

# THE WORLD BELOW

## 400 GHz

The Periodical Newsletter of the  
WAIKATO VHF GROUP Inc.,  
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NZART  
BRANCH 81

[www.zl1is.info](http://www.zl1is.info)

### DECEMBER 2022 ISSUE

#### WAIKATO VHF GROUP EXECUTIVE

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## General Meeting December 2022

The General Meeting of the Waikato VHF Group will be held on  
Sunday, 11th December 2022, 1:30pm  
at the Silver Fern Farms Event Centre, (aka Te Aroha Events Centre),  
44 Stanley Ave, Te Aroha

Our program will be normal business then a mystery movie  
The "WaiPlenty" 2m network on 146.950 will be monitored for anyone requiring directions.

A sub renewal/joining form can be found [HERE](#).

#### Meeting suggestions

- Please don't attend the meeting if you have cold, flu or COVID-19 symptoms, you should get a test. You must stay home until you get a negative result.
- Face masks are encouraged for those attending unless you carry an exemption.

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Repeaters/Beacons

The Waikato VHF Group owns and maintains a number of repeaters and beacons in the greater Waikato and Bay of Plenty area. These are available for sponsorship for a period of 1 year. Please see <http://zl1is.info/sites.html> for a list of repeaters, beacons & links that are currently available for sponsorship. If you are interested in sponsoring one of them, please contact our Secretary (ZL1GWP) or Treasurer (ZL1TAT).

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WaiPlenty Repeater Network - News

**Maungakawa '5575** was re-linked with the other three WaiPlenty network sites and IRLP on 18th November.

A replacement battery plus new charger and Low Voltage Disconnect has been installed at **Te Weraiti**. Antenna system issues at that site are compromising '695 repeater performance until they can be addressed by the site owner, hopefully during this coming summer.

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Who funds our repeaters?

The WaiPlenty 2-metre repeater network along with National System repeaters at Kaimai and Hamilton are funded and operated by the Waikato VHF Group Inc. These facilities don't run on fresh air, but rely on funds derived from **membership subscriptions and donations** to keep them on the air. Annual expenditure includes 14 radio licence fees, electricity and site access payments plus maintenance costs, which last year exceeded \$2000.

For less than fifty cents a week, members of our VHF Group support these facilities thereby helping keep them on the air. If your subscription has lapsed (you won't have been emailed a subscription receipt for 2022), or you know someone using our repeaters who's not currently a member (ask them), how about contributing a subscription payment. Simply complete the membership form included with this newsletter (below), scan or photograph it, and email to [branch.81@nzart.org.nz](mailto:branch.81@nzart.org.nz) to advise your details required to register your membership and reconcile with your payment.

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## HIGH GAIN WIDEBAND VHF ANTENNA by Ian Hutchings ZL2HUT

The early days of NZPO radio links used wideband VHF links in the 80MHz or 150MHz bands to provide 48 voice channels between various main centres. To keep thermal noise low, high signal strengths were required, up to 1mV ideally for a fully loaded system. This allowed for some fading on the long paths used, some exceeding 100km. Measurements between Mahanga Rd (Mahia) and Kahuranaki (Hawkes Bay) sites showed fading in excess of 20 dB in the 150 MHz band on a 120km over-water path. A 20dB drop in signal level gave a 23dB rise in noise levels on the voice circuits.

Another system requirement was for well-matched antenna to avoid reflections which caused intermodulation noise in the derived voice circuits. The requirement was for a VSWR of 1.1:1 or a return loss of 26dB. So, the use of well matched, high gain antennas was a must for good performance and it was up to the installers to achieve it.

The antennas used were either yagis or rhombic types, with yagis or stacked yagis being used for individual transmitters or receivers, and the rhombic types for combined transmission and reception. The yagis were made for a frequency range but then individually matched to the required frequency by stubs in the feeder cabling and were therefore only suitable for operation on a single frequency. There were several types used for various levels of gain required including:

- 4 element
- 6 element
- Dual (stacked) 4 element
- Dual (stacked) 6 element

Obviously as the array size increased, so did both the gain and the physical mounting structure.

