

# **Spectrum Allocations for Broadband Wireless Access**

## **Summary of Submissions**

September 2006

First published in December 2006 by the  
Radio Spectrum Policy and Planning Group  
Energy and Communications Branch  
Ministry of Economic Development  
PO Box 1473, Wellington, New Zealand  
<http://www.rsm.govt.nz>

ISBN 978-0-478-30422-0 (Paperback)  
ISBN 978-0-478-30437-4 (PDF)  
ISBN 978-0-478-30423-7 (HTML)

## **Disclaimer**

The opinions contained in this document are those of the Ministry of Economic Development and do not reflect official government policy. Readers are advised to seek specific legal advice from a qualified professional person before undertaking any action in reliance on the contents of this publication. The contents of this discussion paper must not be construed as legal advice. The Ministry does not accept any responsibility or liability whatsoever whether in contract, tort, equity or otherwise for any action taken as a result of reading, or reliance placed on the Ministry because of having read, any part, or all, of the information in this discussion paper or for any error, inadequacy, deficiency, flaw in or omission from the discussion paper.

## **Executive Brief**

---

In July 2006, the Ministry of Economic Development published a Discussion Paper on Spectrum Allocations for Broadband Wireless Access (BWA). The discussion paper sought the views of industry and other stakeholders on identified spectrum allocation opportunities for BWA in New Zealand. The paper specifically sought stakeholder views on the optimal use of each band and the mix of technologies that would achieve this, their interest in and intentions of deploying particular technologies for each band and their views on various spectrum management arrangements that would best suit particular applications. Following the release of the discussion paper, the Ministry also met with stakeholders, to provide them with an opportunity to clarify their submissions and to discuss the issues raised in the paper.

This paper summarises the submissions received and proposes the next steps to be taken.

The Ministry received 43 submissions from diverse interest groups, such as existing radio and spectrum licence holders, including existing and potential BWA operators, cellular operators, suppliers' of BWA equipment, standards organisations, international forums, the broadcasting industry and public safety service operators.

Spectrum at 800/900 MHz, and 1.8, 2.0, 2.1, 2.4, 5.8, 3.5 and 24-29 GHz is currently available for broadband wireless access (BWA) services, through a mixture of nationwide and regional rights, and shared use.

Based on the submissions and other inputs received, especially from international forums, the Ministry has considered how best to manage the immediate demand for additional spectrum to provide BWA services while recognising the evolving nature of technological standards. As a result, the Ministry has identified additional spectrum allocation opportunities for BWA in bands, including the 2.3 GHz, 2.5 GHz, 5.4 GHz and bands above 60GHz. These opportunities are highlighted under "Next Steps".

## Contents

---

<b>EXECUTIVE BRIEF .....</b>	<b>3</b>
<b>GLOSSARY .....</b>	<b>5</b>
<b>1. PURPOSE.....</b>	<b>8</b>
<b>2. BACKGROUND.....</b>	<b>9</b>
<b>3. SUBMISSIONS.....</b>	<b>10</b>
<b>4. ANALYSIS .....</b>	<b>11</b>
4.1 Fixed Wireless Access (FWA) .....	11
4.2 WLANs (WiFi) and WiMAX .....	15
4.3 Satellite.....	20
4.4 Cellular .....	21
4.5 Digital Broadcasting.....	23
4.6 Spectrum Allocation Options .....	25
4.7 Allocation Opportunities – 2.3 GHz.....	26
4.8 Allocation Opportunities – 2.5 GHz.....	33
4.9 Allocation Opportunities – 5.4 GHz.....	39
4.10 Allocation Opportunities – 60 GHz.....	41
4.11 Allocation Opportunities – 70, 80 & 90 GHz .....	42
4.12 Other bands not considered in the discussion paper .....	44
<b>5. SUMMARY OF OUTCOMES AND NEXT STEPS .....</b>	<b>49</b>
5.1 2.3 GHz Band .....	49
5.2 2.5 GHz Band .....	49
5.3 60 GHz Band .....	50
5.4 70, 80 & 90 GHz Bands .....	50
5.5 Other Bands .....	51
<b>APPENDIX A .....</b>	<b>52</b>
List of Organisations who provided Submissions .....	52
<b>APPENDIX B .....</b>	<b>55</b>
Summary of Analysis.....	55

## Glossary

---

2G	Second-generation
3G	Third-generation
3GPP	3rd Generation Partnership Project - 3GPP specifications are based on evolved GSM specifications, now generally known as the UMTS (or W-CDMA) system.
3GPP2	3rd Generation Partnership Project 2 - the standardization group for CDMA2000, the set of 3G standards based on earlier 2G CDMA technology
BB	Broadband
BWA	Broadband Wireless Access – Fixed, Nomadic & Mobile
CEPT	European Conference of Postal and Telecommunications Administrations
CDMA	Code Division Multiple Access
CDMA2000	A family of 3G cellular standards that use CDMA
CMAR	Customer Multi Access Radio
CPE	Customer Premises Equipment
DFS	Dynamic Frequency Selection
DMB	Digital Multimedia Broadcasting
DTT	Digital Terrestrial Television
DTTV-H	Digital Terrestrial TV - Handheld
DTTV-M	Digital Terrestrial TV - Mobile
DTTV-T	Digital Terrestrial TV - Terrestrial
DVB-H	Digital Video Broadcasting - Handheld
DVB-S	Digital Video Broadcasting - Satellite
DVB-T	Digital Video Broadcasting - Terrestrial
FCC	Federal Communications Commission (FCC)
FDD	Frequency Division Duplex

## Spectrum allocation for broadband wireless applications: Summary of Submissions

FoIP	Fax over Internet Protocol
FWA	Fixed Wireless Access
GSM	Global System for Mobile Communications – a 2G cellular system
GUL	General User Licence
GURL	General User Radio Licence
HSDPA	High Speed Downlink Packet Access – evolution of UMTS
ICT	Information and Communications Technology
IEEE	Institute of Electrical and Electronic Engineers (USA)
IMT-2000	International Mobile Telecommunications - refer to many third generation (3G) cellular technologies
IP	Internet Protocol
ISP	Internet Service Providers
ITU-R	International Telecommunications Union – Radiocommunications Sector
LMDS	Local Multi-point Distribution Services
LTE	Long Term Evolution – of the UMTS standard
MBMS	Multimedia Broadcast Multicast Service
MDS	Multi-point Distribution Systems
MSP	Managed (Spectrum) Park
MR	Management Right
NGN	Next Generation Networks
NTIA	National Telecommunication Information Administration (USA)
OECD	Organisation for Economic Cooperation and Development.
F-OFDM	Flash - Orthogonal Frequency Division Multiplexing
PAN	Personal Area Network
POTS	Plain Old Telephone Service
P-P	Point to Point

