

# RNZ Transmission

## Constraints and Considerations for the Development of land around the RNZ Titahi Bay Transmission Site

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# Introduction

## Background

This document provides the RNZ and Porirua City Council (PCC) a view of the constraints and considerations required when developing any land on or around the RNZ Titahi Bay AM transmission site.

## Context

RNZ has operated a high power AM transmission site from Titahi Bay for over 80 years. As the Porirua region has grown over that time, housing and other developments have been located right up to the boundary of the Titahi Bay site.

While there are opportunities for further development around the Titahi Bay, the presence of a high power AM transmission site places some constraints on the use of the land, and also presents some risks for both the design, construction and occupancy of building structures near the site.

# Constraints and Considerations

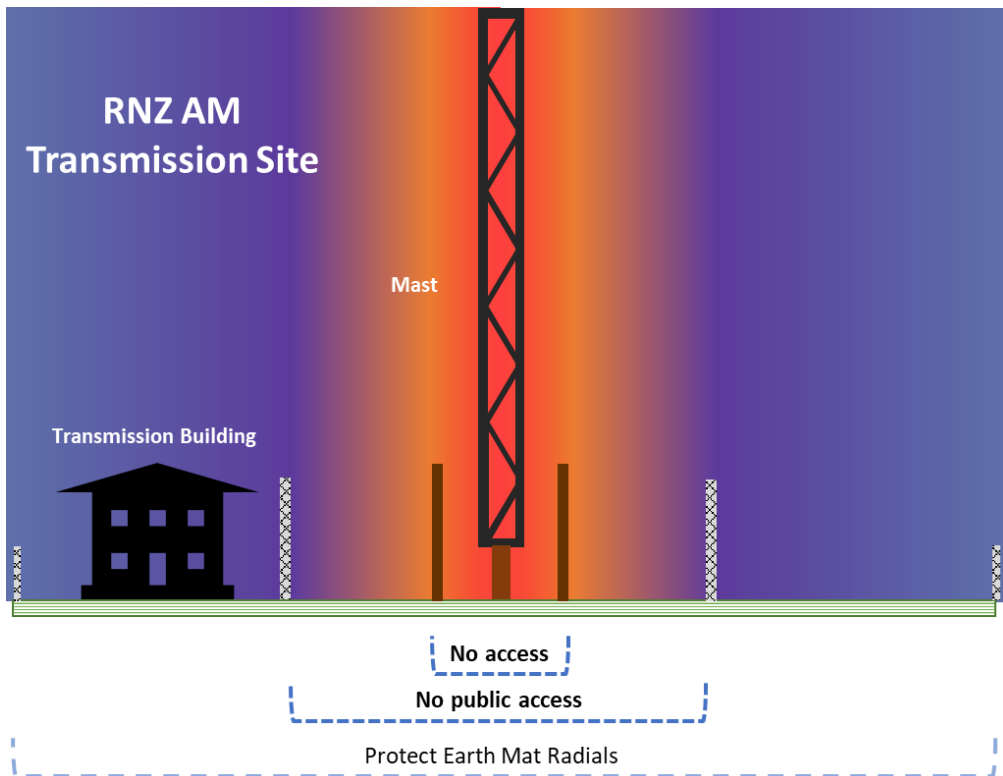
A high-power AM transmission site has several key characteristics that need to be considered when looking to develop land adjacent to the site:

Dimension	Considerations	Type
Visual	<ul style="list-style-type: none"> <li>The AM transmission mast is a 137m high steel guyed mast, which is prominent on the peninsular. The mast also has <i>low intensity</i> aviation beacons attached at 45m, 90m and a flashing <i>medium intensity</i> beacon on top of the mast at 137m.</li> </ul>	<p>Reverse sensitivity: RNZ has permission to install and operate the mast, and while seen by many as a landmark in the Wellington region, others may consider it an eyesore, particularly those living in proximity to the mast.</p>
Audible	<ul style="list-style-type: none"> <li>The AM transmission mast and guy wires generate audible noise in the wind. A detailed analysis was undertaken of the old mast, and the new mast is quieter than the old one</li> <li>In order to ensure continuity of service, RNZ has a large power generator on site that produces noise when operating.</li> </ul>	<p>Reverse sensitivity: While RNZ has permission to install and operate the mast, there is potential objection from people living close to the mast to the noise it generates, particularly in high winds.</p> <p>Reverse sensitivity: While RNZ has a dispensation to operate the generator and to exceed standard noise limits while doing so, people living close to the mast may still not agree with the noise and/or RNZ's dispensation from normal noise limits.</p>
Earth Mat	<ul style="list-style-type: none"> <li>There are 120 copper wires buried ~300mm deep in the earth surrounding the mast out to a distance of at least 212m from the mast. These are required for the correct operation of the mast.</li> </ul>	<p>Land use: As the radials are buried 300mm deep, the land surrounding the mast cannot be used for any non-transmission structures. All current structures on the site are designed to ensure the integrity of the earth mat.</p>
Electro-Magnetic Radiation (EMR)	<ul style="list-style-type: none"> <li>The mast transmits medium frequency (0.5-1.5Mhz) radio waves at high power. While this radiation is non-ionising and not harmful to humans at a cellular level, it can induce dangerous voltages / EMR levels into tall metallic objects such as building framing, wiring, plumbing and roof structures.</li> <li>RNZ manage the very high EMR levels present close to the mast, and protect the public and workers from these, in line with current NZ and international radiation standards.</li> <li>However, structures outside RNZ's immediate control are also potentially subject to EMR coupling</li> </ul>	<p>Compliance with EMR regulations. While actively observed and managed on RNZ sites, EMR risk from transmission sites are not widely understood outside of the industry. Developers of adjacent properties may unknowingly design and build structures which do not meet NZ EMR regulations and are dangerous to both construction staff and occupants of those structures.</p> <p>Reverse Sensitivity: High RF levels can cause issues with the correct operation of household technology, such as remote door openers, radio and TV signals, wifi signals and electronic devices. While the EMR levels may be within regulations, poorly designed home technology devices may not operate correctly, leading to frustration.</p>

