood levels.

An increase of this magnitude is considered to be well within tolerance levels for flood impact assessment and is commonly interpreted as a zero net impact on flood characteristics. Due to the similar scale of the works currently proposed for the upgraded car parking area, it is reasonable to conclude that any impacts associated with the filling proposed to form the upgraded car park, will be minor and will be contained within the development site.

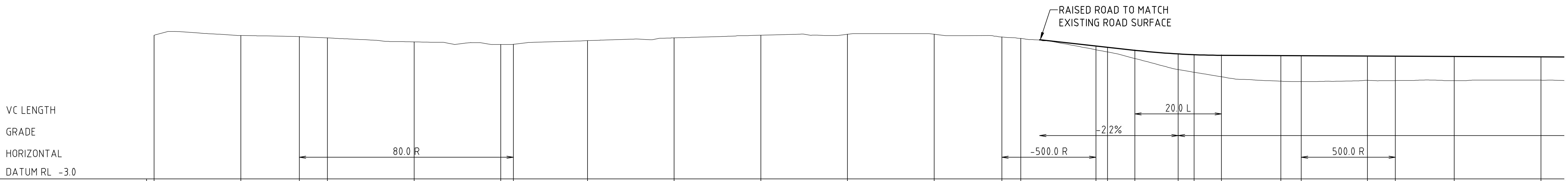
Potential Impact on Flood Conveyance

The proposed raising of Webster Street to allow it to function as a flood evacuation route will involve a slight realignment of the existing road formation and filling along the most westerly 350 metres. The extent of the proposed works is shown in **Figures 4** and **5**. The works will involve raising the road by up to 1.2 metres over a 350 metre length extending in an easterly direction along Webster Street from the entrance to the Site; that is, from Chainages 540 to 200 as shown in **Figure 4**.

The centreline of the existing road is to be realigned up to 3 metres to the south in order to minimise the potential for the raised road formation to impact on vegetation located along the northern edge of Webster Street.



PLAN
SCALE 1:500



CHAINAGE	EXISTING SURFACE	PROPOSED CL LEVELS
0.00	3.62	
20.00	3.61	
33.51	3.56	
40.00	3.50	
60.00	3.32	
80.00	3.20	
82.90	3.21	
100.00	3.37	
120.00	3.50	
140.00	3.62	
160.00	3.67	
180.00	3.67	
195.60	3.54	
200.00	3.47	
217.32	2.95	3.13
220.00	2.85	3.07
226.30	2.55	2.93
236.30	2.04	2.76
240.00	1.91	2.73
246.30	1.71	2.70
260.00	1.50	2.69
264.71	1.49	2.68
280.00	1.54	2.67
286.42	1.53	2.66
300.00	1.53	2.65
320.00	1.55	2.63

PROPOSED UPGRADE TO WEBSTER ST - LONGITUDINAL SECTION
SCALE HORIZONTAL 1:500
SCALE VERTICAL 1:100

1:100 (A1) 1:200 (A3)
1:500 (A1) 1:1000 (A3)

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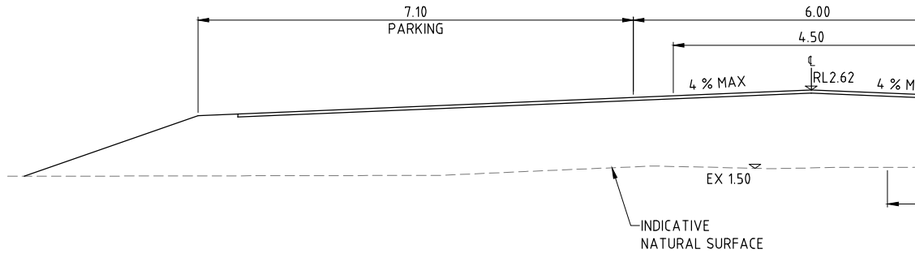
C	03.09.14	ISSUED FOR WEBSTER ST ALTERNATIVE
B	05.08.14	ISSUED TO CLIENT
A	14.03.14	ISSUED TO CLIENT

NORTH

DOLTONE HOUSE DEEPWATER
WEBSTER STREET EVACUATION ROUTE - PLAN & LONG SECTION
SHEET 1 OF 2
FIGURE 4

LOCATION: W:_INFRASTRUCTUREPROJECTS\301015-02379 - DEEPWATER MOTOR BOAT CLUB REDEVELOPMENT\11.0 DRAWINGS\SKETCHES\FIA REPORT\301015-02379-FIA FIGURE 04_C.DWG
USER NAME: phil.cornish
PLOT DATE & TIME: 3/9/2014 3:46:54 PM



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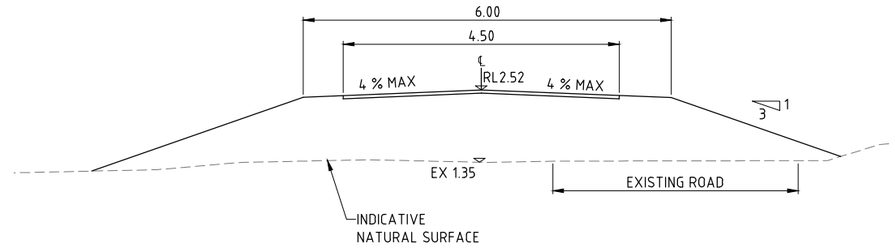
SCALE 1:50



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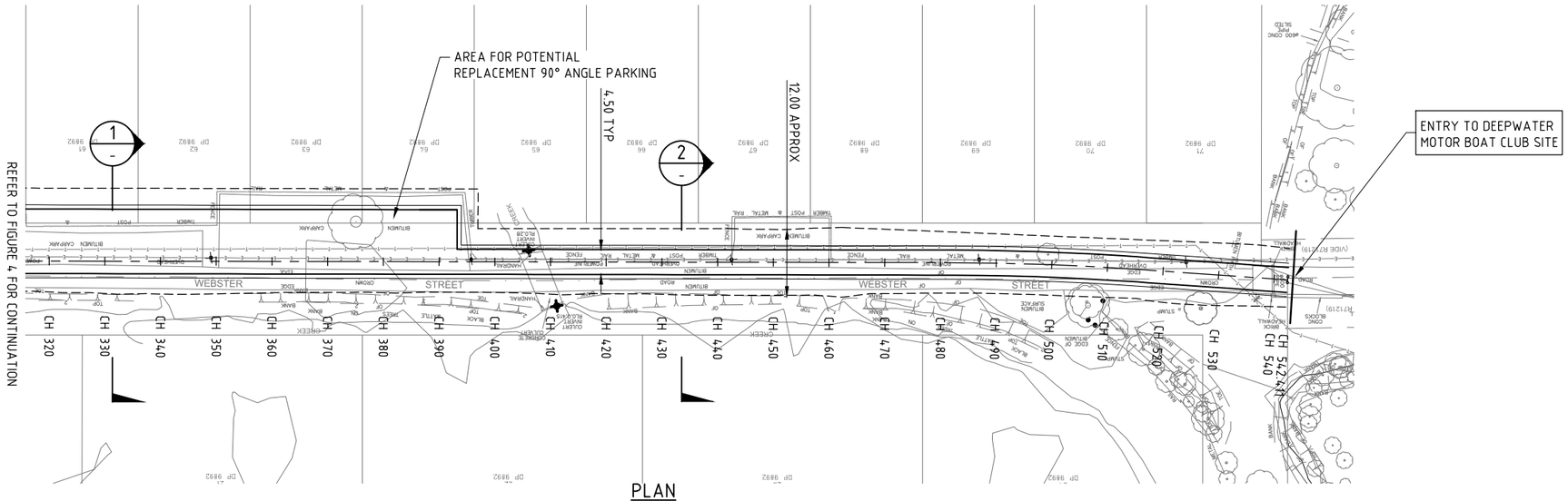
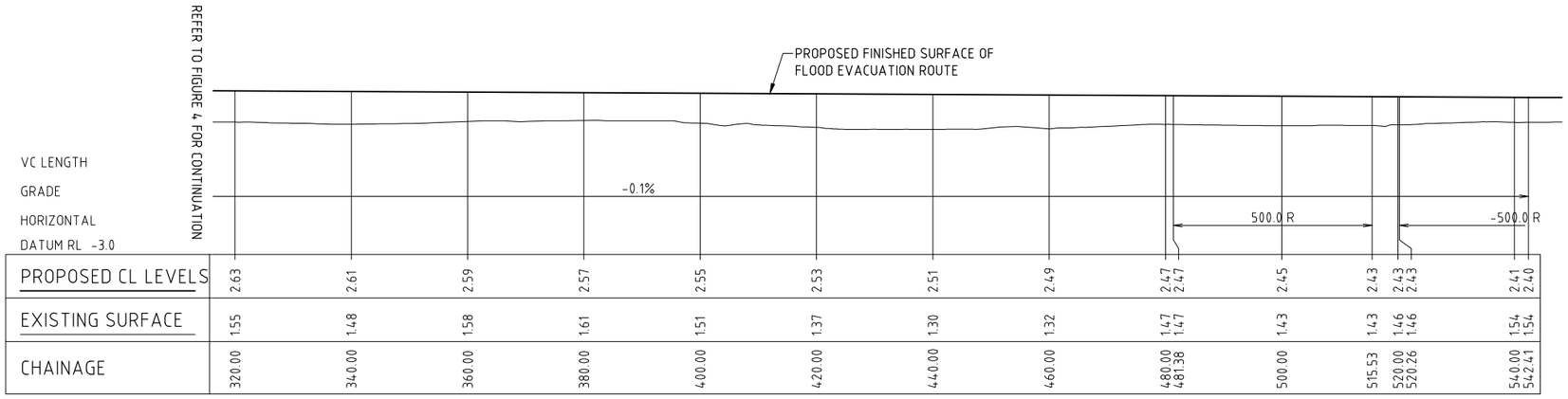