## Spectrum allocation for broadband wireless applications: Summary of Submissions

PPDR	Public Protection and Disaster Relief
P-M	Point to Multipoint
PROBE	Provincial Broadband Extension
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RFID	Radio Frequency Identification Device
RLAN	Radio Local Area Network
SME	Small and Medium Enterprise
SOHO	Small Office Home Office
SRD	Short Range Device
STL	Studio Transmitter Link
TDD	Time Division Duplex
TVOB	Television Outside Broadcast
UMTS	Universal Mobile Telecommunications System – a 3G Cellular technology – also referred to as W-CDMA
UNII	Unlicensed National Information Infrastructure (USA)
UWB	Ultra Wide Band
VoIP	Voice over Internet Protocol
WG	ITU-R Working Group
WiBro	Wireless Broadband – a Korean equivalent of the WiMAX standard
WiFi	Wireless Fidelity – a WLAN standard
WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network
WPAN	Wireless Personal Area Network

## 1. Purpose

---

In July 2006, the Ministry of Economic Development (“the Ministry”) published a Discussion paper on *Spectrum Allocations for Broadband Wireless Access (BWA)*. Industry and other stakeholders were invited to comment on identified spectrum allocation opportunities for BWA in New Zealand, the optimal use of each band and the mix of technologies that would achieve this, their interest in and intentions of deploying particular technologies for each band and their views on various spectrum management arrangements that would best suit particular applications.

This paper summarises the submissions received and outlines the next steps in the allocation process.

## **2. Background**

---

There is increasing recognition that broadband is a key enabler of economic growth and development. The Ministry released a discussion paper in July 2006 to provide interested parties with the opportunity to comment on identified spectrum allocation opportunities for broadband wireless access in New Zealand. The paper noted that the bands most readily available for BWA deployment are the 2.3 GHz, 2.5 GHz and 5.4 GHz ranges. Spectrum bands at 60 GHz, 70 GHz, 80 GHz and 90 GHz were also identified as potential bands in the longer term.

Following the release of the discussion paper, the Ministry also met with stakeholders to provide them with an opportunity to clarify their submissions and to discuss the issues raised in the paper.

Based on the submissions and other inputs received, especially from international forums, the Ministry has considered how best to manage the immediate demand for spectrum to provide BWA services while recognising the evolving nature of technological standards. The next steps in this process are explained in the final section of this document.

### 3. Submissions

---

The Ministry received 43 submissions on the discussion paper on BWA from a diverse range of interest groups. The responses have helped highlight the major outstanding issues that need to be considered further.

The groups who provided submissions include:

BWA operators (existing and new)	22
Suppliers of BWA equipment	8
Public safety service operators	2
International forums	3
Other interest groups	8

A summary of the individual submissions on the discussion paper on BWA is provided in [Appendix B](#). Some submitters also provided comprehensive details of studies and references which has been a valuable addition to the Ministry's knowledge base on BWA. For the sake of brevity, some of these studies had to be excluded from this report. These submissions can be made available to interested parties upon request.

## 4. Analysis

---

The Ministry's discussion paper on BWA raised a range of issues for comment (refer to <http://www.rsm.govt.nz/spp/bwa/index.html>). This section discusses issues in relation to the submissions and other inputs received.

### 4.1 Fixed Wireless Access (FWA)

- 1a Do you have an interest in deploying voice and/or data services using FWA technology?
- 1b If so, what technologies and standards would you consider and why?
- 1c Which bands do you consider to be the most suitable for this purpose and why?
- 1d In which markets or regions would you consider deploying FWA and why?
- 1e What is your timeframe for deploying FWA and why?

At least 23 respondents express interest in using FWA technology to deploy voice and (or) data services. Most of them either have existing FWA networks or are planning to actually deploy one. JDA and Vector express limited interest.

#### Standards and Technologies:

4RF proposes that the provision of P-P network backhaul be given as much attention as BWA.

Alcatel, in its submission, advocates encouraging multiple wireline and wireless broadband technologies. It believes adopting a single access technology for a country would be generally inefficient, especially where there is a wide range of demographic and geographic environments to service, such as in New Zealand.

Many respondents support WiFi (IEEE 802.11x) and WiMAX technologies (IEEE 802.16-2004 and 802.16e).

CallPlus considers that Fixed WiMAX applications, as it is being deployed today, is not seen as a long-term solution due to its inferior economies of scale and significant limited functionality compared to nomadic/mobile WiMAX.

Other standards and technologies supported by respondents include:

- IMT 2000 family of technologies (UMTS, HSDPA, CDMA 2000, 3GPP/3GPP2),
- IEEE 802.xx family of technologies (802.22, 802.11g),
- WiBro,

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

- VoIP over BWA,
- E1 and Ethernet, and
- Proprietary technologies (SCADA, Motorola Canopy).

THL (BCL) recommends that New Zealand's standards be aligned with international standards.

### **Optimal Bands:**

Spectrum bands identified as suitable for FWA include the following:

- 2.3 GHz band (by Araneo, CallPlus, Compass, Convergenx, Intel, JDA, NATCOM, NZWireless, TeamTalk, TelstraClear, ThePacific.net, WiMAX Forum),
- 2.4 GHz (by Compass, NATCOM, NZWireless, ThePacific.net),
- 2.5 GHz band (by Araneo, CallPlus, Intel, NZWireless, TeamTalk, WiMAX Forum),
- 3.5 GHz band (by Airnet, CallPlus, Compass, NATCOM, Nokia, NZWireless, TelstraClear, WiMAX Forum).

The CDG identifies the 450 MHz band as suitable to deliver FWA services to remote and underserved areas in New Zealand due to favourable propagation characteristics in this band.

The WiMAX Forum notes that the 5.725-5.85 GHz band is already being used for lightly-licensed applications internationally.