## EMR Constraints and Considerations

As EMR constraints and considerations are the least well understood, this section details what they are and where they apply in and around the Titahi Bay site.

The AM site mast emits non-ionising EMR radiation, which diminishes rapidly the further it travels from the mast. Around the mast, RNZ manages the EMR from the mast, in line with NZ and International standards:



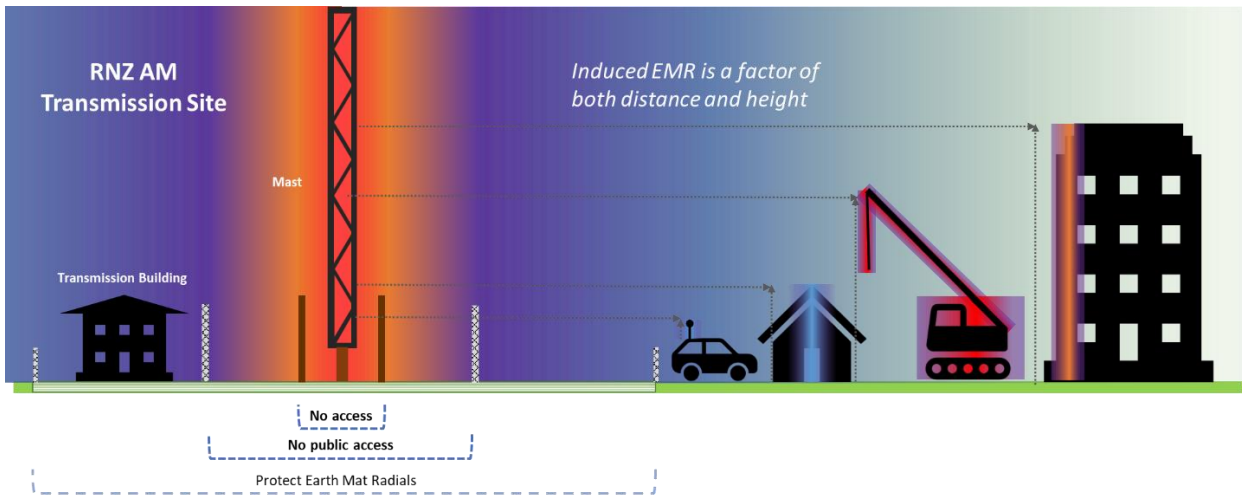
This radio transmission works by the transmitter mast emanating a large Electro-Magnetic radio signal, which induces a very small signal in the receiving aerial, or any metallic object. At a distance this induced signal is very small (e.g. 0.010V/m in urban areas, 0.0005V/m in rural areas) and causes no issue, even when a person directly contacts the receiving aerial or metallic object.

However, very “close” to the mast, within a kilometre or so, this can cause issues as the induced voltage can be high.

In structures, these metallic objects can include:

- Electrical wires
- Copper water pipes
- Metallic downpipes
- Telephone and computer cables
- Reinforcing rod in concrete

The induced EMR is related to how far the object is from the mast, and the vertical length of the object, and is concentrated around these metallic objects:



In terms of the RNZ Titahi Bay site, there are five zones around the mast, the last two of which are relevant to developments outside RNZ’s boundary:

Zone	Responsibility for Managing EMR Risks	Risks Present	Other Concerns
<b>Immediate area around the mast</b> <5m from the mast	RNZ – this area is protected with a high vertical timber fence, barbed wire and is locked shut, with signage to denote the risk of shock and radiation exposure	Severe burns or death if a person were to come in contact with the mast  EMR exceeds internationally agreed levels for trained RF workers at this distance from the mast.	When in operation, no persons are permitted in this area.
<b>Mast compound</b> <45m from the mast	RNZ – this area is protected with a mesh wire fence, barbed wire and is locked shut. There is also signage advising of the non-ionising radiation risk inside the compound.	EMR exceeds internationally agreed levels for members of the public inside this distance from the mast.	Only trained RF workers are permitted in this area when the mast is in operation.
<b>Mast earth mat / RNZ transmission site</b> ≤212m from the mast	RNZ – this area is not protected from the public, other than for general site security reasons, as EMR levels are below public limits.	Risk of EMR exceeding levels when aircraft, tall structures or machinery are used. RNZ manages this risk on a case-by-case basis.	The earth mat must be protected as this ensure the effective propagation of the mast.
<b>In the local vicinity of the site, outside of the RNZ site boundary</b> ≤528m from the mast (≤1 Wavelength Zone)	Current Council District Plan implicitly manages the risk by limiting building structures to 10m or less	Structures >10m <b>will mostly likely</b> result in EMR levels exceeding public limits.  Shocks / burns from contact with large metallic objects, including temporary structures like cranes.	This is also an area where “nuisance” issues can cause reverse sensitivity issues.  <b>Note that new government initiative to permit three storey housing will put occupants at risk if structures &gt;10m are erected.</b>

<p><b>Within ~1km of the mast</b></p> <p>&gt;528m and ≤1057m from the mast</p> <p><b>(1-2 Wavelength Zone)</b></p>	<p>Current Council District Plan implicitly manages the risk by limiting building structures to 10m or less</p>	<p>Structures &gt;10m <b>may</b> result in EMR levels exceeding public limits.</p> <p>Shocks / burns from contact with large metallic objects, including temporary structures like cranes.</p>	<p>This is also an area where “nuisance” issues can cause reverse sensitivity issues.</p> <p><b>Note that new government initiative to permit three storey housing may put occupants at risk if structures &gt;10m are erected.</b></p>
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At distances greater than 1km from the mast, the EMR risks are sufficiently small to not require active mitigation.

## Implications for Development of Sites Adjacent to the RNZ AM Transmission Site

Zone	Permanent Structures	Construction Methods / Temporary Structures / Cranes
<p><b>In the local vicinity of the site, outside of the RNZ site boundary</b></p> <p>≤528m from the mast</p> <p><b>(≤1 Wavelength Zone)</b></p>	<p><b>No structures above 10m (~2 storeys) in height, no exceptions.</b> To be enforced through local council district plan and building consent process. Individual EMR assessments of structures not required.</p>	<p><b>All temporary structures and use of cranes with a vertical height greater than 10m to be subject to a site and equipment-specific EMR assessment and specific work practices to mitigate EMR risks.</b></p> <p>The need for the assessment must(?) be specified in building consent and PCBU managing construction site must ensure it is undertaken.</p>
<p><b>Within ~1km of the mast</b></p> <p>&gt;528m and ≤1057m from the mast</p> <p><b>(1-2 Wavelength Zone)</b></p>	<p><b>The design of any structure above 10m (~2 storeys) in height must include a site-specific and construction materials-specific EMR assessment to ensure the structure does not affect transmission propagation nor expose construction workers or occupants to EMR above NZ standards.</b></p> <p>To be enforced through local council regulations and building consent process.(?)</p>	<p><b>All temporary structures and use of cranes with a vertical height greater than 10m to be subject to a site and equipment-specific EMR assessment and specific work practices to mitigate EMR risks.</b></p> <p>The need for the assessment must be specified in building consent and PCBU managing construction site must ensure it is undertaken.</p>
<p>Outside of the ~1km radius</p>	<p>Assumes construction of any significant infrastructure e.g. Power pylons / cell towers will have an EMR assessment conducted as a matter of course / current council policy.</p>	<p>Relies on major infrastructure industries to be aware of and manage their own EMR risks, as they already do.</p>

For Titahi Bay development adjacent to the RNZ site, the following map indicates those areas:





## Example: Shelley Street Sections

For example, if sections are made available in Shelley street, the sections are no closer to the mast than other sections, but they will be significantly closer to the transmission building than previous occupied / residential sites.

Our two primary concerns for the Shelley Street sites are:

1. EMR concerns, structures on these sites must be restricted to no more than 10m in height
2. Noise concerns from the diesel generator. This can be quantified with an acoustic analysis, similar to the process used previously for measuring mast acoustic noise.



## Management / Mitigation of Issues / Risks

The EMR concerns are manageable as long as the height restrictions are adhered to both during construction and of the final structures.

The Noise concerns from the diesel generator can be mitigated by retrofitting acoustic treatment to the generator, generator hall and the exhaust. This would have to be negotiated as part of any development plan for the area.

# Document Control

## Version history

Date	Version	Changes	Author
20 October 2021	0.1	Initial Draft	Michael Wilson
21 October 2021	0.2	Updates from technical review by Steve White	Michael Wilson
05 May 2022	1.0	Minor updates for release to response document for draft Porirua District Plan	Michael Wilson