PLAN
SCALE 1:500



CHAINAGE	320.00	340.00	360.00	380.00	400.00	420.00	440.00	460.00	480.00	481.38	500.00	515.53	520.00	520.26	540.00	542.41
EXISTING SURFACE	1.55	1.48	1.58	1.61	1.51	1.37	1.30	1.32	1.47	1.47	1.43	1.43	1.46	1.46	1.54	1.54
PROPOSED CL LEVELS	2.63	2.61	2.59	2.57	2.55	2.53	2.51	2.49	2.47	2.47	2.45	2.43	2.43	2.43	2.41	2.40

PROPOSED UPGRADE TO WEBSTER ST – LONGITUDINAL SECTION
SCALE HORIZONTAL 1:500
SCALE VERTICAL 1:100

2 0 2 4 6 8 10m
1:100 (A1) 1:200 (A3)

10 0 10 20 30 40 50m
1:500 (A1) 1:1000 (A3)

WorleyParsons
resources & energy

OneWay
to zero harm

ISSUE	DATE	ISSUE DESCRIPTION
A	03.09.14	ISSUED FOR WEBSTER ST ALTERNATIVE

NORTH

DOLTONE HOUSE DEEPWATER
WEBSTER STREET EVACUATION ROUTE - PLAN & LONG SECTION
SHEET 2 OF 2

FIGURE 5

PLOT DATE & TIME: 3/9/2014 3:47:18 PM
USER NAME: phil.cornish
LOCATION: W:_INFRASTRUCTURE\PROJECTS\301051\02379 - DEEPWATER MOTOR BOAT CLUB REDEVELOPMENT\11.0 DRAWINGS\SKETCHES\FIA REPORT\301051-02379-FIA FIGURE 04_C.DWG

Figure 5 also identifies an area along the southern side of Webster Street that will be raised to create replacement 90° angle carparking. The area identified is in excess of that which would be required, but has been specified to allow dedication of carparking spaces in areas of least ecological value.

A discussion of the ecological impacts of the filling associated with the proposed raising of Webster Street is documented in a separate report prepared by Anne Clements & Associates.

The section of Webster Street that is to be raised is aligned parallel to the direction of flow of floodwaters carried by the Georges River (*refer* **Figure 4**). In addition, the location of this section of the road within Deepwater Reserve is such that it sits in the "shadow" of the M5 Motorway embankment. As a result, no significant overland flows travel downstream through the reserve during major floods. Flooding of the area typically occurs as backwater flooding from overtopping of the banks of the Georges River along the frontage to Deepwater Reserve. Hence, the raised road embankment will not present as an impediment to overland flows from upstream.

It is noted that there is a tidal connection which links the Georges River to Deepwater Lagoon. This tidal connection is shown in **Plate 2** and incorporates a twin cell box culvert across Webster Street. This tidal connection to Deepwater Lagoon will be retained. Hence, floodwaters in minor events will still enter Deepwater Lagoon in a similar manner to existing conditions.

Therefore, due to the alignment of the roadway and its location in the shadow of the M5 Motorway, the proposed raising of Webster Street will only serve to reduce the available flood storage afforded by this section of Deepwater Reserve. As discussed above, the loss of flood storage is estimated to be less than 3,500 m^3, which is a very small proportion of the flood storage afforded by Deepwater Reserve.

Furthermore, the proposed raising of Webster Street will involve raising it to a minimum level of 2.4 mAHD at its western end and a typical level of 2.7 mAHD. Based on data presented in **Table 2-1**, Webster Street will be overtopped during events in excess of the 20% AEP flood. Hence, the road will become "drowned out" and the filling associated with the road raising will be inconsequential during floods exceeding the 5% AEP event.

Therefore, the proposed raising of Maxwell Avenue will not have a significant impact on flooding through the area.

Plate 2 View looking north towards the existing culvert across Webster Street that links Deepwater Lagoon to the Georges River

4.3.3 Summary

The proposed development involves minor filling of relatively small areas of the site. Filling associated with the proposed upgrade to the carparking area will result in a net loss of flood storage of no more than 4,500 m^3. Filling to raise Webster Street will result in a net loss of flood storage of no more than 3,500 m^3.

The net loss of floodplain storage due to the proposed redevelopment of the Deepwater Site is estimated to be only 6.5% of the total flood storage currently afforded by the 4 ha site.

When considered in the context of the entire area of Deepwater Reserve and the Site (*approximately 16.2 ha*), the loss in flood storage is even less and is estimated to be less than 1.5% of the total flood storage currently afforded by the Site and Deepwater Reserve in a 1% AEP flood. This is a relatively minor reduction in flood storage and will have no impact on floodwater conveyance. As a consequence, the proposed redevelopment of the site will have no measureable impact on upstream flood levels.

4.4 Consideration of Potential Flood Damages

In assessing potential flood impacts, it is also appropriate to consider potential damages that could arise as a consequence of the flooding of the Site post development.

A flood damages analysis is typically based on the depth of inundation across property and buildings. The greater damages are usually incurred when flood damages exceed the floor levels of buildings. The lowest floor level of any building proposed as part of the redevelopment of the Deepwater Motor Boat Club will be the undercroft floor level of the proposed Function Centre. The undercroft or ground floor area of this building will remain at its existing elevation of 2.7 mAHD. As outlined above, the ground floor of this building will continue to be used for administration and boat storage purposes by the Deepwater Motor Boat Club, with the remaining ground floor level areas dedicated to loading dock, new back of house and pre-function facilities associated with the Function Centre. Although it is proposed to flood proof the ground floor of the building, the proposed uses have been designed to ensure any damages related to flooding of the ground floor are minimised.

The first floor of the Function Centre building will retain the existing floor level of the building which has an elevation of 5.8 mAHD. The proposed restaurant is to be constructed at the site of the derelict swimming pool with a floor level at an elevation of 3.5 mAHD.

Table 2-1 lists predicted design flood levels in the vicinity of the Deepwater Motor Boat Club Site. These levels are extracted directly from existing flood investigation reports including a report by FloodMit Pty Ltd which was prepared as a peer review of a previous DA that was lodged for redevelopment of the site.

A comparison of the data presented in **Table 2-1** with the floor levels of the restaurant and ground floor (undercroft) of the function centre building indicates that neither building will be inundated in events up to the 20% AEP flood. In fact, it would take an event of the magnitude of a 10 to 15 year ARI event to lead to any material flood damage to be incurred at the proposed restaurant. A flood reaching a level 700 mm higher than the 1% AEP flood would be required to cause damage to the upper level of the proposed Function Centre.

