

Dove Radio Communications Waterview Connection Project



Steve Wicker

Dove Radio Communications

Scale of the Project

To supply and maintain a tunnel radio communications system during the construction phase of the Waterview Twin 2.4km Tunnels project being built by the Well-Connected Alliance Team.

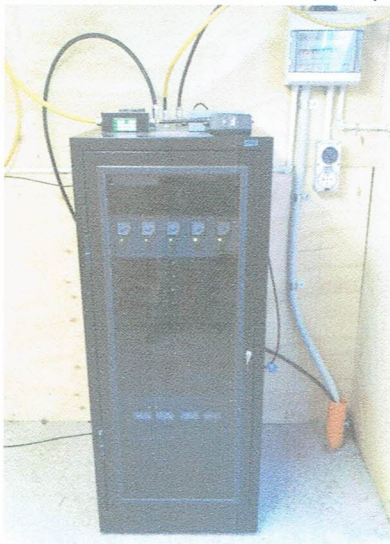
The communications requirements for the project meant the use of a leaky feeder radio headend unit, portable, mobile and base radios being utilised.

The equipment needed to be rugged and reliable as the environment in which it was being deployed would be an extreme test of any manufactures claims for performance and durability of their product.

Quick Facts

- 7 x Tait TB7100 Repeaters
- Over 100 TP8100 / TP9300 Portable Radios
- Over 100 Hytera TM610 Mobile & Base Radios.
- More than 10km of Leaky Feeder Cable
- 25+ Bi Directional Amplifiers

McConnell Dowell as an Alliance partner supplied an existing VHF Headend unit.



Scope & Challenges faced

As the project involved two tunnels, planning for the communications in the first tunnel was relatively straight forward. As with all modern tunnel building a TBM (Tunnel Boring Machine) was used. With the TBM continually moving, a special rotary coupler was utilised so that the leaky feeder cable could be rolled out from a drum position on the machine.

The overall communications requirement for the project was to include an above-ground coverage for approximately 500m of the north and south portals.

Communication with the NZ Fire Service as emergency responders in the event of an incident required a cross-band link between the Fire Service UHF & tunnel VHF radios. This was installed as a quiet Emergency Response Team (ERT) Channel so that any two-way conversations were isolated from the site wide emergency communications channel.

At the completion of the first tunnel the TBM would be turned around so that it could bore the second tunnel in the opposite direction. As part of this process 16 cross passages would be constructed and this meant that the headend unit would need to be moved from the southern portal and reinstalled so that the leaky feeder cables in tunnels 1 & 2 ran in parallel.

In addition to the two tunnels was the construction, one in each tunnel, of a service culvert beneath the roadway approx. 2.5 x 2.5m. The culvert is for the distribution of the heavy power requirements throughout the tunnels. During the construction phase of the tunnels and in event of an incident, the culverts can be used as an escape passage or to allow entry into a partially completed tunnel by the emergency response team. For this purpose, the radio communication in the culverts was critical.



Delivery of Project Solution

Dove Radio arranged to have the headend unit delivered to our Hamilton workshop in advance of the project starting so that the assembly and testing of all equipment could be done in a controlled environment prior to delivery onsite.

Dove Radio, partnered by two local radio contractors, commissioned over 100 mobile/base and portables radios in just three days.

When the radio system was turned on it achieved all its design functionality.

Additional/Ongoing requirements

Dove Radio had built a strong relationship with the client and soon became their go-to people when there was the need for ongoing solutions.

The first of these was the supply of a Sonetic stand-alone Vox Headset System interfaced with the radio system, so that in the case of an emergency, the workers using the Vox headset could hear an emergency broadcast announcement. The Sonetic System was set up on the TBM and was used by the ring segment placement team who needed to be able to communicate with each other, as their communication needed to happen without the interruption of an open channel as is common in most mines and tunnel projects. Proof of the success of the system came when one of the four headsets got damaged and the team tried to continue without the Sonetic's system by using one of the spare radio channels. As soon as the production team realised that the ring placement team were falling behind with their allowed time for completing the ring placement, Dove got the SOS call; quote "Do what it takes to get this System working again," which Dove duly did and productivity of the ring placement team was quickly back on track.

