

Drive Holdings Ltd
Level 1, 3 Owens Road
Newmarket
Auckland

Attention: Mr. D. Osborne

Dear Doug

Mission Bay Redevelopment Coastal and Catchment Flood Hazard Assessment and Design Floor Levels

1 Introduction

Tonkin + Taylor Ltd (T+T) were commissioned in 2015 to undertake a desktop assessment of flooding in Mission Bay to derive design floor levels for a mixed use redevelopment located at the intersection of Tamaki Drive with Patteson Avenue¹.

The flood levels were reported in the following two reports:

1. "Mission Bay Redevelopment – Rev 2; Floor levels, catchment flood hazard assessment and mitigation plan" (T+T letter dated 11 August, 2015)
2. "Mission Bay Redevelopment; Coastal inundation assessment for design floor levels" (T+T letter dated 17 April, 2015, ref 30738)

Since the 2015 reports were completed, there have been changes to both the proposed development and the regulatory framework in relation to the Auckland Unitary Plan. We discussed these changes with the project team in December 2016², and as a result we were requested to update our 2015 assessments and assess an additional catchment modelling scenario modelling one metre sea level rise³. An initial letter (9 February 2017) was provided summarising the flood levels from both coastal inundation and catchment flooding. Additional advice was received from Council relating to design floor levels and required freeboard. This letter sets out that information to present updated design flood levels and recommended floor levels.

2 Flood levels (Coastal and Catchment)

Our review shows that coastal inundation levels incorporating tide, storm surge, wave setup and sea level rise derived by T+T (2015) for Mission Bay remain valid, with no updated technical guidance

¹ 89-97 Tamaki Drive, 6-12 Patteson Avenue and 14-30 Marau Crescent

² Email from Jon Rix(T+T) to Derrick Reelick(Savills) & Sarah Gilbertson(Cheshire), 16 December 2016 8:32. RE: Mission Bay flood and inundation level considerations.

³ Email from Derrick Reelick(Savills) to Karin Speight(T+T), 20 January 2017 10:19. RE: Mission Bay – review of catchment and flood study proposal.

available since this time. It is noted that updated guidance on sea level rise may be presented in the upcoming MFE guidance document due in mid 2017.

In addition to the catchment flood scenarios reported in August 2015, an additional scenario representative of 1m sea level rise has been included. The details of the assessment, including the methodology remain as reported in 2015.

Table 1 summarises flood levels adjacent to the site at Tamaki Drive, Patteson Avenue, and Marau Crescent for:

1. 1% annual exceedance probability (AEP) rainfall event, with allowance for increased rainfall intensity due to climate change and two sea level rise projections of 0.5m and 1m.
2. Coastal levels including tide levels and inundation levels associated with coastal storms

Levels are defined according to Auckland Vertical Datum 1946 (AVD46) and are referred to hereafter as the site reduced level (RL).

Table 1 Catchment flood levels at the Mission Bay redevelopment site

Scenario		Existing	Future (circa 2117)	Tamaki Drive Elevation (m RL)	Patteson Avenue Elevation (m RL)	Marau Crescent Elevation (m RL)
Catchment flood levels*	1% AEP floodplain level	✓		2.7	2.7	3.0
	1% AEP floodplain level (0.5 m Sea Level Rise)		✓	2.7	2.7	3.0
	1% AEP floodplain level (1 m Sea Level Rise)		✓	2.8	2.8	3.1
Coastal water levels	Highest Astronomical Tide (HAT)	✓		1.9		
	Mean high water spring level (MHWS)	✓		1.5		
	MHWS (0.5 m SLR)		✓	2.0		
	MHWS (1.0 m SLR)		✓	2.5		
	1% AEP inundation level (tide + storm surge + wave setup)	✓		2.45		
	Future 1% AEP inundation level with 0.5 m SLR		✓	2.95		
	Future 1% AEP inundation level with 1.0 m SLR		✓	3.45		

*Flood levels are presented for scenarios representing 0.5 m and 1.0 m of sea level rise (SLR) above the RL 1.39 m water level specified in the Auckland Council Modelling Specification (November 2011), with tidal boundaries of RL 1.89 m and RL 2.39 m respectively.

3 Floor levels

Following request from the project team⁴, we have included the following advice on floor levels.

