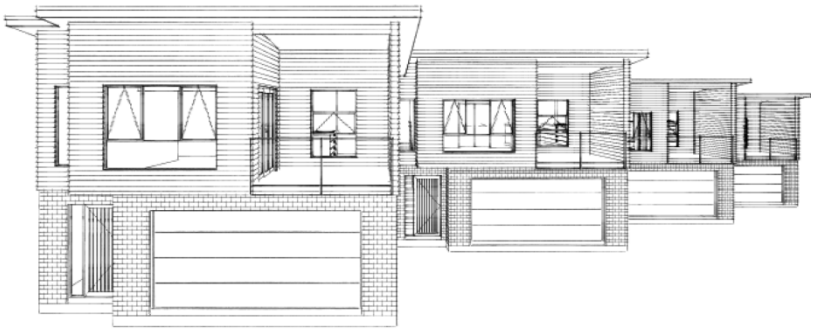
MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Determination 2017/012

Regarding the corrosion zone of a proposed housing development at 16 Tory Way, Omokoroa



Summary

This determination considers the compliance of the proposed building work with respect to durability. The determination includes the expert opinion of a specialist in corrosion engineering, and discusses the exposure and corrosion zones relevant to the site.

1. The matters to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004[1] ("the Act") made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, Ministry of Business, Innovation and Employment ("the Ministry"), for and on behalf of the Chief Executive of the Ministry.

1.2 The parties to the determination are:

- the developer as owner of the site, My New Home Limited ("the applicant"), acting through one of its directors
- Western Bay of Plenty District Council carrying out its duties and functions as a territorial authority or a building consent authority ("the authority")

1.3 This determination arises from conflicting classifications of the corrosion zone as C and D[2] from the authority for the subdivision after a building consent was issued for two single storey dwellings. The applicant's view is that the durability of the proposed construction will comply with the Building Code if built under Zone C requirements.

1.4 The matter to be determined[3] is therefore whether the proposed building work will satisfy the minimum durability periods stated in Clause B2.3.1 if designed and built

[1] The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Ministry are all available at www.building.govt.nz or by contacting the Ministry on 0800 242 243.
[2] Unless otherwise stated, in this determination references to corrosion zones are to those defined in NZS3604:2011
[3] Under section 177(1)(a) of the Act

using Zone C: Medium as defined in NZS3604:2011 as the appropriate exposure zone.

1.5 In making my decision, I have considered the submissions of the parties, the report of the independent expert commissioned by the Ministry to advise on this dispute ("the expert"), and the other evidence in this matter.

2. The building work and background

2.1 The building work considered in this determination consists of 43 proposed houses, with a mixture of single storey detached houses and townhouse units that are situated on a gently sloping site close to a tidal estuary. The subdivision is located in a high wind zone for the purposes of NZS 3604[4].

2.2 The proposed units and houses are light timber frame construction on a concrete foundation. They are proposed with different types of cladding including fibre-cement cladding, masonry veneer cladding, and trussed roofs with profiled metal roof cladding. I note that I have only received the plans for some units and not the entire subdivision.

2.3 The development will be consented under separate building consents, and a building consent was issued for two single dwelling units, Units 13 and 16. It was noted on the drawings, by the designer that the buildings were within a 'sea spray zone' and were proposed to be constructed using NZS 3604 corrosion Zone D requirements. The designer received advice from the builder that the site's proximity to a tidal estuary meant that Zone C was the appropriate corrosion classification. On the 23 November 2016 the designer contacted the authority querying the corrosion zone classification for the consented buildings.

2.4 In an email dated 25 November 2016 the authority responded to the designer stating that it was of the view the site was conservatively classified as corrosion Zone D, unless justification with supporting documentation or an independent second opinion could be provided.

2.5 The applicant responded to the authority in an email dated 28 November 2016 with supporting documentation identifying the location of the building work, and stating the applicant's view that the proposed building work was located in a sheltered inlet and could be constructed under corrosion Zone C.