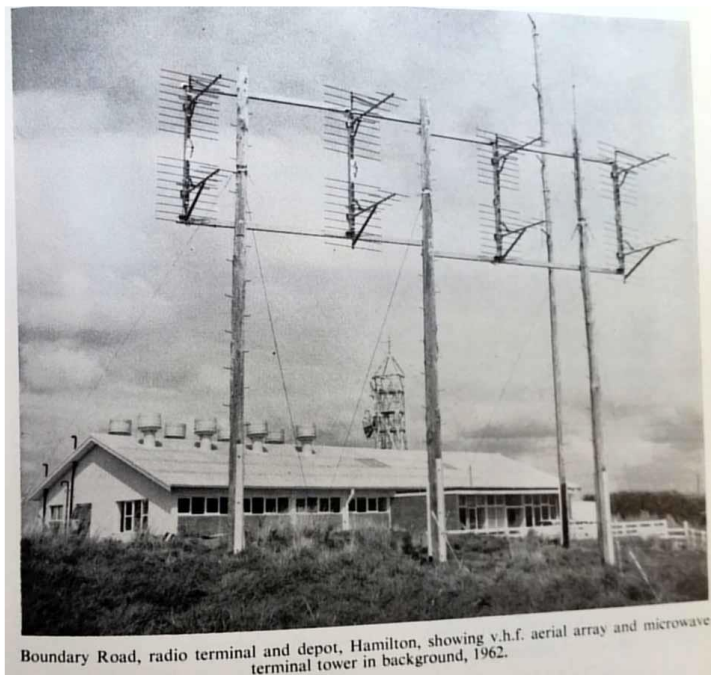
A dual stacked 6 element array could offer perhaps 14dBd gain, but was really only physically practicable in the 150MHz bands. A site would need 4 such antennas (for transmission, reception, for both main and standby equipment).

The photograph shows four stacked yagi arrays at Hamilton for the 150MHz band on the link to Paeroa. This array initially went directly to Paeroa (60km) but fading necessitated a repeater at Tahuna.

To achieve a higher gain and better resilience against weather, rhombic antenna became the norm wherever there was space. While not in the photograph, the Hamilton site also had a 7-pole support system

for two rhombic antennas heading to Rotorua.

The rhombic antennas were large arrays, with the length of each of the four "legs" being several wavelengths in length. At the 80MHz mid-band frequency the three physical NZPO designs had a leg length of between 5 and 12 wavelengths, necessitating a space between



150 and 300 feet (91.4m) for a single rhombic. The design for 150 MHz had a leg length of 11 wavelengths, requiring a 150 foot (45.7m) space.

The designs were terminated at the far end, which made them unidirectional with gains of 17 ~ 20dBd. The size in relation to a wavelength made them essentially wideband and suitable for good matching across the band used for transmit and receive frequencies. In some cases, where two systems were deployed, both were multiplexed onto a single wideband rhombic antenna.



*WELD CONE - MARLBOROUGH*

There are four rhombics in total on this site, but only the south facing two and part of one north facing antenna are visible.



*MT ALBERT - WELLINGTON*

More space devoted to antenna poles than to the equipment building! There were 4 rhombic antennas, two to Weld Cone (and onto Christchurch) and two to Seddon.

Combining a transmitter and receiver onto a rhombic was relatively straightforward as the radio equipment included cavity filters which, while designed to protect the receivers and remove transmitter harmonics, also allowed for two quarter wave sections to be used to a common point which fed to the antenna. The quarter-wave to the receiver was based on the transmitter frequency, providing maximum rejection of the transmitter, while the transmitter quarter-wave was based on the receive frequency. The antenna installation specification required a positional accuracy of 4 inches (100mm) for each support pole to make sure the high gain was directed where it was intended.

Those were the days! ZL2HUT

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The above article is reprinted from the Wellington VHF Group magazine "Q-Bit" with the author's permission. Equipment and antennas referred to in it were in service from the 1950s through to 1960s.