Other suitable bands identified include:

- 502-806 MHz (by Araneo, NATCOM, TeamTalk),
- 900 MHz GUL band (by Compass, NATCOM),
- 1.8 GHz band (by NATCOM),
- 2.3-2.7 GHz range (by Convergenx, NetSmart, WiMAX Forum),
- 2.5-2.7 GHz band (by ThePacific.net),
- 3.3-3.8 GHz band (by Convergenx, Intel, WiMAX Forum),
- 5120-6100 MHz band (by ThePacific.net),
- 5150-5825 MHz (by Araneo, NZWireless, TeamTalk),
- 5.3-5.8 GHz band (by Compass),

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

- 5.725-5.875 GHz band (by NATCOM, Nokia),
- 5.9 GHz band (by NATCOM),
- 10 GHz band (by JDA),
- 10.5-10.680 band (by Araneo, TeamTalk),
- 24.549-26.400 GHz band (by NZWireless),
- 25-28GHz band (by Araneo, NZWireless, TeamTalk),
- 57-66 GHz band (by Araneo, TeamTalk) and
- 71-95 GHz band (by Araneo, TeamTalk).

Mount Campbell and SCORCH propose that spectrum in the 500-1000 MHz band be made available for long range rural applications. They also thought that spectrum in the mid-range, i.e. the 2-3 GHz range and also the 4-5 GHz range could be made available for FWA.

Current FWA providers such as Airnet, who use public park spectrum, identify a need for access to 'exclusive use' spectrum. PlaNet, who currently uses public park spectrum at 2.4 GHz and 5 GHz, strongly supports the Managed Park concept and considers the spectrum between 2-10 GHz to be the most suitable for FWA.

CallPlus considers the 3.5 GHz band to be the most suitable band due to its current paired channel allocation and the benefits of FDD duplexing for interactive latency sensitive services such as VoIP, FoIP and video conferencing.

Compass is interested in seeing the 900 MHz GUL band being synchronized with that of Australia.

Telecom is of the view that New Zealand is a small market and could not dictate the frequency bands in which particular technologies can be operated and has to be reliant on global manufacturers for equipment. Therefore, it proposes that New Zealand take advantage of 'standards-compliant' equipment that operates in bands where there are economies of scale and worldwide deployment. The NZ Police, NZ Fire Service, SCORCH and THL (BCL) have similar views.

### **Markets and Regions:**

Intel and Nokia intend to be involved in the global deployment of FWA technologies.

Araneo, the NZ Police, NZ Fire Service and TeamTalk plan to deploy FWA technologies throughout New Zealand. Telecom intends to complement their existing nationwide cellular and fixed networks with FWA.

Various respondents disclose plans to deploy FWA in these regions:

- **Airnet** - Hawke's Bay and the East Coast area
- **AirSpeed** - Enterprise & SME markets in Auckland, Hamilton, Napier, Wellington and Christchurch
- **CallPlus** - provincial coverage north of Auckland (constrained by spectrum availability)
- **Compass** - SME and residential markets nationally
- **Convergex** - New Zealand's metropolitan areas
- **JDA, Mount Campbell** – rural areas
- **NATCOM** - regional New Zealand as well as urban centres
- **NetSmart** - Bay of Plenty, Waikato region with further expansion planned
- **NZWireless** - Wellington/Lower Hutt region initially, but keen to provide services in nearby urban areas
- **SCORCH** – has deployed in Canterbury since November 05, with plans to extend coverage to Otago, Nelson, Wellington, Waikato and Auckland regions in the next few months
- **ThePacific.net** - rural and urban areas at the top of South Island, with plans to expand to the south progressively
- **TelstraClear** - is currently providing FWA-based services to SME customers, but considers WiMAX to be suitable for providing services to SOHO and residential customers, especially when more WiMAX based CPE is available. TelstraClear has deployed pre-WiMAX equipment in Auckland, Nelson, Rotorua, Napier and Dunedin, with other towns being actively considered.

### Timeframe for Deployments:

Compass, NetSmart, TelstraClear and the ThePacific.net have already deployed FWA.

NATCOM and TeamTalk's deployment of FWA will be immediate and Araneo is currently deploying FWA for business customers nationwide, with a consumer offering conditional upon suitable spectrum being made available.

CallPlus intends to have its first FWA deployment in 2006 in Whangarei, with plans to extend coverage in early 2007. CallPlus believes that a 60% population coverage is achievable within five years, given suitable nationwide spectrum.

NZWireless has already deployed FWA in Wellington and plans to expand in Wellington and further deploy in Lower Hutt before the end 2006, with an estimated minimum population coverage of 70% within a two-year span.

Mount Campbell is in its initial stages of implementing FWA.

A new entrant to the New Zealand market, AirSpeed, plans to commence services in early 2007.

The NZ Police and the NZ Fire Service intend to deploy an FWA broadband network within the next five years, subject to resources and availability of funding.

In terms of equipment, Nokia note that their resources are being concentrated on infrastructure and devices for nomadic/mobile WiMAX. Nokia expects to see pre-commercial tests of significant scale in 2007 and commercial deployments in 2008.

## **4.2 WLANs (WiFi) and WiMAX**

- 2a Do you have an interest in deploying WLANs and/or WiMAX?
- 2b If so, what technologies and standards would you consider and why?
- 2c Which bands do you consider to be the most suitable for this purpose and why?
- 2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?
- 2e What is your timeframe for deploying WLANs and/or WiMAX and why?

At least 26 respondents express interest in WiMAX, with another 13 interested in WLAN technology. Most of them already have networks in deployment or are actually planning to deploy services using these technologies.

### **Standards and Technologies:**

Many respondents support WLAN/WiFi (IEEE 802.11x) and WiMAX technologies (IEEE 802.16-2004 and 802.16e). There is some support also for the WiBro standard. The respondents supporting these technologies include:

- WLANs - Airtel, Araneo, Compass, Intel, Motorola, NATCOM, NetSmart, Nokia, NZWireless, NZ Police, TeamTalk, Telecom and ThePacific.net
- WiMAX – 4RF, Airtel, AirSpeed, Araneo, CallPlus, Compass, Convergex, Econet, Intel, Motorola, Mount Campbell, NATCOM, NetSmart, Nokia, NZWireless, NZ Police, SCORCH, TeamTalk, Telecom, TelstraClear, ThePacific.net, THL (BCL), Vector, WIC, WiMAX Forum and Woosh
- WiBro – Araneo, NATCOM, NZWireless and TeamTalk.