2.6 On 29 November 2016 the authority responded that the evidence supplied by the applicant did not alter its classification of the corrosion Zone D for the site. The authority stated that the applicant could either obtain an independent review by a suitability qualified person or apply for a determination.

2.7 The Ministry received an application for a determination on 2 December 2016.

3. The submissions

3.1 The applicant provided a letter with the determination application, noting that the BRANZ maps[5] used by the authority to classify the corrosion zone specifically state that they do not define a tidal estuary or sheltered inlet. The applicant is of the view that the building work falls within the classification of sheltered inlet and tidal

[4] New Zealand Standard NZS3604: 2011 Timber framed buildings
[5] BRANZ Maps is an online mapping tool showing the earthquake and corrosion zones for a given address in New Zealand.

estuary zone due to its location relative to the shore. The applicant is of the view that the site should be classified as corrosion Zone C.

3.2 The applicant supplied the following information:

- Definition of corrosion Zone D taken from the BRANZ Map zone information descriptions[6]
- BRANZ corrosion maps (maps of the North and South Island that show BRANZ's interpretation of the exposure zones in NZS 3604)
- Definitions of estuary and sheltered inlet taken from Wikipedia

3.3 The authority acknowledged the determination but made no submission.

3.4 A draft determination was issued to the parties for comment on 14 February 2017.

3.5 The authority accepted the draft determination on 24 February 2017, with additional comments in regards to paragraph 5.2.3, stating:

> It was never [the authority's] intention to enforce the requirement of BRANZ Maps … BRANZ Map was used only as a guide/reference tool.
>
> There is no definition of estuaries in NZS 3604. The definition of "estuaries" is open for interpretation either by the [authority] or by other design professional … Without the benefit of an expert/expert report; the [authority's] definition of "estuaries" can be conservative; and so does the designers in most cases.

3.6 The applicant did not respond to the draft of the determination, but advised by email on 10 February 2017 that he concurred with the view formed by the expert.

4. The expert's report

4.1 As described in paragraph 1.5, I engaged an expert to assist me with the determination. The expert is a Chartered Professional Engineer with specialist expertise in corrosion and is a member of several national and international organisations for corrosion engineering. The engineer reviewed the documentation provided with the application and carried out a site visit on 22 January 2017.

4.2 The expert provided a table identifying the different categories of site corrosivity and their characteristics:

ISO 9223[7]	**AS/NZS 2312:2002[8]**	**NZS3604:2011**		**NZS3404.1:2009[9]**	
C5-M	E-M: Very High	Zone D(E): High	Surf beaches	Sea spray	Within 50 metres of breaking surf
C4	D:High	Zone D: High	< 500m of sea or harbours	Sea spray	50 metres up to 500 metres from breaking surf (or more with prevailing winds). In the immediate vicinity of calm salt water such as harbour foreshores.
		Zone D: High	< 100m of tidal estuaries	Zone 1	Within 1 km of breaking surf or in immediate vicinity of salt

[6] BRANZ Zone Information http://www.branz.co.nz/map-viewer-zone-information
[7] ISO 9223:2012, Corrosion of metals and alloys
[8] AS/NZS 2312:2002, Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings. I note while this version has been cited in NZS 3604 and ZNS 3404, the Standard has been superseded by NZS 2312.1:2014 – Part 1:Paint Coatings, and NZS 2312.2:2014 – Part 2: Hot dip galvanizing
[9] NZS 3404.1:2009, Steel structures Standard – Materials, fabrication and construction.

					water estuaries.
C3	C: Medium	Zone C: Medium	Inland coastal areas	Zone 1	More than 1km from salt water including harbours

4.3 The expert considered the local topography, weather and site corrosivity. In respect of the site corrosivity the expert noted the following:

- The closest distance between the residential development in Tory Way on the Omokoroa Peninsular, and the high water mark of the tidal estuary that forms the upper part of Tauranga Harbour, is approximately 400 metres to the north-northwest (NNW) and approximately 450 metres to the west-southwest (WSW). It is also about 8.4 kilometres southwest from the nearest Pacific Ocean surf beach on the far side of Matakana Island (Figure 1). The site location is elevated and is approximately 35 metres above sea level.