E36.6.1.1. sets the following "permitted activity" standard for "*Habitable rooms in new buildings and additions of habitable rooms (greater than 25m²) to existing buildings in areas subject to coastal storm inundation 1 per cent annual exceedance probability (AEP) plus 1m sea level rise (CSI1)*":

- (1) *Finished floor levels of habitable rooms must be above the coastal storm inundation 1 per cent annual exceedance probability (AEP) plus 1m sea level rise*

Further advice from Auckland Council⁵ suggest than an additional freeboard component of 0.5 m above this level (*to provide for wave action from wind, passing vehicles, wave run-up or overland flow pressure waves etc and uncertainty in the inundation modelling*) will be required. This gives a design flood level for habitable floors of RL 3.95 m.

Specific rules and guidance for non-habitable floors is not provided. The Unitary Plan (E36.9. Special information requirements) suggests that building within the 1% AEP floodplain or 1% AEP coastal storm inundation area plus 1 m sea level rise should be subject to a hazard risk assessment considering the type and frequency of event, the type of activity being undertaken and the consequence and potential mitigation measures. Further advice from Council⁶ suggests that from an engineering perspective, the following aspects should be considered and managed:

- Damage to building e.g. structure and services by inundation, and:
- Effects on persons and activity using the facility e.g. means of escape, entry /access to flooded property, flood management plan in place etc.

Non-habitable floors in the proposed development include: commercial floors along Tamaki Drive, access to the hotel and residential buildings, entry to the basement carpark. Required levels will depend on the tolerable frequency and consequence of flooding and the ability to manage the hazard (i.e. to restrict access to flooded areas, or retrofit flood protection) as sea levels rise in the future (and flooding becomes more likely/frequent).

We recommend that for non-habitable floors where the level can be raised in the future, or where future hazard can be managed to limit consequences (e.g. restrict access when flooding forecast), that levels should be 2.8m RL for Tamaki Drive and Patterson Avenue, and 3.1m RL for Marau Crescent. For the Tamaki Drive non-habitable floor levels, the 2.8m RL is 100 mm above the existing 1% AEP catchment flooding level and 350mm above the existing 1% AEP coastal inundation level. It is also equivalent to a future catchment flooding level (including 1 m SLR). Once sea levels increase 350 mm above present day levels, these activities should be retrofitted or managed to accommodate a further SLR (or as appropriate based on future predictions).

We recommend that for non-habitable floors that cannot be modified or managed to limit consequences at a future date, then a 1% AEP level + 1 m SLR is adopted, i.e. RL 3.45 m.

⁴ Meeting with Project Team and Council 10 February 2017

⁵ Email from Tony Bullard (Auckland Council) to Tom Shand 7 April 2017 Re. Freeboard

⁶ Email from Scott Paton to Quentin Budd 9 March 2017 Re. RE: Mission Bay Redevelopment

Table 2 Recommended design floor level

Situation	Recommendation	Design flood level (m RL)
Habitable floors	1% AEP coastal inundation level plus 1 m sea level rise plus 0.5m freeboard	3.95 m
Other floor levels that can be raised or the effects of flooding managed in the future	Tamaki Drive and Patterson Avenue (based on catchment flood levels)	2.8 m
	Marau Crescent	3.1 m
Other floor levels that cannot be raised or the effects flooding managed in the future	1% AEP coastal inundation level plus 1 m sea level rise (applies to Tamaki Drive and Patterson Avenue only)	3.45 m

4 Closure

This letter summarises flood inundation levels from coastal and catchment flooding. The levels are a combination of the previously reported assessments and an additional assessments carried out for this report.

This report will help to inform floor level discussions, but does not provide a floor level recommendation. A floor level recommendation can be made following Planning advice and following decisions from the property owners about existing and future flood risk.

5 Applicability

This report has been prepared for the exclusive use of our client Drive Holdings Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor Ltd by:




.....
Jon Rix

.....
Mark Thomas

Senior Water Resources Consultant

Project Director

Dr Tom Shand

Senior Coastal Engineer

\\albt\pfile.ttgroup.local\data\rep\aukland\live\tt\projects\1000384\workingmaterial\240417_missionbay_catchmentcoastal_floodlevels.docx