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

4RF's interest is currently limited to applications requiring backhaul and advises the Ministry that it is actively investigating WiMAX technical standards as part of its future product strategy.

Compass is of the view that the Fixed WiMAX standard, 802.16d, will quickly fall into disuse.

CallPlus considers that the converged services on WiMAX 802.16e standards will meet mobile, nomadic and fixed WLAN customer requirements.

Vodafone advises the Ministry that it has considered WiMax as an alternative to HSDPA and has decided not to roll out a WiMax network because:

- There is a gap between what is in the standards and what is likely to be delivered due to the lack of maturity of the WiMAX technology.
- A Mobile WiMAX network would be too expensive.
- WiMAX does not provide the scale advantage that HSDPA enjoys.

### **Optimal Bands:**

Spectrum bands identified by respondents as being suitable for WLANs include the following:

- 900 MHz (Motorola, NATCOM, SCORCH),
- 2.4 GHz (by CDG, Compass, Intel, Motorola, NATCOM, NetSmart, Nokia, NZWireless, ThePacific.net) and
- 5 GHz (by CDG, Intel, Motorola, NetSmart, Nokia, ThePacific.net).

Spectrum bands identified as suitable for WiMAX include:

- 2.3 GHz band (by AirSpeed, Alcatel, Araneo, CallPlus, CDG, Compass, Convergenx, Intel, JDA, Motorola, NATCOM, NORTEL, NZWireless, TeamTalk, Telecom, TelstraClear, ThePacific.net, WiMAX Forum, Woosh),
- 2.5 GHz band (by AirSpeed, Alcatel, Araneo, CallPlus, Convergenx, Intel, Motorola, NORTEL, NZWireless, TeamTalk, Telecom, TelstraClear, Vector, WiMAX Forum, Woosh),
- 3.5 GHz band (by Alcatel, CallPlus, CDG, Compass, Motorola, NATCOM, Nokia, NZWireless, Telecom, TelstraClear, WIC, WiMAX Forum) and
- 5.8 GHz band (by CDG, JDA, NATCOM, Nokia, NZWireless, WiMAX Forum).

Other suitable bands identified by respondents for WiMAX include:

- 502-806 MHz band (by NATCOM, NORTEL, SCORCH),

## Spectrum allocation for broadband wireless applications: Summary of Submissions

- 2.xx GHz band (by Airnet),
- 3.3-3.8 GHz band (by Convergenex, Intel, WiMAX Forum),
- 24.549-26.400 GHz band (by NZWireless) and
- 25-28 GHz band (by NZWireless).

The CDG is of the view that the 2.5 GHz band should only be used for BWA by operators using IMT-2000 based technologies, because this band could be the only true “global” IMT-2000 band.

In contrast, NORTEL considers that the future use of the 2.5 GHz band could be for WiMAX, IMT 2000 or 4G and as such, it would be undesirable to impose a specific technology for this band. It further notes that, depending on the amount of spectrum that is currently used for TV OB and the intensity of that use, it may be possible to quickly release sufficient spectrum for one WiMAX service in New Zealand in this band.

Nokia supports the use of the 3.5 GHz band, in line with the European CEPT approach for broadband wireless access, for both fixed and nomadic WiMAX applications. It prefers FDD over TDD, due FDD’s better compatibility with existing 3.5 GHz FWA systems, eliminating the need for guard bands.

NORTEL advises the Ministry that there is considerable global interest in the 700 MHz band for mobile WiMAX. This spectrum is licensed for BWA in some countries and is actively being considered in others, as the transition to digital TV releases sizeable amounts of spectrum for potential reallocation.

Mount Campbell proposes that spectrum in the 500-1000 MHz band be made available for long range rural applications. It is also of the view that spectrum in the mid-range, i.e. the 2-3 GHz range and also the 4-5 GHz range, could be made available for BWA.

Current WLAN providers such as NetSmart, who uses public park spectrum, identify a need for ‘licensed’ spectrum for WiMAX. PlaNet, who currently uses the public park spectrum at 2.4 GHz and 5 GHz, strongly supports the Managed Park concept and considers the spectrum between 2-10 GHz to be the most suitable for BWA applications.

Telecom is of the view that New Zealand is a small market and could not dictate the frequency bands in which particular technologies can be operated and has to be reliant on global manufacturers for equipment. Therefore, it proposes that New Zealand take advantage of ‘standards-compliant’ equipment that operates in bands where there are economies of scale and worldwide deployment. The NZ Police, NZ Fire Service, SCORCH, THL (BCL) and Vector have similar views.

Woosh recommends that the Government offer existing managers of 2.3 GHz band the option to renew their spectrum, subject to significant use prior to 2010.

Convergex recommends that the Government commercially reallocate spectrum in the 2.3-2.4 GHz band. It advocates accelerating this allocation so that deployments could start by early 2008.

Intel urges the Ministry to make spectrum available for BWA in the 2.3-2.4 and/or 2.5-2.69 GHz bands in 2006/2007.

### **Markets and Regions:**

Intel, Motorola, Nokia and the WiMAX Forum intend to be involved in the global deployment of WiMAX technologies.

Araneo, Compass, NATCOM, the NZ Police, NZ Fire Service and TeamTalk plan to deploy WiMAX throughout New Zealand. Telecom intends to complement their existing nationwide cellular, WLAN and fixed networks with WiMAX.

Regional WiMAX providers plan to operate in the following regions and markets:

- **Airnet** - Hawke's Bay and the East Coast area.
- **AirSpeed** - Enterprise & SME markets in Auckland, Hamilton, Napier, Wellington and Christchurch.
- **CallPlus** - provincial coverage north of Auckland, but is constrained by spectrum availability.
- **Convergex** - New Zealand's metropolitan areas.
- **JDA** – rural areas, North Island and the northern half of South Island and possibly West Coast.
- **Mount Campbell** – rural and sparsely populated areas.
- **NATCOM** – is trialling WiMAX now, with some deployments in Auckland and has deployed WiFi nationwide via Satellite as well as via HotSpots.
- **NZWireless, SCORCH** – rural as well as urban areas.
- **ThePacific.net** – urban, rural, residential and businesses throughout the top of South Island, with plans to expand progressively south over the next year.
- **TelstraClear** - is currently providing FWA-based services to SME customers using a pre-WiMAX technology. It considers WiMAX to be suitable for providing services to SOHO and residential customers, especially when more WiMAX based CPE is available. TelstraClear has deployed pre-WiMAX equipment in Auckland, Nelson, Rotorua, Napier and Dunedin, with other towns being actively considered.
- **Vector** - primary interests are in Auckland and Wellington, with national expansions dependent on their commercial success in these areas.

