THE LIKELY EFFECT ON THE MARINE ENVIRONMENT OF THE PROPOSED DEVELOPMENT AT SITE 9 KUMUTOTO

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EXECUTIVE SUMMARY

1 The proposed development at Site 9 Kumutoto consists of the construction of a new building on vacant land. The site of the development is situated entirely landward of the shoreline so there would be no direct alteration of the seabed or foreshore.

2 As part of the development, fill will be excavated from the site. It is likely that this fill contains contaminants and therefore there is potential for indirect effects caused by contaminants leaching into the sea.

3 I consider that this development, as proposed, is not likely to significantly affect the marine environment for the following reasons:

3.1 There are no proposed works in or above the marine environment that may result in direct effects;

3.2 The relatively low likelihood of indirect contamination occurring;

3.3 The already contaminated nature of the receiving environment;

3.4 The capacity to mitigate such effects.

PROPOSED NEW CONSTRUCTION

4 The proposed development at Site 9 Kumutoto involves the construction of a building on currently-vacant land. The site is situated to the east of Customhouse Quay and at its the closet point, the foreshore is approximately 14 metres further to the east. No works are proposed in or above the marine environment (Fig. 1).

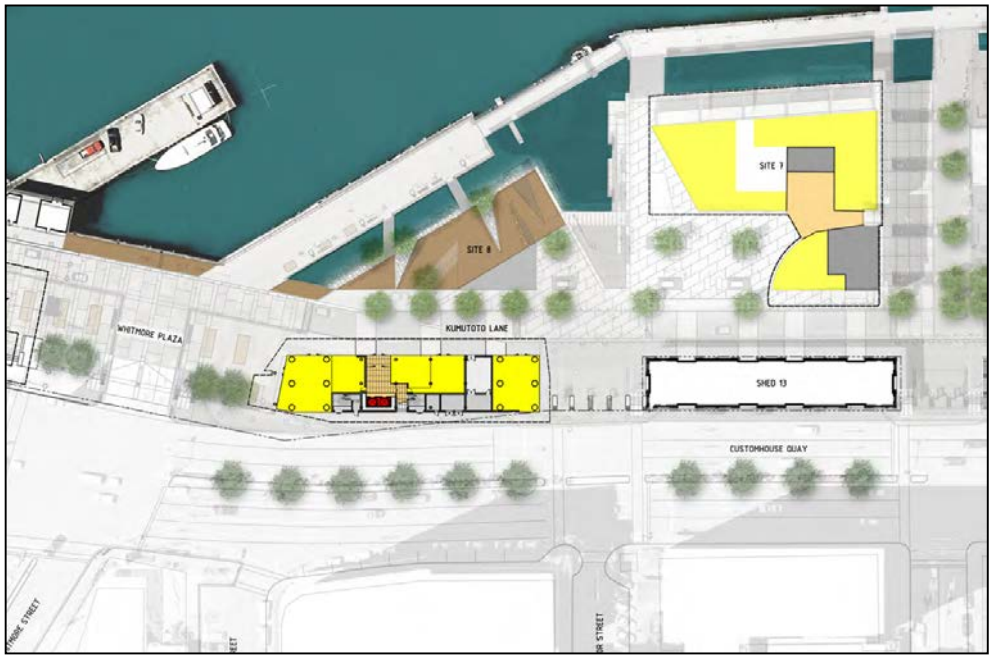

Figure 1. Location of proposed development in relation to Harbour.

5 Some moderate surface excavation of the current site would be required to form foundations which would involve drilling piles to a depth of 10 to 18 metres along the eastern and western edges on the site. Walls would be formed using continuous flight augur piles to form a barrier between the site and the marine environment.

SITE CHARACTERISTICS

6 In 2009, a previous geotechnical investigation at Site 9 encountered reclamation fill to a depth of 3.5 to 6.5 metres.[1] This comprised primarily sands and sandy gravels, but it was noted that some layers of the reclamation fill had a hydrocarbon odour. Below the fill was natural sediment deposits.