Additional notes by ZL1TAT

"Boundary Road" referred to under the "radio terminal and depot photo" (1<sup>st</sup> photo) was renamed "Newcastle Road" in 1958<sup>1</sup>. The present Boundary Road is across the other side of

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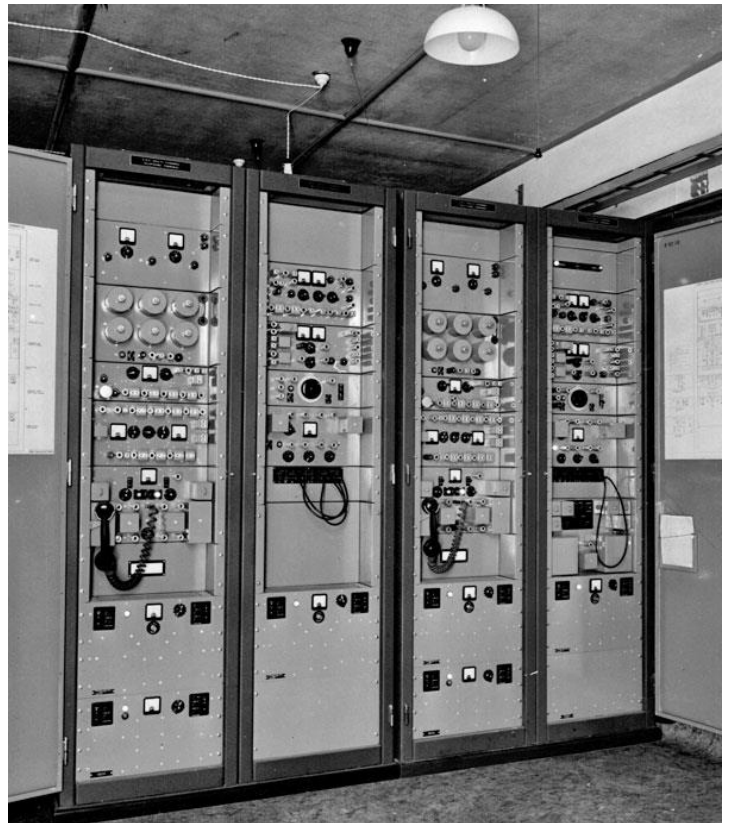
<sup>1</sup> [https://en.wikipedia.org/wiki/List\\_of\\_streets\\_in\\_Hamilton,\\_Waikato#Dinsdale](https://en.wikipedia.org/wiki/List_of_streets_in_Hamilton,_Waikato#Dinsdale)

Hamilton running from Victoria Street to Five Crossroads, being the boundary between Hamilton East and Claudlands.

48-channel VHF equipment used by the Post Office in various locations throughout New Zealand was (model HM100) manufactured by Marconi Company Ltd, UK.

The 60km direct radio path between Hamilton (Newcastle Road) and Paeroa (Bennett Street) is not line-of-sight (obstructed by Hangawera Range N/W of Morrinsville), so was split into two LOS hops by installation of a repeater at Waiti Road, Tahuna. Waiti Road no longer exists as a radio site, after its Land-Mobile channels relocated to Maungakawa (where '5575 is now).

Repeater equipment at Waiti Road would have looked like that in this photo, with two cabinets housing the Hamilton facing terminal, and the second two housing the Paeroa facing terminal.



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## Translation guide

**understanding statements made at used electronics and ham sales:**

"Untested" I know it's broken, I know it can't be fixed and I want it gone.

"Tested. Powers on" but it does nothing else.

"Cord not included" Popped the circuit breaker in the house, so I cut off the cord.

"For parts or repair" I broke it myself.

"Low transmit" Held the PTT with no antenna connected.

"Realigned" Now it doesn't work.

"Never used" Because I bought it on eBay and it was Dead On Arrival.

"Only used it once" My kid used it and broke it.

"Rare" I've never seen one before - it's probably an orphan.

"Vintage" Has vacuum tubes. Some may even light up.

"May need work" Definitely needs work.

"No Returns" I let the factory smoke out, so now its junk.

"No microphone" It was sold on eBay. The mic was the only part that worked.