In addition, the proposed car parking will have a minimum finished surface elevation of 2.4 mAHD, grading up to a maximum elevation of 3.1 mAHD. Therefore, it would take a flood of 20% AEP to cause any material damage to the proposed car parking area.

Hence, it can be concluded that minor flooding of the Georges River will result in a relatively shallow depth of inundation across low lying areas of the site and would not inundate any of the major infrastructure / buildings that are proposed as part of the development, including the car parking area. Accordingly, the flood damages associated with the more frequent floods that could be experienced at the site are likely to be quite small.

A flood damages assessment for the developed site was undertaken to assist in quantifying the potential flood damages. The flood damages assessment was based on the methodology that would be applied to undertake a precinct wide flood damages assessment as part of a government funded floodplain risk management study.

The assessment was based on the peak flood levels listed in **Table 2-1** and an estimated peak flood level of 3.1 mAHD for the 10% AEP event. Note that additional flood modelling would need to be undertaken to reliably estimate the design 10% AEP flood level at the site.

The damages analysis was also based on the areal extent of the buildings within the proposed development and damage costs derived from elsewhere for standard industrial and commercial properties. The results of the analysis suggest that flood damages at the site in a 1% AEP flood would amount to about $35,000 (*in 2014 dollars*) and that the average annual damage for the development would be between $23,000 and $30,000, depending on whether the PMF is considered. These damage costs are well within the financial capacity of the proponent and are considered to be within the financial means of any future owner who seeks to use the development in a commercial capacity.

An analysis of the operating cost of the four Doltone House function centre shows that operating costs (*excluding employee related costs*) range from about $400,000 pa to over $900,000 pa. Of these costs, the repairs and maintenance costs proportion ranges from 53% to 69%. The function centre that is proposed for the Deepwater Site is expected to operate at the top end of these ranges given its substantial site size and the landscape maintenance that will be required.

Based on the annualised notional long term imputed flood damage costs of $23,000 to $30,000 per annum, the flood cost would represent less than 5% of the annual repairs and maintenance budget and only about 3% of the operating budget excluding labour costs. Given that labour costs at function centres exceed other operating costs, the notional annualised flood cost is likely to represent less than 1.5% of annual costs.

It should also be noted that functions centres require constant refurbishment and modernisation. For example, carpet and furniture are replaced at least every 5 years, and bathrooms and kitchens at least every 10 years. Major refurbishments occur every 5 to 7 years. Hence a major flood event, if it causes property damage, would do no more than accelerate the normal refurbishment and replacement cycle.

It follows from an analysis of the operation of function centres that flood risk to this property does not pose an unmanageable potential financial burden beyond the normal operating costs of the centre.

4.5 Consideration of Climate Change Impacts

Council does not currently have a specific active policy or control regarding the potential for future sea level rise as a result of climate change. Council appears to have relied on guidelines specified by the NSW Government.

In that regard, the NSW Coastal Planning Guideline: Adapting to Sea Level Rise was released by the Department of Planning (*DoP*) in August 2010 and highlights the need to consider the effects of sea level rise due to climate change. The guideline refers to the NSW Sea Level Rise Policy Statement published in 2009 by the then NSW Department of Environment, Climate Change and Water (*DECCW*) (*now the Office of Environment & Heritage*), which lists the sea level rise planning benchmarks as an increase above 1990 mean sea levels of 400 mm by 2050 and 900 mm by 2100.

However, since that time the NSW Government has moved away from enforcing a formal climate change policy that requires implementation as part of development proposals. Instead, the onus is placed on Local Government to determine an appropriate response to climate change consistent with projections from the available science.

In 2012, Bankstown City Council engaged FloodMit Pty Ltd to investigate the potential impact of climate change on flood levels within the Georges River. The draft findings from that investigation are taken from a report prepared by FloodMit and are summarised in **Table 4-1**.

This data shows that the impact of the projected sea level risk (SLR) planning benchmarks is not that significant when applied to large floods. The proposed main floor level of the function centre will be at an elevation of 5.8 mAHD, which is above all predictions for the 1% AEP flood level over the planning horizon to 2100.

A nominal 50 year design life is proposed for the function centre, meaning a nominal end of services in 2065 (*approximately*). Interpolating between the current flood level estimate for the site and the 2100 SLR plus increased design rainfall estimate, indicates that the Year 2065 1% AEP flood level at the site would be about 5.4 mAHD.

Table 4-1 Impacts of Climate Change at Deepwater Motor Boat Club Site

ASSESSMENT CONDITION	1% AEP FLOOD LEVEL (mAHD)	HIGHEST ASTRONOMIC TIDE (mAHD)
Existing Condition	5.10	1.1
2050 SLR benchmark (+0.40)	5.15	1.5
2100 SLR benchmark (+0.90)	5.24	2.0
2100 SLR benchmark plus increased design rainfall	5.63	N/A

* Flood data contained in FloodMit Report dated March 2012

This level is 400 mm below the proposed floor level for the function centre. Hence, the potential increase in design flood levels that may manifest due to climate change over the design life of the development is such that the increase will only take up 20% of the available freeboard to the design floor level for the function centre.

The proposed restaurant is to be sited at a level of 3.5 mAHD, which is below the predicted peak level of the 5% AEP flood. It is recognised that inundation of the restaurant will occur during floods in the order of about a 10% AEP event. That is, flooding of the restaurant to above floor level is expected to occur once in every 10 years, on average.

Accordingly, the risk for damage to equipment housed within the restaurant is recognised by the proponent. In that regard, any additional risk posed by climate change impacts would serve to slightly increase the frequency of inundation that could be expected.

Perhaps more relevant is the fact that climate change impacts could result in an increase in the frequency of inundation of the site. However, measures are proposed to provide evacuation from the site via Webster Street which will be raised to a minimum elevation of 2.4 mAHD and to grade in an easterly direction to higher ground at Henry Lawson Drive.

5. FLOOD EMERGENCY RESPONSE STRATEGY

Part E3 of DCP 2005 outlines a range of flood evacuation requirements. These evacuation requirements also influence the design of the carpark. The DCP requires that "*any change in use does not increase flood risk having regard to property damage and personal safety*".

As outlined, the proposed development falls entirely with the "high" flood risk precinct, as defined by the DCP. Therefore, an appropriate evacuation route needs to be identified, consistent with the requirements of the DCP in relation to level, warning time and signage and consistent with the principals of the NSW Floodplain Development Manual (*2005*).

The following outlines the proposed flood evacuation strategy for the site. It is based on two fundamental principles:

(i) That events proposed at the function centre would be cancelled in advance should a Flood Watch be issued by the Bureau of Meteorology that indicates the high likelihood of major flooding of the Georges River; and,

(ii) Should a flood event occur when patrons are on-site at either the restaurant or the function centre, then the entire site would be evacuated in advance of the onset of the flood.

The philosophy for the Flood Emergency Response Strategy is that patrons should not be on-site once floodwaters exceed an elevation of 2.4 mAHD. This Strategy therefore requires a failsafe Flood Evacuation Plan which includes the adoption of an appropriate trigger to facilitate evacuation and a mechanism for safe evacuation to occur.

The following outlines the basis for the proposed Flood Evacuation Plan for the site. A Draft Flood Evacuation Plan for the development is provided in **Section 7**.

5.1 Assessment of Flood Evacuation Potential

5.1.1 Rate of Rise of Floodwaters

The Georges River Flood Study (*1991*) includes hydrographs for the 5% and 1% AEP flood events at a number of locations along the river. Hydrographs plot the change in flood level with time and hence are important when considering the time available to effect evacuation during a flood.

There is no specific flood hydrograph available for the Deepwater Motor Boat Club Site. However, the site is located approximately midway between the hydrographs reported for Milperra (*upstream*) and East Hills (*downstream*). Accordingly, a representative hydrograph based on interpolation between these two records can be developed to assess warning times for the site.

The time available from the start of the design storm to selected thresholds is reported for the 5% and 1% AEP floods in the Georges River Flood Study (*1991*). This data has been reproduced in **Table 5-1**.