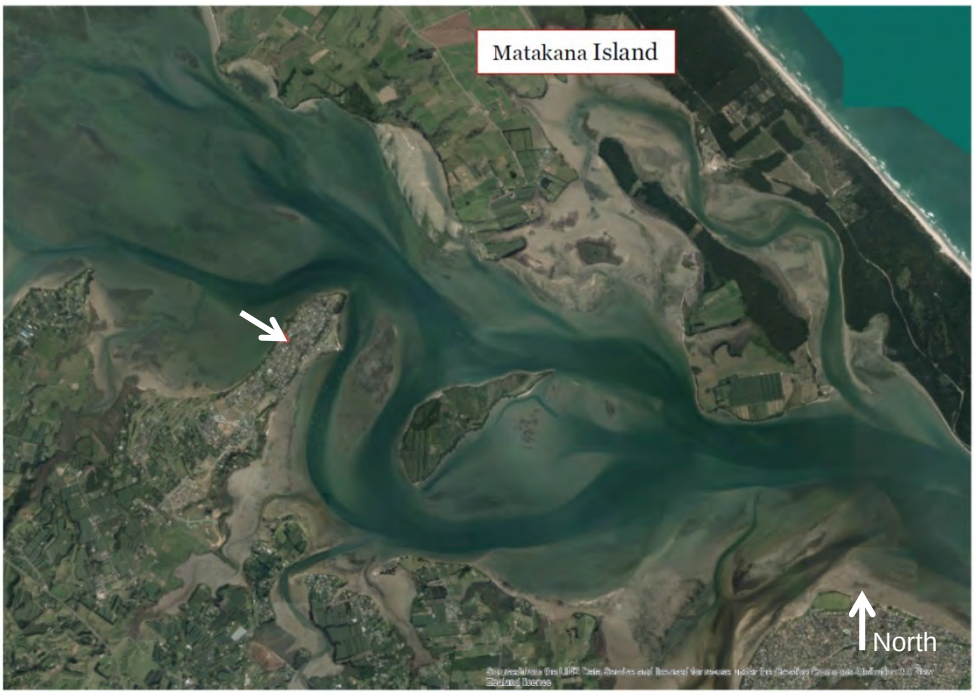


Figure 1: Aerial photograph with site location indicated

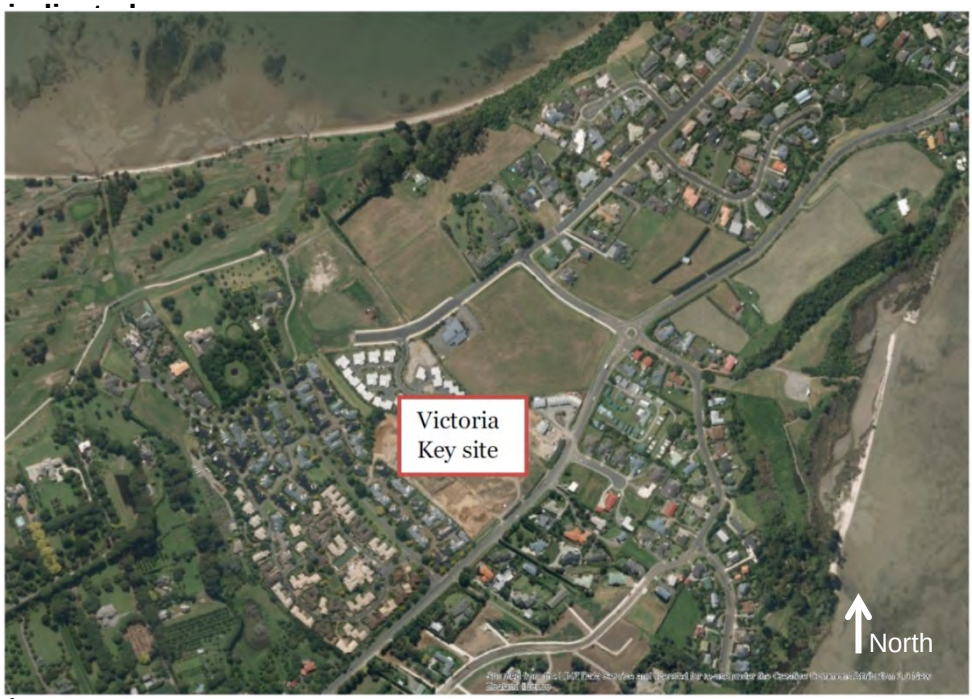


Figure 2: Aerial photograph of the site

- The wave action on both sides of the peninsular is reduced by the shallow water depth that leaves extensive mudflats at low tide.
- The tidal range varies between 1.55m and 1.22m and the area's average annual rainfall is 1350mm.
- The wind generated wave action in the estuary is reduced by the proximity of Matakana Island to the North and Motuhoa Island to the East (both about 1.7km from the peninsular at their closest points).
- The largest adjacent body of salt water is to the Northwest but, there is very little wind from that direction. The expert noted that the prevailing strong wind direction blows off the mainland from the west to southwest.
- In summary, while the site is nearby two large bodies of salt water at high tide, it is some distance and usually upwind from the source of large breaking waves (i.e. ocean and coastal surf beach) where most of the corrosive marine aerosol is generated.
- The ISO category C4 (equivalent to AS/NZS 2312 D: High) is defined by ISO 9223 as having a first year corrosion rate for mild steel of more than 50 microns /year. This rate is greater than BRANZ reported being measured on steel panel mounted on a pier of the Auckland Harbour Bridge (i.e. 390 $g/m^2/y$ which is equivalent to 50 microns/year) and double the rate reported for Tauranga Airport (25 microns/year) and another local test site at Katikati (19 microns/year) that was 1.5km from the harbour. Tory Way, although subject to some wind borne salts at high tide during rare Northerly or Easterly storms, is significantly less exposed to marine aerosol than the Tauranga Airport that is beside and just north of Waipu Bay in Tauranga Harbour and approximately 2km from the Mt Maunganui surf beach. Omokoroa should receive considerably less wind-borne marine salts than this airport which is technically rated as being in ISO category C3.