7 Six samples were collected at Site 9 and tested for seven metals and two samples were also tested for polycyclic aromatic hydrocarbons (PAH).

8 All samples tested were well below guidelines for commercial use of the site, however background concentrations were exceeded.

POTENTIAL STRESSORS

9 Given the proposed construction would be set back from the foreshore, there will be no direct effects on the marine environment such as piling, other disturbance to the seabed, or alteration of the existing land-sea interface.

10 There is the potential for indirect effects through discharge of sediment and contaminants into the Harbour. Given the limited nature of the proposed excavation and earthworks, I consider that this risk is very low and, for the reasons outlined below, would have a negligible effect on the marine environment.

SEDIMENTATION

Receiving Environment

11 The marine environment adjacent to the proposed development is a relatively small area of intertidal substrate and shallow subtidal seabed at a depth of approximately 1-2 metres below chart datum. The sea floor environment that would be affected is typical soft-bottom substrate comprised of primarily mud and sand.

12 The intertidal and shallow subtidal fauna inhabiting the intertidal zone are species common to most hard substrates in Wellington Harbour and similar temperate environments throughout New Zealand. These include the common periwinkle, barnacles, limpets, chitons, bivalves, top shells, seaweeds, porcellanid crabs and star fish.

[1] Tonkin + Taylor. *Ground Contamination Assessment—North Kumutoto Site 9*. Prepared for Willis Bond and Co. July 2017, at page 6.

13 The species that inhabit the subtidal sediments are common to those found in similar soft sediment environments. The area of the proposed development is not considered to be pristine and has undergone significant alteration as a result of the development of surrounding port facilities and the regular passage of vessels.

Likely Effects of Sedimentation

14 Sediment movement is a key feature of the ecology of shallow soft sediment environments and resident communities consist of organisms that are able to adapt naturally to periodic increases in sediment load. Increases in sediment load occur due to natural events such as turbulence from surface waves and tides and human-induced activities like the passage of ships and storm water discharge. Given the natural changes in turbidity and the low likelihood of significant sedimentation occurring, I consider the effects of any increased sedimentation on benthic organisms would be negligible.

15 It is noteworthy that similar developments such as the removal of the rip-rap and the addition of the balcony at the Union Steamship Building (formerly the Greta Point Tavern); the development to date at Site 10 Kumutoto and Whitmore Plaza have not had any noticeable, long-term, deleterious effects on the biological community.

CONTAMINATED SEDIMENT

Receiving Environment

16 It is well established that the sediments in Wellington Harbour have been subject to contamination from both historical and contemporary human activities.[2] In surveys in 2006 and 2011, concentrations of Cu, Pb, Zn and Hg exceeded nationally-recognised "early warning" guidelines for at several sites within Wellington Harbour.[3]

17 A more site-specific study by Bolton-Ritchie (2003) examined sediment contamination from storm drains in Wellington Harbour and also found elevated metal concentrations associated with all sites studied.[4] One sample site was at Queens Wharf and almost directly in front of the proposed development at Site 9. For all metals, the sample sites associated with storm drains near Queens Wharf were enriched with heavy metals (Table 1).

18 This contamination was primarily attributed to outflow from storm water drains. However, with respect to the Queens Wharf site, Bolton-Ritchie considered the proximity of the site to a refuelling pump and the commercial nature of the wharf area, is likely to also have contributed to elevated heavy metals in associated sediments.

Table 1: Maximum enrichment of sediments in front of the storm drain at the Queens Wharf

	Copper	Zinc	Chromium	Nickel	Lead	Arsenic
Max EF[5]	3.13	1.95	1.29	1.03	3.85	3.4

General effect of contamination

19 The effect of toxic metals on marine biota is not straightforward. Metals found together in sediments can act synergistically or antagonistically in relation to the biota (Ahsanullah et al., 1988; Long et al., 1995; Rule and Alden, 1996; Eisler, 1997). In field conditions, examples of deleterious effects of a specific metal on macrobenthos are comparatively rare (Bryan and Langston, 1992).