Table 5-1 Time from Commencement of Design Storm to Inundation of Development Site

DESIGN EVENT (AEP)	1.5 mAHD (inundation of low lying areas)	2.0 mAHD (inundation of most areas of the Site)	2.7 mAHD (ground floor level of function centre)	Peak Design Flood Level
5%	17 hrs	19 hrs	21 hrs	~28 hrs
1%	15 hrs	17 hrs	19 hrs	~28 hrs

Source: Figure 18, Georges River Flood Study

The information presented in **Table 5-1** indicates that there is approximately 4 hours between the time when overtopping of the banks of the Georges River commences at 1.5 mAHD and when flooding reaches the ground floor level of the function centre which is at an elevation of 2.7 mAHD. This suggests that floodwaters rise at a rate of about 0.5 metres every 2 hours for a typical Georges River flood.

5.1.2 Selection of Proposed Evacuation Route

The site is currently accessed via Webster Street. Access can also occur via Maxwell Avenue but this route is currently closed. A previous development application for the site adopted Webster Street as the preferred route for flood evacuation.

Investigations for the current DA have considered the viability of both routes as options for flood evacuation. The investigations have established that both routes could be upgraded to function as an effective evacuation route for the Site, but would involve earthworks to raise the road surface to a level that would provide sufficient time for safe evacuation.

Discussion of the alternative evacuation routes was undertaken with representatives from Bankstown City Council and the proponent. The discussions considered the capital works costs associated with upgrading both roads and the potential ecological impacts. As an outcome of these discussions and with consideration of the ecological impact assessments undertaken by Anne Clements & Associates, it was determined that if Webster Street was realigned slightly to the south it could be upgraded to function as the evacuation route for the site at least cost and least ecological impact.

Accordingly, it is proposed that Webster Street be realigned and raised to function as the flood evacuation route for the site. To facilitate flood evacuation, Webster Street will be raised to provide an upwardly grading egress from the site, beginning at an elevation of 2.4 mAHD at the eastern end of function centre carpark near the site entry (*refer* **Figure 3**).

5.1.3 Issues Associated with the On-site Carparking

Full compliance with the technical requirements of Council's DCP is difficult to achieve and may in fact be undesirable. It is not practical to consider increasing the elevation of the carparking area (*and access road*) to the 5% AEP flood level of 4.2 mAHD, as this would result in it being "raised" relative to the existing natural surface around the existing main building and the adjoining lands. Apart from the aesthetic impact, a proposal to construct a car park on the site with a minimum elevation of 4.2 mAHD would further reduce the flood storage afforded by the site in events of the magnitude of the 1% AEP flood.

Furthermore, a car park level of 4.2 mAHD would result in an evacuation route that grades downwards in the direction of the M5 Motorway, because sections of Henry Lawson Drive which connect the site to the M5 Motorway and higher ground are at an elevation of only 2.9 mAHD (*in the vicinity of Maxwell Avenue*).

Notwithstanding, the risk of flood damage to vehicles will be minimised if an improved flood evacuation route is provided, even if it the car parking area does not strictly conform to the requirements of DCP 2005.

It also needs to be recognised that cars would not be left in the car parking area during a major flood. That is, it would be built into the flood evacuation plan for the site that all vehicles would be relocated from the site during the onset of any significant flooding.

At the same time, it will be necessary to grade the car park to ensure the paved surface drains in response to runoff from local catchment storms. It is logical that drainage of the paved surface occur in a west-to-east direction which is consistent with the downstream direction of flow in the adjoining Georges River. In addition, the site currently drains to the eastern entry to the site where existing drainage infrastructure carries concentrated runoff via an open channel to the Georges River. The use of this existing drainage system for drainage of the upgraded car parking area will have the least environmental impact.

Hence, the design of the on-site car park needs to be based on a balance of meeting the principals of sound floodplain management and flood emergency response, as well as achieving a practical drainage of the area.

In recognition of these constraints, a grading plan for the car park has been developed that will result in the least filling of the site to ensure sufficient warning time for evacuation of the carparking area and drainage of the paved surface consistent with Council guidelines. The proposed grading plan is shown in **Figure 3** and shows that the carparking area will grade from an elevation of 3.1 mAHD in the west to 2.4 mAHD at the entry to the Site.

5.1.4 Warning Time Required for Evacuation

As outlined in **Section 5.1.1**, it takes 2 hours for flood levels in the Georges River to rise from 1.5 mAHD to 2.0 mAHD. It takes a further 2 hours for floodwaters rise to 2.7 mAHD. This suggests that in the vicinity of the Site, floodwaters rise at a rate of about 0.5 metres every 2 hours. Recorded hydrograph data from the August 1986 flood indicates that this is consistent with the rate of rise of floodwaters recorded during that flood (*PWD, 1991*).

The natural surface of the land surrounding the existing main building is typically at an elevation of about 1.5 mAHD. Therefore, flooding to this elevation would serve as an observable on-site "trigger" that flooding of the area and potentially the site, is likely to occur.

However, adopting an evacuation trigger level of 1.5 mAHD may result in frequent unnecessary cancellations of functions at the site. That is, this level may be reached relatively frequently in response to moderate rainfall in the upstream catchment, but it may not lead to significant flooding at the site.

A trigger level of 2.0 mAHD, which would be physically observed as widespread inundation of low lying areas of the Site and the adjoining Deepwater Reserve, is potentially a more suitable trigger level for evacuation. If a rate of 0.5 metres flood level rise per 2 hours is assumed, there would be about 1½ hours until inundation of the lowest area of the carpark (*which has a design elevation of 2.4 mAHD*). There would be more than 2 hours before commencement of inundation of the ground floor level of the function centre which has an elevation of 2.7 mAHD.

Flood evacuation investigations undertaken by SES for the Hawkesbury-Nepean Valley are based on the assumption that a single lane of road can be used to evacuate 600 vehicles per hour under flood onset conditions. Therefore, a warning time of 1 hour would be sufficient for evacuation of the maximum 340 cars that could be accommodated in the proposed formal car parking areas across the site.

5.2 Adopted Flood Evacuation Triggers

It is noted that the southern end of the car park has been designed to a surface elevation of 2.4 mAHD. This has been adopted to facilitate drainage of the car park and to minimise the amount of filling.

Therefore, the adoption of a trigger level of 2.0 mAHD for evacuation of the car park would mean that there would be 1 to 1½ hours available at the time of evacuation notification before inundation of the carparking area commenced.

Hence, it is recommended that a warning trigger level of 1.5 mAHD be adopted to allow monitoring of flood levels in the Georges River and that an evacuation trigger level of 2.0 mAHD be adopted as the basis for mobilising evacuation of the car parking area.

It is noted that based on the rate of rise data outlined above, an evacuation of trigger level of 2.0 mAHD will still leave 1½ hours for evacuation of all vehicles from the site. This is sufficient time to evacuate the maximum of 340 vehicles that could be housed by the proposed car parking area, based on vehicle evacuation rates of 600 vehicles per hour per lane, as determined by SES in investigations of flood evacuation potential in the Hawkesbury-Nepean Valley.

Details of the proposed mechanism for evacuating the site are outlined in **Section 7** which details the Draft Flood Evacuation Plan for the Site.

5.3 Evacuation Route Capacity

If evacuation of the Function Centre is required during the onset of major flooding of the Georges River, there will be a need to evacuate a maximum of 332 vehicles. The protocols for evacuation detailed in this Draft Flood Evacuation Plan involve vehicles being directed from the carpark along Webster Street, then turning left and travelling along Henry Lawson Drive to the M5 Motorway on-ramp, and from there in an easterly direction along the M5 Motorway to The River Road off-ramp to allow access to the Bankstown City Sports Complex in Condell Park.

It appears that the only roads along the proposed evacuation route that could be congested by other evacuating traffic are Henry Lawson Drive, the M5 Motorway and The River Road. Available mapping shows that the distance from the intersection of Maxwell Avenue to the M5 Motorway is only 350 metres. Therefore, as vehicles egress the Function Centre site they will only have to travel 350 metres before reaching the on-ramp for the M5 Motorway. The M5 Motorway is a multi-lane roadway that has a road surface elevation that is above the predicted peak level of the 1% AEP flood. Therefore, once vehicles reach the M5 Motorway they will be able to travel to the SES dedicated flood refuge via a roadway that will be unaffected by most floods and which will have sufficient carrying capacity, particularly for east bound traffic.