- The authority has considered the site corrosivity in Tory Way to be Zone D as defined in NZS 3604 because of their interpretation of the BRANZ Maps since the site is within 500 metres of a 'coastline'. This has been taken as the limit of high tides in Tauranga Harbour, but given the BRANZ published corrosivity data for similar sites in the region and allowing for the direction of prevailing winds and the distance from any significant wave action this is an overly conservative classification for the selection of building materials to meet durability requirements of the NZ Building Code.
- Based on the available data discussed above and in the absence of site specific testing, it is the expert's opinion that since the location of Tory Way is much more than 50 metres from the edge of a sheltered shoreline, the site's atmospheric corrosivity category is well within ISO Category C3 (equivalent to C: Medium) and also as defined in AS/NZS 2312.1[10].
- This desk assessment was confirmed in a visit by the expert to Omokoroa on 22 January 2017, where galvanized fittings on power poles beside Omokoroa Road that were estimated to be at least 20 years old were observed to still be in reasonable condition.

[10] The expert has referred to NZS 2312.1:2014.

- Also based on the broad and approximate categories in the New Zealand Standards, the expert was of the opinion Tory Way should be zoned Zone C as described in NZS 3604 or Zone 1 as described by NZS 3404.1, since it is more than 100 metres from the edge of a tidal mudflats and considerably more than 500 metres upwind from breaking surf on the Pacific Ocean coastline.