- **WIC** - commercial and residential sectors in Dunedin City and the Otago region.

### **Timeframe for Deployments:**

Araneo, Compass, NATCOM, NetSmart, ThePacific.net and WIC have already deployed WLANs.

### **WiMAX:**

AirSpeed plans to commence services in Q1/Q2 of 2007 for the business sector and envisions providing a fully mobile service using WiMAX in the 2008/2009 timeframe, if suitable spectrum is available.

Compass intends to deploy WiMAX when 802.16e equipment becomes commercially available sometime in 2007.

CallPlus's timeframe for deployment is dependent on how soon the 2.3 GHz and 2.5 GHz spectrum will become available. NZWireless and Vector have similar views.

JDA is likely to deploy WiMAX within the next five years.

Motorola advises the Ministry of it being engaged in WiMAX trials with many operators on a global basis.

NATCOM is currently engaged in a WiMAX trial. NetSmart believes its trials can begin within 12 months if suitable spectrum and equipment become available.

TeamTalk is currently planning and evaluating their deployment options.

TelstraClear estimates that it will only take about two months to upgrade its current equipment to WiMAX.

The NZ Police and the NZ Fire Service intend to deploy a broadband network within the next five years, to deliver data to their staff and vehicles (including fire engines).

SCORCH's deployment of broadband wireless services will be immediate.

Telecom and Woosh's timeframe for deploying WiMAX is dependent upon certainty of tenure over the necessary spectrum.

WIC plans to deploy WiMAX in mid-to-late 2007.

In terms of equipment, Nokia notes that their resources are concentrated on infrastructure and devices for nomadic/mobile WiMAX. Nokia expects to see pre-commercial tests of significant scale in 2007 and commercial deployments in 2008.

## 4.3 Satellite

- 3a Do you have an interest in deploying satellite broadband services?
- 3b If so, what technologies and standards would you consider and why?
- 3c Which bands do you consider to be the most suitable for this purpose and why?
- 3d In which markets or regions would you consider deploying satellite broadband services and why?
- 3e What is your timeframe for deploying satellite broadband services and why?

Only eight respondents express interest in deploying satellite broadband services. Two respondents, Telecom and NATCOM, already have existing deployments. TeamTalk expresses a slight interest in using satellite broadband as an alternative for point-to-point links. Other interested parties include Alcatel, Compass Communications, Convergenx, NZ Police, and NZWireless. The NZ Fire Service notes that it is a current user of satellite broadband services.

### Standards and Technologies:

The majority of respondents state that the most suitable standards and technologies for satellite broadband would be dictated by the satellite service provider.

### Optimal Bands:

Spectrum bands identified as suitable for satellite broadband are:

- L band for Digital Audio Broadcasting (by Alcatel),
- S band for Mobile TV (by Alcatel) and
- Ku band (by Convergenx, NZ Fire Service, NZ Police and Telecom).

Several respondents think that the spectrum bands would be dictated by the satellite service provider.

### Markets and Regions:

All respondents consider that satellite broadband services would best be deployed in rural and remote regions that could not be reached by conventional terrestrial access technologies.

### Timeframe for Deployments:

Respondents have varying timeframes for deployment:

- **NATCOM** – already trialling satellite broadband service

- **NZ Fire Service** – 10-year timeframe due to resource constraints
- **NZ Police** – 10-year timeframe due to resource constraints
- **NZWireless** – currently negotiating with iwi
- **TeamTalk** – soon
- **Telecom** – already retailing satellite broadband services according to customer demand.

## **4.4 Cellular**

- 4a Do you have an interest in deploying cellular broadband services?
- 4b Which bands do you consider to be the most suitable for this purpose and why?
- 4c If so, what technologies and standards would you consider and why?
- 4d In which markets or regions would you consider deploying cellular broadband and why?
- 4e What is your timeframe for deploying cellular broadband and why?

At least 10 respondents express interest in actually deploying cellular broadband services, two of which, Telecom and Vodafone, already have existing networks. TelstraClear has announced an initial deployment in Tauranga. Other interested parties include Airspeed, Compass, Econet, NZWireless, and SCORCH. CallPlus anticipates looking into cellular broadband while 4RF's view will depend on the outcome of this allocation process.

### **Optimal Bands:**

Spectrum bands identified as suitable for cellular broadband include the following:

- 800/850 MHz band (by CDG, Motorola, Telecom, and TelstraClear),
- 900 MHz band (by Econet, Nokia, TelstraClear, and Vodafone),
- 1.8 GHz band (by Econet, Motorola and Nokia and
- 2.1 GHz band (by Econet, Motorola and TelstraClear).

TelstraClear expresses preference to use the 850/900 MHz over the 2.1 GHz band.

AirSpeed is looking into the 450 MHz spectrum band, with the 450-470 MHz band being identified by CDG as also suitable.

Other suitable bands identified include:

- 1.7-2.2 GHz band (by CDG),
- 2.3 GHz (by Airspeed, Nokia),
- 2.3-2.45 GHz (by NZWireless),
- 2.5-2.6 GHz (by Airspeed, CDG and Nokia),
- 2.7-2.9 GHz (Nokia),
- 3.4-4.2 GHz (Nokia) and
- 4.4-5.0 GHz (Nokia).

### Standards and Technologies:

TelstraClear believes that GSM and 3GSM 3GPP standards would be most suitable for cellular broadband. Vodafone likewise thinks the same for the GSM family of technologies, including HSDPA. Motorola's view is that it would be UMTS and HSDPA subset while CDG supports CDMA2000. Nokia believes that IMT2000 / W-CDMA, with evolutions like HSPA and LTE, would be suitable.

Airnet and NZWireless consider the fully mobile 802.16e standards as being suitable, while NATCOM specifies mobile WiMAX and WiBro as suitable for cellular broadband.

AirSpeed believes that an F-OFDM based network would be suitable in the 450 MHz band.