The only road that could present as potentially being congested is Henry Lawson Drive. However, inspection of available mapping indicates that there are no residential precincts in the vicinity of the Deepwater Motor Boat Club site that would require evacuation along Henry Lawson Drive. The area to the east is dominated by the Kelso Park sporting fields and the site of the former Bankstown Tip. The nearest residential areas are East Hills and Panania, which are both located to the south. While traffic could be directed from these suburbs in a northerly direction along Henry Lawson Drive, this is considered to be unlikely because:

(i) Traffic heading north from East Hills along Henry Lawson Drive would need to negotiate low points in Henry Lawson Drive between East Hills and Webster Street which would render this route unsuitable because it would not ensure vehicles travelled on an upwardly grading route.

(ii) The most direct route for evacuation of residents of East Hills and Panania to the Bankstown Sport Complex refuge is via Park Road, Tower Road and then on to The River Road.

Hence, SES is unlikely to promote evacuation of any residential areas south of Webster Street along Henry Lawson Drive.

Therefore, any evacuation of the Deepwater Motor Boat Club site can occur in an orderly fashion and without concerns that evacuation traffic from other precincts along the Georges River will impact on the efficiency of the evacuation.

6. ASSESSMENT OF COMPLIANCE WITH PLANNING CONTROLS

6.1 Deemed SEPP

Clause 9(3) of the *Greater Metropolitan Regional Environmental Plan No 2 - Georges River Catchment 1999* (*the Deemed SEPP*) requires that the following be recognised:

(a) the benefits of periodic flooding to wetland and other riverine ecosystems,

(b) the pollution hazard posed by development on flood liable land in the event of a flood,

(c) the cumulative environmental effect of development on the behaviour of flood water and the importance of not filling flood prone land.

The proposed development is consistent with the aims and objectives set out in Clause 9(3). It will involve only minor filling of relatively small areas of the site. In addition, the culvert crossing of Webster Street that forms the tidal connection between Deepwater Lagoon and the Georges River will be retained. Hence, the benefits of periodic flooding of the wetland areas within Deepwater Reserve will be retained.

The proposed development will also formalise sewer services to the site and will result in the removal of building debris. Therefore, the potential pollution hazard posed by the development will be reduced in the event of a flood that leads to inundation of the site.

The only aspects of the proposed development that could influence flood behaviour at the site are the filling associated with the proposed upgrade to the carparking area and the raising of Webster Street so that it can function as an evacuation route.

The concept design for the proposed car parking area recognises the importance of minimising filling of flood prone land. The design is based on raising the car parking area to an acceptable level for flood evacuation management, while at the same time aiming to minimise the change to the existing landform. The proposed reshaping of this area of the floodplain is required for drainage of the car parking area surface. It will result in a net loss of flood storage of no more than 4,500 m^3.

Filling to raise Webster Street will result in a net loss of flood storage of no more than 3,500 m^3.

The net loss of floodplain storage due to the proposed redevelopment of the Site is estimated to be less than 1.5% of the total flood storage currently afforded by the Site and Deepwater Reserve. This is a minor loss of flood storage and will have no measurable impact on flood behaviour. It will result in no change in upstream flood levels.

Due to the small scale of the proposed filling and the negligible impact that this will have on on-site flood characteristics, it follows that the contribution of the proposed development to the cumulative impact of all existing and potential future development in this reach of the Georges River floodplain will be negligible.

6.2 Bankstown LEP 2001

Bankstown LEP 2001 requires that where development is proposed on flood liable land, the consent authority must:

(i) consider the provisions of any relevant development control plan; and,

(ii) the requirements of any floodplain development manual

Accordingly, in undertaking its assessment, Council needs to consider the requirements of Bankstown DCP 2001. It also needs to consider the tenets of the NSW Floodplain Development Manual (*2005*) and guidelines for development contained therein. A commentary on the alignment of the proposed development with guidelines provided in Bankstown DCP 2001 is provided in **Section 6.3**.

6.3 Bankstown DCP 2005

The following addresses the relevant controls and policies for developments and works within flood risk areas as per Schedule 3 of Bankstown DCP Part E3 Flood Risk Management. The DCP identifies recommended planning provisions for the Georges River floodplain based on "flood risk precinct" mapping and the proposed land use category of the development under consideration.

The Georges River Floodplain Management Study and Plan (*2004*) indicates that the flood risk category of the Deepwater Site is identified as "High". Application of Schedule 3 of DCP 2005 suggests that the land use category for the proposed function centre would be "commercial and industrial", is a "potentially unsuitable land use".

However, Item 3 under the General Notes and Controls within Schedule 3 indicates that:

> *"Council can consider a DA for a "potentially unsuitable use" that clearly complies with the objectives of this DCP and with the performance criteria. In this case, prescriptive controls will be applied on a DA specific basis"*

Hence, it follows that development may be permissible if it can be shown that the development complies with specific prescriptive controls and the objectives of DCP 2005.

The following is an assessment of specific prescriptive flood management controls that apply to proposed development under Bankstown CDP 2005.

6.3.1 Minimum Habitable Floor Levels

DCP 2005 specifies minimum habitable floor levels for different land uses according to the level of flood risk. Typically, minimum habitable floor levels are required to be 500 mm above the design 1% AEP flood level.

As outlined in **Table 2-1**, the design 1% AEP flood level in the vicinity of the Site is 5.1 mAHD. Hence, strict application of the floor level criteria would require the minimum habitable floor level to be 5.6 mAHD; i.e., 5.1 mAHD corresponding to the 1% AEP flood level plus 0.5 metres freeboard.

As described above, the existing building comprises a ground floor level at an elevation of 2.7 mAHD and a first floor level at an elevation of 5.8 mAHD.

The proposed ground floor area of the main building includes enclosed areas that comprise existing and expanded boat storage areas, various amenities rooms, the motor boat club room, pre-function rooms and an office. These areas are below the 1% AEP flood level but typically serve as the existing clubhouse area, storage areas or pre-function areas, to facilitate entry and accessibility to the first floor of the function centre from street level. None of the enclosed area will be used as a habitable area; that is, as an area where people would live or sleep overnight.

Therefore, the habitable floor level of the proposed main building will be at an elevation of 5.8 mAHD, which is above the minimum floor level criteria specified in DCP 2005. Hence, the proposed main building will comply with the minimum floor level requirement of the DCP.

The proposed restaurant is to be sited on the existing concrete slab of the existing outbuilding that adjoins the existing swimming pool. This concrete slab is at an elevation of 3.5 mAHD, which is 1.6 metres below the predicted peak level of the 1% AEP flood. It is recognised that inundation of the restaurant will occur during floods in the order of about a 10% AEP event. That is, flooding of the restaurant to above floor level is expected to occur once in every 10 years, on average. Therefore, the restaurant as proposed does not conform to the minimum floor level criteria specified in DCP 2005.

6.3.2 Building Components and Methods

The proposed minimum habitable floor level for the function centre will have an elevation of 5.8 mAHD as discussed in **Section 4.3.1**. This is approximately 3.2 metres above the existing ground level and 700 mm above the design 1% AEP flood level. DCP 2005 makes no requirement for building component materials for development in areas above the 1% AEP flood level.

The ground floor will be partly enclosed as per the existing building structure and partly open undercroft with a floor level of 2.7 mAHD. The area will be 300 mm above the predicted peak level of the design 20% AEP flood (*5 year ARI flood*) and 1.4 metres below the predicted peak level of the 5% AEP flood (*20 year ARI flood*). DCP 2005 requires that all structures below the 1% AEP flood level are constructed from flood compatible building components.

Accordingly, all facilities below the 1% AEP flood level will be “flood proofed” using flood compatible materials as described in the architectural plans.

The proposed restaurant will be constructed on the slab of the existing swimming pool outbuilding which has an elevation of 3.5 mAHD. This is 800 mm above the design level of the undercroft area of the function centre, but will be 700 mm below the predicted peak level of 5% AEP flood and 1.6 metres below the predicted peak level of the 1% AEP flood.

Accordingly, in order to align with the requirements of DCP 2005, the restaurant will be constructed with flood compatible building components as shown on the architectural drawings.

6.3.3 Structural Soundness

The main building and the restaurant will be designed and certified by a qualified structural engineer to cater for both hydrostatic loads associated with floodwater inundation and impact loading associated with debris carried by floodwaters. As shown on the architectural drawings, the extension to the main building will be supported on columns which will be designed to cater for live and dead loads associated with the proposed usage of the first floor. These design criteria are expected to be more onerous than any impact or hydrostatic loading associated with flooding. Notwithstanding, a brief report addressing these hydraulic loads will be prepared and supplied to address this issue at the detail design stage.