A requirement for the health and safety team was for a PA type system to be installed in a purpose-built people mover vehicle; in effect this was a converted segment moving vehicle with two refuge type compartments installed. We installed a portable radio with an RSM mounted in an in-vehicle charge into each compartment. The radios were programmed to talk with the driver

of the SMV, which could be driven at either end, i.e. forward or backward. The driver of the SMV was required to wear a Radio Headset while driving. This ensured that any two-way conversations would be clearly received as that noise level of the SMV was deafening. The SMV driver radio was required to always default to Channel 2 the open talk group. The critical part of making the solution work was to correctly program the radio so that it would scan in addition to the site emergency channel, any activity on either of the portable radios, plus set the 'hang time' so that the driver could respond directly to the caller from the compartment much like a hands-free operation and not having to change to a different talk channel.



The client also required a hands-free radio solution in two of the gantry cranes. Dove's solution was to use a radio headset and foot switch PTT. For this a small junction box was install to house a special circuit board designed to interface the headset speaker, microphone and the PTT switch.

As the above ground site developed with the construction of buildings and a huge storage areas of concrete segments, there was a need to cover for the loss of radio coverage in the shaded areas that was being created. Dove installed underground leaky feeder cable above-ground with additional aerial couplers strategically positioned which improved the above ground communications in these areas.



Due to a delay of the Radiax cable for the permanent installation, a solution needed to be found to supply temporary communications into the culverts as they were being constructed. To overcome the problem, Dove installed a branch unit from the tunnel leaky feeder into culvert one for the construction phase. It was planned that the Radiax cable would be onsite by the time

culvert one had broken through and the construction of culvert two was about to start. This allowed the finished tunnel team to install the Radiax cable into culvert one and the leaky feeder cable would be re-used in culvert two. As the design for the culvert communications was to use the Radiax Cable without the use of inline BDA's, Dove chose to install a high-power BDA at the headend and then run a new low loss lead-in cable to the portal of culvert one. This type of BDA was required to compensate for the expected loss in the Radiax cable over the 2.4km length of the culvert.

Support and Maintenance of the Communications System

Dove committed to hold stock of equipment for immediate delivery for the duration of the project.

We also attended weekly visits over the three-year period of the project, which helped maintain clear lines of communication and relationships.

Testing of the Finished Tunnel Installation

Dove were again asked to assist by carrying out preliminary testing of the finished tunnels communications cables and above ground antenna's.

Conclusion

The Waterview Connection project is one of the most important infrastructure developments ever to take place in New Zealand and the communications were one of the keys to its success.

Dove successfully project managed and engineered workable solutions to help the project stay on track and this was evident with the stand-alone headsets for the ring placement team mentioned above.

Date: 09/03/2017

Reference No.: 004

DOVE Radio Communications Ltd
Radio Communications Specialists
89 Church Rd, Pukete,
Hamilton 3200

Attention Peter Dove

Dear Peter,

Testimonial for DOVE Radio Communications Ltd

DOVE Radio Communications Ltd supplied the Well Connected Alliance Waterview Tunnel Project with radio communications equipment and professional service from 2013 to 2017.

Peter and his team are truly professional and specialists in their Radio Communications field. The complexity of running a leaky feeder wire system through all the working areas (tunnels, surface, cross passages and culverts with a repeater system was a challenge and Dove were up to the task. Some the solutions involved were innovative to keep the signal strength available to all work groups.

While the primary function was workplace communication, the radio system was a key part of the emergency response for site and had to be robust and reliable. Also the radio system had to tie into the external emergency services such as the NZ Fire Service. Dove worked with NZFS to achieve a system where they had access to the leaky feeder system via a channel programmed on specific site radios that were for emergency services only. This worked well and was used during a WorkSafe High Hazard Level 3 CIMS event.

I would have no hesitation in recommending Dove Radio Communications.

Yours sincerely



Andy Schmidt
Tunnel Safety Manager
Waterview Tunnel Project