It is Telecom's view that any technologies standardised by the ITU, IETF, and IEEE would be suitable.

Intel's view is that spectrum allocation in New Zealand should remain technology-neutral, as is currently the case.

The NZ Fire Service and the NZ Police, as users, will adopt commercially available technologies that are proven to be reliable.

### Markets and Regions:

Telecom and Vodafone already operate nationwide cellular broadband networks. Econet intends to initially operate in Auckland, Wellington, and Christchurch, with deployment in other regions planned and subject to co-location arrangements. TelstraClear has announced that it will initially deploy in Tauranga. Airnet operates in the Hawke's Bay/East Coast areas. Compass intends to deploy such services into their existing national coverage and multiple markets. NZWireless plans a gradual deployment based on specific needs of particular regions. AirSpeed will consider all markets. Motorola would like to be involved wherever networks are deployed and Nokia prefers a global deployment.

Telecom is currently undertaking a work programme to upgrade to Rev A. TelstraClear has announced that its “Unplugged” broadband cellular services will be launched in July 2007. Econet has an 18-month plan to deploy 450 cell sites, assuming rapid multi-site access to co-location is available. Vodafone states that its timeframe, at this stage, remains confidential.

### **Timeframe for Deployments:**

NZWireless could not be definite with its timeframe for deployment until 2008, when the implementations of the 802.16e specification shall have been assessed. AirSpeed will need a 24-month period before making their services available. Airnet will also need further indication from the outcomes of this consultation process.

In terms of equipment, Motorola informs the Ministry that its products are now available. Nokia confirms that IMT2000 / W-CDMA based networks and HSDPA are being deployed right now and the next steps will be the deployment of HSUPA and I-HSPA. It also confirms that planning for LTE has already started.

## **4.5 Digital Broadcasting**

- 5a Do you have an interest in deploying digital broadcast or convergent services?
- 5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?
- 5c Which bands do you consider to be the most suitable for this purpose and why?
- 5d In which markets or regions would you consider deploying digital broadcast services and why?
- 5e What is your timeframe for deploying digital broadcast services and why?

There appears to be a wide interest in the deployment of digital broadcast or convergent services.

Interest is expressed by Airnet, Airspeed, Alcatel (as a hybrid mobile TV supplier), Compass (no evaluation to date), Convergex (if sufficient spectrum is available), Econet (also if sufficient spectrum is available), Intel (very active in this space), JDA (definite interest), Motorola (as equipment vendors), Mount Campbell Networks (in multiple services), NATCOM, Nokia (in mobile services), NZWireless, Telecom, TelstraClear (currently providing triple play services), THL (as part of its core business of providing transmission services), Vodafone, and the WiMAX Forum (via BWA).

### **Standards and Technologies:**

DVB-H will be considered by Motorola, Nokia (terrestrial), Telecom (terrestrial – for mobile), THL, and Vodafone. JDA will consider DTTV-T and DTTV-H to DTTV-M while THL intends to adopt DVB-T, DVB-S, DVB-M and MediaFLO.

Alcatel, Nokia and Vodafone are looking into MBMS. Alcatel is additionally considering HSDPA.

WiMAX 802.16e will be considered by Convergenex, NZWireless (terrestrial – FDD, mobile – TDD). NZWireless suggests the use of satellite, where the terrain is 'prohibitive'.

The WiMAX Forum thinks a broad range of technologies and standards are suitable for digital broadcasting and NATCOM would like to consider all of them. Mount Campbell will adopt the 'New Zealand standard'. Econet will consider the cheapest standards, with the largest economies of scale. Intel prefers IP-based technologies. Terrestrial standards will be looked into by Airspeed (mobile) and Airnet (for capacity and flexibility). TelstraClear has no clear preference, as yet.

### **Optimal Bands:**

The WiMAX Forum thinks a broad range of bands are suitable for broadcasting. Intel maintains a technology-neutral stance on this issue. Econet prefers bands with the best economies of scale.

Mount Campbell specifically identifies the UHF-TV bands, with Motorola agreeing that the recovered UHF-TV bands would be suitable.

Nokia considers the most suitable bands to be below 750 MHz. Telecom identifies as suitable, the 700 MHz spectrum. It also identifies a possible range from 470-862 MHz, similarly identified by Vodafone (470-802 MHz) and Airspeed (470-750 MHz). THL considers the 502-806 MHz (terrestrial) band and the KU bands (satellite) as most suitable.

Airnet agrees that any band up to 3.5 GHz is suitable for digital broadcasting. TelstraClear points out the 1 and 1.5 GHz bands, in 100 MHz blocks, while Alcatel identifies the 2.2 GHz, 2.3 GHz, and designated IMT+ bands as appropriate for the same technology. Vodafone also identifies the 3G bands as suitable (for MBMS). In relation to mobile service bands, the NZ Fire Service points out that the digital broadcasting bands should not be adjacent to the mobile bands.

The view of NZWireless will depend on equipment availability, spectrum availability, and range of CPE. JDA prefers Bands IV and V but its final view will also depend on equipment availability, propagation, and transmission infrastructure.

### **Markets and Regions:**

Intel, Nokia, and the WiMAX Forum intend to be involved in the global deployment of digital broadcasting services. Motorola will deploy in the markets and regions it is currently operating in.

Econet Wireless and JDA plan to deploy throughout New Zealand, with particular focus on provincial and rural areas for JDA. Airspeed's focus will be on urban centres. Airnet will deploy in the Hawke's Bay/East Coast region and Mount Campbell, in Nelson and Marlborough.

## **Timeframe for Deployments:**

JDA's deployment of digital broadcast services will be immediate. Airspeed intends to deploy in the 3<sup>rd</sup> quarter of 2008 and Intel, in 2008-2010.

Airnet and NATCOM's timeframes will depend on the outcome of this consultation.

Mount Campbell and TelstraClear's timeframes will depend on the availability of spectrum, with the additional consideration of customer demand for the former. WiMAX Forum's will depend on the business models of its members.

Motorola confirms that digital broadcasting equipment will be available in time for deployment. Nokia also confirms that DVB is now available and MBMS will become available in 2008.

## **4.6 Spectrum Allocation Options**

6a Should spectrum for future BWA deployment, be reserved as a Managed Park? Why or why not?

6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?

6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?