The restaurant building will be constructed from flood compatible materials as shown in the architectural drawings. It will also be designed to cater for impact loading associated with floating debris carried by floodwaters using 1% AEP overbank flow velocities extracted from the flood modelling that was undertaken for the Georges River Floodplain Management Study and Plan (*2004*).

Accordingly, both the main building and the restaurant will meet the structural soundness requirements specified in DCP 2005.

6.3.4 Carparking and Access

As outlined above and shown in **Figure 2**, the proposed car parking area will extend to the north of the proposed function centre and will cover a greater area than the existing car park. DCP 2005 indicates that non-enclosed car parking areas should be no lower than the design ground floor level of the building that the car park will service (*refer Schedule 3, Clause 8 of Section titled "Car Parking and Driveway Access"*). However, this clause goes on to state that:

> *"where this is not practical, a lower level may be considered. In these circumstances the level is to be as high as practical, and, when undertaking alterations and additions, no lower than the existing level"*

A concept grading plan has been prepared for the proposed carpark and is shown in **Figure 3**. This indicates that the carparking area grades from 2.4 mAHD near the entry from Webster Street to 3.1 mAHD near the proposed restaurant (*refer* **Figure 3**).

The carparking area will be constructed to a level of 2.7 mAHD near the entry to the proposed ground floor level of the function centre. This is necessary to ensure functionality in terms of access from the entry access road into the Porte Couchere.

In terms of the criteria for car parking specified in DCP 2005, it should be noted that the proposed redevelopment is an alteration and addition to an existing development and use of the site. Hence, compliance with DCP 2005 can be achieved if the car parking area is no lower than the level of the existing car parking area. As shown in the preliminary grading plan presented in **Figure 3**, the proposed grading of the upgraded and extended car park will not result in any material lowering of the existing car parking area.

DCP 2005 also specifies that *"restraints or vehicle barriers are to be provided around car parking areas to prevent floating vehicles leaving a site during a 1% AEP flood"*. Bollards or barriers are proposed to be installed around the perimeter of the car parking area as a means of delineating the car parking area from adjoining landscaped areas of the site. These have the capacity to limit the floatation of any vehicles that might be in the carpark during minor flooding of the site. However, flooding to the level of the 1% AEP flood will mean that the car parking area will be flooded to depths of up to 3 metres. It is not intended to install bollards to this height.

In that regard, it is not considered good flood management practice to try to contain all vehicles within the site during floods that will result in inundation of the car park. Best practice flood management should aim to evacuate all vehicles from the site prior to and during the onset of major flooding of the Georges River. Adherence to Clause 8 of the Section of Schedule 3 titled "Car Parking and Driveway Access" in this instance is at odds with this best practice approach.

Accordingly, although standard size bollards will be installed, it is proposed that implementation of a flood emergency response strategy as outlined in **Section 5** of this report, occur as a mechanism for minimising the potential for vehicles to be in flooded areas in the first instance.

6.4 Compliance with Objectives of DCP 2005

Strict application of Schedule 3 of Part E of DCP 2005 indicates that the siting of a commercial land use within a high flood risk precinct, as defined by Map 1 of the DCP, is a "potentially unsuitable land use". However, Item 3 under the General Notes and Controls within Schedule 3 indicates that siting of a commercial land use within a high flood risk precinct is possible provided the objectives of Part E3 of DCP 2005 are achieved.

The objectives require evidence that the development proposal will:

(i) reduce the risk to human life and damage to property caused by flooding through controlling development on land affected by potential floods;

(ii) can be considered on a merits basis that takes account of social, economic and environmental as well as flooding considerations in accordance with the principles contained in the NSW Floodplain Development Manual; and,

(iii) is consistent with the principles included in the Floodplain Development Manual, issued by the State Government.

Each of these is addressed in the following.

6.4.1 Potential for Reduced Risk to Human Life and Property

Existing uses of the site currently involve activities associated with the Deepwater Motor Boat Club which is the second oldest continuously racing powerboat club in NSW. The Club has 60 active members and stores approximately five boats on the ground floor of the existing building. Race days are held every two months and can be attended by up to 1,000 people. Currently there are no known protocols for managing flood emergencies.

The proposal to redevelop the site has the potential to bring up to 900 people to the function centre to attend organised functions such as weddings. It also has the potential to bring up to 112 people to the site as patrons to the proposed restaurant. At face value, this will not result in an increase in the maximum number of people that could be on site during the onset of major flooding of the Georges River. However, the number of times that this maximum number of people could be on site in any given year will increase. Hence, the increased frequency of patronage of the site due to the proposed development will increase the risk to human life during floods, if measures to mitigate that risk are not implemented.

As outlined in **Section 5**, a detailed analysis has been undertaken to assess the potential for the site to be evacuated during the onset of flooding of the Georges River. This analysis shows that safe evacuation can occur within available timeframes provided a suitable evacuation route is provided. The development proposal includes provisions for Webster Street to be raised to provide an upwardly grading evacuation route from the carpark entry at 2.4 mAHD (*equivalent to the 20% AEP flood leve*l) to its intersection with Henry Lawson Drive.

This will allow patrons to be evacuated in advance of any flooding of the site via a roadway which at the time of evacuation will not be flooded. Hence, the proposed strategy for managing flood risk is to mitigate any risk by ensuring that patrons are not located on site when inundation occurs.

This philosophy and the protocols outlined above and in the Flood Evacuation Plan documented in **Section 7**, indicate that although the frequency of patronage of the site will increase over a given year, the risk that flooding may present to those attending the site will actually be reduced. Therefore, it is considered that this objective of Part E3 of DCP 2005 can be achieved by successful implementation of the Draft Flood Evacuation Plan.

Objective (i) also indicates that there must be evidence of a reduced risk of damage to property. In this regard, it is noted that the proposed development will involve the retrofitting of existing facilities on the site. As shown in the architectural drawings, those facilities that are below the level of the 1% AEP design flood will be constructed using flood compatible materials. In effect, the ground floor area of the function centre building will be "flood proofed" which will be an improvement on the existing ground floor facilities. Therefore, proposed retrofitting of the function centre building will result in a facility that if flooded would incur less flood damage than an upgraded version of the existing facility.

It is noted that although the proposed restaurant is to be constructed using flood compatible materials, it will have floor level of 3.5 mAHD which will mean that it will be inundated once in every 10 years on average. Hence, there is potential for an increase in flood damage to be incurred within this facility relative to existing conditions or previous land uses.

Notwithstanding, when combined with the main building upgrade, it is considered that the net change in flood damages that could be incurred relative to those that would occur under existing or previous land use conditions is minor.

An assessment of the potential flood damages that could be experienced at the developed site is outlined in **Section 4.4**. This assessment established that the average annual damage for the development would be between $23,000 and $30,000, depending on whether the PMF is considered. These damage costs are well within the financial capacity of the proponent and are considered to be within the financial means of any future owner who seeks to use the development in a commercial capacity.

6.4.2 Compliance with Principles of the Floodplain Development Manual

The primary objective of the NSW Flood Prone Land Policy is to reduce to impact of flooding and flood liability on individual owners of flood prone property, and to reduce public and private losses due to floods. This objective must be considered with due recognition that flood prone land is a valuable resource that should not be sterilized by precluding its development.

At first glance, these objectives appear to be at odds. However, their intent is to emphasise the importance of a merits based assessment of any proposal for development in the floodplain such that development is not precluded by the application of prescriptive assessment criteria.

In this regard, Stage 1 of the Doltone House Deepwater development proposal does not involve any significant expansion to the building footprints that currently exist on site. The proposal to retrofit the existing buildings (*function centre and swimming pool outbuilding*) will not result in any increase in habitable or semi-habitable floor areas.

Similarly, the proposal to upgrade the existing car parking area will not materially change the existing land use opportunity afforded by the car park and which would currently be used on days when the Deepwater Motor Boat Club holds its regattas.

Accordingly, although intensification of use may be interpreted to occur as a consequence of the development, it needs to be recognised that there are existing use rights. These use rights need to be considered in any assessment of compliance with the Flood Prone Land Policy in order to avoid sterilisation of the land.