20 It has therefore been argued that no chemical measurement reliably predicts sediment toxicity and the use of chemical data to imply a biological effect should not be used except in cases of extreme contamination (O'Connor and Paul,

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2 Oliver MD. 2013. *Wellington Harbour subtidal sediment quality monitoring: Results from the 2011 survey*. Greater Wellington Regional Council, Publication No. GW/ECSI-T-14/2, Wellington.

Stephenson G, Milne JR, Sorensen P. 2008. *Wellington Harbour marine sediment quality investigation.* Greater Wellington Regional Council. Publication No. GW/EMI-T08/83, Wellington.

3 Ibid. at page 64 in Oliver 2013.

4 Bolton-Ritchie LA. 2003. The effect of storm water discharge on the nearshore benthic environment of inner Wellington Harbour. Unpublished PhD thesis, Victoria University of Wellington, 255pp.

5 Enrichment Factor = mean metal concentration in treatment / mean metal concentration in control.

2000). Nevertheless, there is potential for a biological effect where sediment metal concentrations are elevated above natural levels (Long et al., 1995).

Likely Effects of Discharge of Contaminated Sediment at Site 9

21 To some extent, contaminants associated with the excavation fill will be mobilised, and may have already been introduced into the marine environment. The excavation may result in further mobilisation of contaminants, or exposure to the elements, which increases the potential that contaminants could leach into the marine environment.

22 Further mobilisation of sediment is likely to be negligible given the limited excavation work proposed.

23 Two factors further limit the effects of sediment discharge. First, the marine environment in the vicinity of Site 9 is already contaminated with heavy metals. Should any groundwater enter the marine environment this would merely introduce additional contaminants into an already-contaminated environment. Whilst this is undesirable, animals in the vicinity of Queens Wharf already live within and on top of contaminated sediment and are likely to have adapted to some degree to this environment.

24 Second, active mitigation is proposed that would reduce any effects; these are discussed below.

POTENTIAL MITIGATION MEASURES

25 The construction of subterranean concrete walls as part of forming the building's foundations will provide a relatively impermeable barrier that will reduce lateral flow of groundwater that has the potential to add contaminants to the marine environment.[6]

26 Forming these subterranean walls first to the seaward side of the site would effectively dam the flow of any containment into the sea and thereby largely eliminate any contamination entering the marine environment.

27 While this additional mitigation would reduce the likelihood of contaminants entering the marine environment, I do not consider that the proposed development would have a significant effect on the marine environment if it is not employed.

[6] Adam Thornton, pers. comm.

SUMMARY

28 The proposed development outlined above is not likely to significantly affect the marine environment. This is due to several factors including:

- the lack of direct effects on the marine environment due to the terrestrial location of the development
- the relatively small scale of the proposed work and therefore limited likelihood of discharge into the marine environment
- the receiving environment for any discharge being historically degraded by human activity
- the general nature of the marine environment; the seabed fauna being naturally adapted to small-scale disturbance, and such disturbance occurring as part of everyday use of the wharf area
- the common nature of the marine biota inhabiting the seabed in the vicinity
- no evidence of deleterious biological effects caused by similar works in the area immediately to the north and south of the proposed development

Dr Jeremy Helson
5 June 2018

Qualifications and Experience

I hold a Bachelor of Science with Honours (First Class), Doctor of Philosophy in Zoology, and a Bachelor of Laws.

I gained my PhD in 2001 and was a Japan Society for the Promotion of Science (JSPS) postdoctoral fellow at Tokyo University of Marine Science and Technology in 2002–2003.

I am the author of a number of academic publications as detailed below.

I work intermittently as a consultant marine biologist; details of reports that have resulted from such work are listed below.

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