4.4 The expert concluded that the site should be classified as NZS 3604 Exposure Zone C: Medium.

5. Discussion

5.1 The durability required by Clause B2

5.1.1 The objective of Clause B2 of the Building Code is that a building continues to satisfy all the objectives of the Building Code throughout its effective life, and that includes the requirement under Clause B2.3.1 for the building elements to meet the performance requirements of the Building Code for a period of 5 to 50 years from the date the code compliance certificate is issued.

5.1.2 I note the application of the appropriate exposure zone, in this case using NZS 3604, is used to determine what materials may be used for structural fastenings and the like, in order to satisfy the minimum durability periods stated in Clause B2.

5.1.3 I have not received a complete set of drawings and specifications for the consented building work but this is not critical to the matter to be determined. However, the fixings and materials proposed will be required to comply with Clause B2.

5.2 The exposure zone

5.2.1 Exposure Zone D sites are defined in paragraph 4.2.3.3 of NZS 3604 as 'Coastal areas with high risk of windblown sea-spray salt deposits'. This is defined as 'within 500m of the sea including harbours, or 100m from tidal estuaries and sheltered inlets…'

5.2.2 The BRANZ maps have classified all land within 500m of the coastline as exposure Zone D, and have not taken into consideration the location of tidal estuaries or sheltered inlets. BRANZ states in their map guidance that they have 'not attempted to define what precisely is or isn't a tidal estuary or sheltered inlet, so our maps are technically conservative in those areas.'

5.2.3 However, where there is a tidal estuary (or sheltered inlet) present, NZS 3604 states that exposure Zone D is classified as the area within 100m from the tidal estuary. The expert's report states that the body of water alongside the site is a tidal estuary, and confirmed that the site is located over 100m from the shoreline. The expert has stated that the site is located over 500m upwind from the breaking surf, which is the main source of the corrosive marine aerosol. Therefore, the site should not be classified as exposure Zone D, as it is located over 100m away from the tidal estuary, and has a low risk of windblown sea-spray deposits. The expert has also stated that the site, using the broad definitions from NZ3604 (paragraph 4.2.2.3) and Zone 1 definition from NZS 3404.1, can be classified as being situated in corrosion Zone C.

5.2.4 The authority has stated its decision was based upon paragraph 4.2.3 and 4.2.3.3 of NZS 3604 and not from the BRANZ map. However, I note that the authority in its response to the applicant stated that its classification of the site as corrosion Zone D was 'confirmed/verified also with BRANZ Map...' and it did not take the proximity to the Waipapa Estuary location into account.

5.2.5 I am of the view that the authority should have used the definitions in NZS3604 in conjunction with the BRANZ maps, especially when tidal estuaries are excluded from BRANZ maps classification of corrosion zones. I consider the BRANZ maps a helpful tool for the authority to use in guiding its opinion but I believe it was incorrect to maintain its position on the corrosion zone without consideration of the specifics of the site with regards to NZS 3604 and NZS 3404.

5.2.6 Therefore, I agree with the expert that the site is located in exposure Zone C, and the authority was incorrect to classify the site as exposure Zone D.

6. The decision

6.1 In accordance with section 188 of the Building Act 2004, I determine that the construction if built and maintained according to corrosion Zone C requirements as defined in NZS3604:2011 will satisfy the minimum durability periods described in the New Zealand Building Code Clause B2.3.1.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 6 March 2017.

John Gardiner
Manager Determinations and Assurance

Appendix A: The relevant legislation

A.1 The relevant provisions of the Building Code include:

B2 Durability

B2.3.1 Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

(a) The life of the building, being not less than 50 years, if:

(i) Those building elements (including floors, walls, and fixings) provide structural stability to the building, or

(ii) Those building elements are difficult to access or replace, or

(iii) Failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.

(b) 15 years if:

(i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or

(ii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.

(c) 5 years if:

(i) The building elements (including services, linings, renewable protective coatings, and fixtures) are easy to access and replace, and

(ii) Failure of those building elements to comply with the building code would be easily detected during normal use of the building.