In that regard, the proposal incorporates measures that are designed to mitigate the potential impact of flooding on both the new infrastructure that is proposed and patrons who will attend the venue. These measures include:

- No provision for overnight habitation of the development, thereby ensuring that no one will be on-site outside designated function periods or operating hours for the proposed restaurant.
- A Flood Evacuation Plan that when implemented will ensure that patrons are evacuated from the site along a route that will not be flooded at the time evacuation is triggered. This is considered to be best practice for flood emergency response management.
- The use of flood compatible materials in all areas of the retrofitted buildings up to the level of the 1% AEP flood.

Therefore, the measures that are proposed to mitigate the flood risk that may occur at the site from time to time are considered to sufficiently demonstrate that the risk to life and property can be minimised, while at the same time allowing site usage to occur consistent with the existing on-site infrastructure.

7. DRAFT FLOOD EVACUATION PLAN

7.1 Functions and Event Cancellation Procedure

The fundamental requirement of the Emergency Response Plan is that all functions at the site would be cancelled and staff and patrons evacuated in the event of a flood related emergency. This is the primary operational requirement for the mitigation of flood related risk to the development.

The Bureau of Meteorology provides up to 12 hours warning for flooding on the Georges River at Milperra Bridge, which is approximately 3 km upstream of the site. This warning is issued to the SES which is responsible for broadcasting flood warnings to the public.

It is recommended that the function centre management be required to monitor the Bureau of Meteorology (*BOM*) website daily to determine any flood warnings or expectations of heavy rainfall either in the vicinity of the site or in the upstream catchment.

The BOM website provides direct access to flood warning predictions and also displays graphs of river heights at Milperra Bridge. These should be monitored daily by the function centre staff.

If flood predictions indicate that a peak level of 1.5 mAHD or greater will be reached, then the planned event will need to be cancelled.

In such an event the site would be "packed up" and closed (*including implementation of the onsite response plan which will include removal of any stored goods from all ground floor areas to safe storage*). All staff and the primary contact for the function would be contacted by phone, SMS and email to communicate the notice of cancellation of the particular function.

Furthermore, the main site entry gate would be closed and locked upon the departure of all staff, and an appropriately lit warning sign would be raised at the gate at Webster Street.

7.2 State Emergency Service Flood Warnings

The SES typically makes a decision to evacuate the area of the Georges River based on a combination of weather warnings, predicted rainfall, fallen rainfall and river gauge measurements.

Discussions with the SES Bankstown Branch indicated that it has responsibility for evacuation of the Georges River area, including the Site. The SES confirmed that it would provide warnings and communicate these to the function centre operators in advance of the onset of flooding. Accordingly, the SES would be provided with a list of all relevant phone numbers to provide redundancy for communications to site management.

SES notification of a potential flood event would occur as follows:

- SES would issue a warning that flooding in the Georges River is anticipated.

- General public warnings would occur via TV news broadcasts, radio bulletins, fax and email to targeted audiences, automatic telephone dialling, mobile public address and door to door personal notification.
- SES would contact the operators of the function centre by phone and in person.
- The warning would come approximately 12 to 15 hours in advance of anticipated inundation of the site and the surrounding areas.
- Following the issue of a warning, the SES would make a decision to commence evacuation, and this would be communicated to the club by phone and in person

In addition, at the onset of potential flooding, the SES typically sends a representative to inspect the site and advise any occupants of the need to evacuate. If flooding occurs during a function, the SES representative would assist the site with communication and advise the timing for the evacuation. The SES has advised that should a decision to evacuate be made following commencement of a site function, there would be ample time to arrange and organise an evacuation without the need to rush.

7.3 Secondary Warning System

The SES warnings and associated evacuation procedures represent the primary response measures for the function centre, following the primary procedure of cancelling a function and closing the site as discussed above.

A secondary warning system will also be installed at the cost of the function centre operators. This would consist of a flood gauge sensor that would communicate a warning directly to the function centre management in case of rising floodwaters. This would act as an additional warning system in case the SES managed system failed.

It is proposed to set the warning sensor to measure water at a level of 1.5 mAHD. This will alert the nominated representative that the flood warning trigger level has been breached. Once triggered, the water level will be monitored and evacuation commenced should the flood level at the site rise to 2.0 mAHD. This will allow sufficient time for evacuation to occur prior to the inundation of the evacuation route (*see* **Section 5**).

In the first instance the warning would consist of flashing lights strategically placed within the function centre and offices which would occur for ten minutes.

In this period flood wardens or other trained staff would be able to investigate the river conditions and ascertain the nature of the alarm and “reset” if it is a false positive. If the alarm is not reset within the 10 minutes it will escalate to an audible fire alarm type to provide an alert to all staff and patrons.

The alarm will be implemented and managed by the centre. It is expected that “false positive” alarms will occur from time to time and the site management will be trained to review and respond appropriately.

7.4 Flood Wardens

Site management would ensure that designated flood wardens are suitably trained and ready for duty at all times during functions.

- Training of the flood wardens would be undertaken by a service provider approved by Bankstown Council and training of wardens and staff would be subject to audit.
- All staff would be trained by flood wardens.
- There should be at least two nominated flood wardens on duty at any time the function centre is in use.
- All staff and flood wardens will have access to torches.
- SES shall notify flood wardens by phone or in person of need for evacuation. Once wardens have been notified they shall commence the evacuation procedure.

7.5 Evacuation Procedure

In the event that flooding occurs during a function at the site, the following protocols will apply:

- Nominated staff monitor flood levels once a flood warning notification has been received from the SES, or alternatively once the flood warning system has been activated by the Georges River reaching a level of 1.5 mAHD.
- Once the river level exceeds the evacuation trigger level of 2.0 mAHD, an evacuation announcement would be made over PA system as follows:

  "Attention patrons, the SES has issued a flood evacuation notice. Stay calm and slowly make your way to your vehicles following all instructions from flood wardens and emergency services personnel. Please have your radios tuned to the local station 89.9FM for updates".

  The announcement is to be repeated twice immediately and at regular (*e.g., five to ten minute*) intervals until all patrons have been evacuated.
- Security staff shall be informed and ready to act under wardens' instructions.
- Flood wardens are to coordinate on-ground evacuation of premises using two-way radios to communicate.
- Staff and patrons shall remain at designated areas until instructed by wardens to leave.
- Patrons with vehicles in the car park would be directed by wardens to exit along the Webster Street evacuation route.
- Patrons who walked or were dropped at the function centre would be transported from the site using bus services owned and operated by the function centre. A staging area for bus loading is proposed in the car park. The destination would be Bankstown City Sports Complex in Bankstown, as the designated SES flood refuge.

- As part of the site response plan, once all patrons have departed the function centre and there has been a thorough check by wardens, then staff would be required to evacuate. Wardens are to undertake a final inspection of all areas to ensure no patrons and staff are remaining on the premises and to relocate any valuable materials from the ground floor to storage areas on the first floor.
- Once all staff and patrons have exited the premises then security is instructed to lock the centre to prevent unauthorised access.

7.6 Evacuation Route

Upon evacuation commencement, all patrons would be asked to exit the site. The evacuation route from the function centre will be as follows:

- Exit the site via Webster Street
- Turn left to head north along Henry Lawson Drive
- Turn right to head east along the M5 Motorway
- Turn left to head north along The River Road to the Bankstown City Sports Complex at Condell Park

Further instructions would then be given by SES to evacuees once they have reached the designated refuge centre at the Bankstown City Sports Complex.

7.7 Evacuation Transport

The proposed formal car park areas have been designed to cater for 280 cars with capacity for spillover car parking for 60 cars. The majority of patrons and employees would be evacuating from the site via their own cars and will evacuate to the Bankstown City Sports Complex, as discussed above, while the remainder will be transported using buses.

Doltone House currently owns three buses which are used to chauffeur patrons to and from pick up points to their venues. A total of 45 seats are currently provided by the three buses and can be made available for use for functions at the site.

During a typical function there is expected to be a maximum of 1,012 patrons and staff at the site, including those dining at the proposed restaurant. About 80% of patrons are expected to arrive by private car, and therefore up to two bus trips would be required to evacuate the remainder. The return trip time to the Bankstown City Sports Centre is about 20 minutes.