Of the 43 respondents, 25 believe that spectrum for future BWA deployments should be reserved as a Managed Park. Five are against the idea, 10 have no comments and three would require more details or a separate consultation on this concept in order to form an opinion.

BCL states that the Managed Park concept may be suitable for certain BWA spectrum bands, however, its purpose and users need to be identified first.

IEEE 802 believes that the Managed Park model has merit and recommends that as few restrictions as possible be placed on users, in order to reap the widest benefits. IEEE 802 notes that, along the same lines as the Managed Park, the United States Federal Communications Commission has adopted a minimal regulatory approach to encourage multiple entrants in the 3650-3700 MHz frequency band.

Intel supports the allocation of unlicensed spectrum for low and medium power applications, and a licensed approach for higher power applications. Intel has concerns about the ability of operators to provide adequate Quality of Service in a Managed Park and believes that area licences might provide a better solution.

JDA supports the Managed Park concept as it would give better access to small operators, but states that their support may depend on the band in question.

NZWireless is of the view that Managed Parks will deliver the most innovative technology to the user, particularly if the licences are set up for short term periods.

Telecom states that there may be circumstances where the technology or investment required is such that a Managed Park could become workable, and agrees that it is a concept worth exploring. Their key concerns pertain to entry rights to the Managed Park and in obtaining and maintaining sufficient spectrum to meet capacity and quality requirements for reliable nationwide services.

TelstraClear suggests that there should be at least four WiMAX bands, with one band being a Managed Park, which would be an effective means of entry for new WiMAX service providers.

Vodafone supports the idea of Managed Parks in principle but believes that a market price should be charged for access to these parks.

Out of the respondents who supported the Managed Park concept, a majority assert that when demand in a particular area exceeds the sharing capability of the band, a 'use-it-or-lose-it' requirement should apply.

**Conclusions:** The strongest support for the Managed Park concept comes from small to medium enterprises. These respondents also generally suggest that a Managed Park allocated for BWA deployment should be made available to regional providers.

Telcos such as Telecom, TelstraClear, and Vodafone also see potential benefits in having a Managed Park where practicable, but state a clear preference for the existing Management Rights Regime as the best way to manage spectrum assets.

## **4.7 Allocation Opportunities – 2.3 GHz**

7a Do you have an interest in using the 2.3 GHz band?

7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?

7c What do you consider to be the optimum use for this band?

7d Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; Area Licences or a combination thereof?

There is considerable interest (25 respondents) in the 2.3 GHz band. 20 respondents indicate their plans to deploy BWA in this band. Interested parties include Airnet, AirSpeed, Araneo, CallPlus, Compass, Convergenex, Econet, JDA, Mount Campbell, NATCOM, NetSmart, NZART, NZWireless, SCORCH, TeamTalk, Telecom, TelstraClear, ThePacific.net, THL (BCL) and Vector.

Equipment suppliers with plans to manufacture WiMAX equipment for this band include Alcatel, Intel, Motorola and NORTEL.

## **Packaging:**

Airnet, AirSpeed, Compass, Econet, NATCOM and the WiMAX Forum consider the re-packaging proposed in the discussion paper for this band to be appropriate.

The WiMAX Forum is of the view that the proposed re-packaging is consistent with their stance, that 30 MHz per operator would allow proper broadband services in high traffic areas. NORTEL agrees with this view.

Intel and NATCOM support the allocation of at least 30 MHz per operator for this band.

TelstraClear agrees that 30 MHz blocks should be sufficient for a national WiMAX deployment, but recommends that the 3<sup>rd</sup> block should be a 20-year Management Right allocated by auction rather than as a Managed Park. It is of the view that access to the 2.3 GHz band is likely to be strongly contested, as it is likely to be the most desirable WiMAX band because of its better non-line-of-sight performance and reach.

InternetNZ supports the proposed packaging sizes, but would prefer two Managed Parks and one block under a Management Right.

JDA agrees with the proposed packaging but recommends breaking down the Managed Park into a smaller block.

Compass agrees with the proposed packaging, but noted that 3 x 20 MHz could also work if the managers of this band has access to other spectrum resources. Convergex, expressing a similar view, agrees with the proposed packaging of 30 MHz blocks with 5 or 10 MHz channels, but was also fine with 20 MHz blocks.

Motorola favours 20-30 MHz blocks per operator, allocated in a technology neutral manner. It notes that the most likely channel sizes used within these blocks are 3.5, 5 and 10 MHz.

Alcatel notes that the channel sizes planned for the 2.3 GHz band are 5, 8.75, 10 and 20 MHz. It further notes that a frequency re-use of three will be initially utilised, with a re-use of one applicable when more advanced interference techniques become available at the end 2007. It is of the view that the optimum packaging for this band is contingent on competition policy and the desired bit rates of the wireless broadband network. Alcatel cites an example that, if the primary objective is to compete with wire-line services, then the largest channel sizes with a re-use of three would be required.

NetSmart and ThePacific.net supports the re-packaging to allow 5, 10 or 20 MHz channels. ThePacific.net, however, is of the view that a 40 MHz block size is needed for an optimal network.

NZART proposes re-packaging the band into three lots of 30 MHz each, leaving a 10 MHz upper guard band between the 2.3 GHz band and the 2.4 GHz public park spectrum.

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

Vector considers the proposed repackaging to be appropriate. It, however, proposes that three blocks be commercially allocated, with a Managed Park that will also be open to band managers.

Araneo agrees that two licensed blocks plus one Managed Park would be an optimal configuration, but recommends that one of the Management Rights comprise 36 MHz as that would be preferable for a WiBro operator. It notes that this would provide more technology options to potential BWA nationwide operators.

CallPlus believes that the proposed two Management Rights of 30 MHz and 36 MHz in a Managed Park would limit the potential number of nationwide competitors and would be detrimental to the long term benefit of consumers. It recommends treating the 2.3 GHz and 2.5 GHz bands as complementary, with a minimum of 3 x 30 MHz blocks in the 2.3 GHz band and 6 x 30 MHz in the 2.5 GHz band, being made available as Management Rights. CallPlus is of the view that the remaining spectrum in each band should form a smaller block to be made available regionally. It recommends that if a Managed Park is to be established, then one of these remaining smaller blocks should be used for that purpose. If, however, the 2.5 GHz spectrum could not be cleared, CallPlus strongly opposes the establishment of a Managed Park in the 2.3 GHz band and instead recommends that four 20 MHz blocks and one 15 MHz block be established in the 2.3 GHz spectrum rather than having three 30 MHz blocks.