Accordingly, buses made available by Doltone House could adequately evacuate patrons from the site during the onset of major flooding of the Georges River.

The buses could pick up patrons at a designated marshalling area within the car park, which will be illustrated on Site Emergency Response signs located across the function centre. The buses will drop patrons off at the Bankstown City Sports Complex as discussed above.

The management and coordination of evacuation by bus would be coordinated by the flood wardens.

7.8 Signage

Signage is an important tool in flood risk management as it promotes awareness amongst the community. They provide graphical illustrations of instructions, which the community and users of the function centre should find easy to understand.

Signage for the Deepwater Function Centre would include:

- The flood evacuation procedure, including evacuation route maps
- Maps of roadways that are susceptible to flooding
- Flood planning level markers located around the site.

The flood evacuation procedure and maps would be located at prominent and well lit locations and shall include contact numbers for:

- Site management and flood wardens
- SES
- Police
- Electricity providers
- Telecommunications providers
- Local radio stations (phones and frequencies)

In the event of a function cancellation or evacuation, signage would be erected at the closed gate ensuring that any visitors or guests arriving are fully informed of the site closure.

7.8.1 Flood Evacuation Procedure Sign

The Flood Evacuation Procedure sign shows a map of the SES preferred evacuation route, evacuation procedures and relevant emergency telephone numbers. Signs shall be placed nearby all ingress/egress points in the function centre in a laminated wall mounted display. This sign would also raise awareness amongst patrons that the car park is subject to flooding and that it should not be used as a refuge from flooding. This plan would also include details of marshalling points for bus pickup.

7.8.2 Flood Planning Level Markers

A flood planning level marker will be installed on *the Webster Street frontage* to the site indicating critical levels such as the 20%, 5% and 1% AEP flood levels of 2.4, 4.2 and 5.1 mAHD. This marker would assist emergency services in judging the height of floodwaters and raises flood awareness within the community. Additional markers and signage would be located throughout the site so that the depths of inundation can be gauged, particularly in areas of the carpark and along Webster Street.

7.9 Staff Training and Education

It is the responsibility of centre management to maintain a register of trained flood wardens and to ensure all other employees are educated in the flood evacuation procedures.

Training of employees as to the evacuation plan shall be undertaken during employee induction. Annual drills would be undertaken to maintain familiarity with the procedures discussed herein.

An important component of the flooding management procedures and evacuation plans is to ensure appropriately trained staff and management teams. This will be achieved by the implementation of flood wardens (similar to the concept of fire wardens). Flood wardens will be appropriately trained by an external supplier who will be vetted and approved by Council. Flood wardens will be available at the site to ensure all provisions and procedures of the plan are followed and implemented at all times, and will be responsible for oversight, coordination and liaison in the event a flooding related evacuation is required.

Building management shall train flood wardens to comply with the following requirements. Flood wardens are to:

- Be intimately knowledgeable with the contents of this plan;
- Be able to train others and induct users of the function hall;
- Have experience using 2-way radios;
- Know the evacuation route and be able to direct others to use it;
- Ensure the SES is able to advise the function centre via phone, sms and email of flood evacuation;
- Undertake regular callout updates of key numbers and updating the emergency plan;
- Have regular contact with SES;
- Know how to control a crowd or be in a position to direct security or others to control;
- Responsible for coordinating the cancellation of any event and ensuring the site is appropriately closed as per the site response plan and all guests notified;
- Have undertaken an emergency response training course, or as a component of another course, and first aid;
- Monitor warning systems including flood gauges, BOM warnings, SES advice and review expected weather forecasts, prior to and during each function;
- Inspect and manage failsafe secondary alarm to review false alarms and response accordingly;
- To arrange maintenance of all systems as required and ensure compliance with the audit requirements.

Further to this all staff on the site will be inducted and will be made familiar with the procedures, roles and principles of this plan.

7.10 Audit Procedure

Each year the building manager will be required to undertake an audit of all staff, facilities and operations to ensure the flood emergency response procedures are effective. An audit record will be maintained and be available for inspection at any time by Council or SES staff. The building manager will also be responsible for the annual training drills and inducting new staff and tenants to the flood evacuation strategy procedures. The audit record is to document all persons who have been trained, including the date and signatures of the trainer and trainee.

This document, along with all appendices, will be reviewed annually in consideration of the audit by building management and will be updated with the release of any updated SES Flood Emergency Sub Plan.

The audit will also confirm that the function centre is on the SES list for notification of warnings and evacuation decisions, and that all contact details are correct.

8. CONCLUSIONS

This report presents the findings of a Flood Impact Assessment that has been undertaken for the proposed redevelopment of the Deepwater Motor Boat Club Site at 30 Webster Street, Milperra. The proposal involves alterations and additions to the existing two storey clubhouse building (*main building*) for use as a function centre with an 800 seat capacity and 900 person cocktail function capacity (*part ground level and all of the first floor*) and expansion of the existing motorboat club area at ground level. Anew restaurant will also be constructed on the site of the existing swimming pool and associated outbuilding. The proposal also involves upgrading the existing car parking area and raising nearby Webster Street so that it can serve as an evacuation route during times of major flooding of the Georges River.

The proposed development involves minor filling of relatively small areas of the site. Filling associated with the proposed upgrade to the carparking area will result in a net loss of flood storage of no more than 4,500 m^3. Filling to raise Webster Street will result in a net loss of flood storage of no more than 3,500 m^3.

The net loss of floodplain storage due to the proposed redevelopment of the Site is estimated to be less than 1.5% of the total flood storage currently afforded by the Site and Deepwater Reserve. This is a relatively minor reduction in flood storage and will have no impact on floodwater conveyance. As a consequence, the proposed redevelopment of the site will have no measureable impact on upstream flood levels.

The proposed redevelopment of the site has also been considered in the context of the potential flood risk to future patrons. A Draft Flood Evacuation Plan has been developed (*refer* **Section 7**) which outlines the key protocols for evacuation of the developed Site should a flood occur during a major function. These protocols are based on analysis of the typical rate of rise of floodwaters for Georges River floods and data available in the literature on vehicle movement times during flood emergencies. The protocols include:

- Designation of appropriate site management responsibilities and procedures for implementation of flood evacuation planning
- Adoption of a local Site Flood Watch Protocol once river water levels reach 1.5 mAHD
- Application of a Site Flood Evacuation Instruction once river water levels reach 2.0 mAHD
- Evacuation of the Site by vehicle (bus or private car) via Webster Street.

In this regard, the upgraded Webster Street will serve as a flood free evacuation route in all floods up to the 20% AEP event. Therefore, overtopping of the upgraded Webster Street is predicted to occur once in every 5 years on average. Accordingly, evacuation of the Site or cancellation of an event is only expected to occur or be required once in every 5 years, on average.

The findings from the investigations documented in this report demonstrate that in the event of a significant flood event in the Georges River, a full evacuation of the site can be completed in less

than two hours, before inundation of critical sections of the car parking area and the proposed evacuation route. Safe evacuation will be facilitated by road raising works along Webster Street.

Doltone House has also demonstrated its commitment to adopt the proposed measures to minimise any risks by:

- The proposal to upgrade Webster Street so that it can function as a flood emergency evacuation route that will connect the site to Henry Lawson Drive and allow orderly evacuation during the onset of flooding of the Georges River
- Commitment to adopt and implement the Draft Flood Evacuation Plan
- The implementation and installation of a secondary warning system
- Training of staff by Council approved experts
- Undertaking an annual audit of flood emergency response protocols with Council and SES

It should be noted that as is customary practice, the Draft Flood Evacuation Plan will be updated during the Construction Certificate phase of the project and finalised as the Adopted Flood Evacuation Plan for submission to Council to secure Certificate of Occupancy. A copy of the Flood Evacuation Plan will also be issued to the Regional Office of the NSW State Emergency Services to ensure that emergency personnel are aware of the protocols that are in place should evacuation of the facility be activated.

Measures that are proposed to mitigate the flood risk that may occur at the site from time to time are considered to sufficiently demonstrate that the risk to life and property can be minimised, while at the same time allowing site usage to occur consistent with the existing on-site infrastructure. Hence, the proposed redevelopment of the site is considered to be consistent with the flood related requirements the Georges River SEPPP, BLEP 2001 and DCP 2005.

9. REFERENCES

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