Consultel notes that previous BWA spectrum blocks that have been allocated by the ITU and national spectrum regulators have often been quite small, in the order of 1 to 5 MHz and that large spectrum blocks have helped to make cellular services more viable. It is of the view that spectrum blocks of 10-30 MHz are now more typical for BWA.

IDC (in a report commissioned by Woosh) estimates that at least 30 MHz is needed per operator in most markets, including New Zealand, for voice and data services plus another 50-60 MHz for broadcasting/multicasting. IDC is of the view that converged services, including any TV or IPTV (video on demand), will require large chunks of spectrum.

Mount Campbell and SCORCH recommend re-packaging the band for WiMAX.

Woosh notes that it requires a minimum of 50 MHz of spectrum to provide quad-play services.

AUSTAR and Unwired advise the Ministry of their control of over 100 MHz of spectrum, the former in regional Australia and the latter in major metropolitan areas.

Telecom proposes delaying any plan to package this band until after the WRC-2007 as this band is a candidate band for IMT-Advanced cellular technologies.

THL proposes that 8 x 10 MHz blocks be made available for competitive allocation as private Management Rights plus a 16 MHz Managed Park (with three 5 MHz channels) for technical and competitive reasons. THL further recommends that Managed Park users should only be allowed to use a single 5 MHz (or 10 MHz) block

**Spectrum allocation for broadband wireless applications: Summary of Submissions**

in their area and that Management Rights be auctioned with a cap of 30 MHz allocation per organisation and a requirement that an organisation bid only for contiguous blocks.

Vodafone has a similar view. It considers the proposed spectrum blocks to be too large, which could have a significant influence on the shape of the market. It believes that the 2.3 GHz should be packaged into smaller blocks, to allow the market to decide how many players could enter and how much spectrum each potential player gets.

**Optimal Usage:**

The majority of respondents (19) advocate BWA as the optimal use for this band. Four respondents specifically advocate Mobile/Nomadic WiMAX and 11 support Fixed/Mobile WiMAX applications.

Other applications recommended include: FWA (two respondents) and a mixture of WiMAX/IMT-2000 technologies (one respondent).

Four respondents advocate technology neutrality.

4RF proposes that this spectrum be shared so that economic advantages accrue to all potential users and suppliers. It also suggests that re-planning of this band consider both P-P and P-MP services in a technology independent manner.

Intel, Motorola and Nortel urge New Zealand to allocate this band for BWA in a technology neutral manner, with the choice of technology left to the licensee of the spectrum.

Motorola strongly believes that an ideal technology for this band is WiMAX and that there is a well-established case to demonstrate that it is the most spectrally efficient wireless technology available. Nortel expresses a similar view.

**Optimal Management Regime:**

There is a range of views on the optimal management regime for this band, summarised below.

	Public Park	Managed Park	Licensing	Area Spectrum Licences	Management Right Regime
4RF	x	x	With licence fees based on an operating revenue model	x	x
Airnet	x	✓	x	✓	x

## Spectrum allocation for broadband wireless applications: Summary of Submissions

	Public Park	Managed Park	Licensing	Area Spectrum Licences	Management Right Regime
AirSpeed	x	✓	x	x	✓
Araneo	x	✓	x	x	✓
CallPlus	x	x	x	x	✓
ConvergeX	x	x	x	x	With use-it-or-lose-it condition
Intel	x	x	x	x	✓
InternetNZ	x	✓	x	x	✓
JDA	x	✓	x	x	✓
Motorola	x	x	With deployment milestones	x	x
Mount Campbell	x	x	x	✓	x
NATCOM	x	✓	x	x	✓
NetSmart	x	✓	x	x	x
NZ Wireless	x	x	Crown-managed, conditional	x	x
SCORCH	x	x	x	✓	x
TeamTalk	x	✓	✓	x	x
TelstraClear	x	x	x	x	✓
THL (BCL)	x	✓	x	x	✓
Vector	x	✓	x	x	✓

SKY and Woosh believe that the best way forward for New Zealand is for the existing right holders to be offered renewal rights, subject to showing reasonable use of the spectrum prior to their expiry in 2010.

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

Airnet does not support “closed tenders” and is of the view that they are fraught with ‘holes’.

Intel expresses concern about licensing some of this spectrum under the “Managed Park” framework and believes that national or regional spectrum licences might be a better solution for the third lot. Intel believes that Management Rights would likely prove most beneficial. Nortel also does not support Managed Parks.

NetSmart, in contrast, supports allocating the entire band as a Managed Park.

NZWireless is of the view that the tenure of Management Rights is substantially too long. Conditional spectrum licences under Crown management is recommended instead.

TeamTalk considers that Management Rights do not ensure maximum accessibility to or the efficient use of spectrum and proposes using a Managed Park to provide access to this spectrum band. Externally engineered Radio Licensing is recommended as an alternative method of access. It recommends any regime chosen to include “use-it-or-lose-it” provisions.

Mount Campbell and SCORCH also do not favour twenty year Management Rights for national wireless broadband deployment and recommend area spectrum licences as the optimal management regime for this band, allocated through a multiple ascending round allotment.

JDA, on the other hand, does not favour area licences unless they are very carefully detailed.

Vector considers a combination of Management Rights and a Managed Park to be the optimal form of management for this band. It is also of the view that operators should not be excluded from having access to both.

CallPlus is of the view that organisations with ‘3G mobile spectrum’ in the 2.1 GHz band should be precluded from acquiring spectrum in these bands. It too advocates tight “use-it-or-lose-it” clauses for successful bidders. CallPlus, however, considers that regional spectrum holders in the 3.5GHz band should not be restricted from acquiring nationwide blocks in the 2.3/2.5 GHz bands, given the mobility aspects of the latter bands.

### **Conclusions:**

The majority of respondents (19) advocate using this band for BWA, with 15 specifically specifying WiMAX to be the optimal technology application.

18 respondents support the allocation of at least 30 MHz per operator and are of the view that this would allow proper broadband services in high traffic areas.

Three respondents support larger spectrum blocks of 36 MHz, 40 MHz and 50 MHz.

Four respondents support 20 MHz blocks being allocated whilst another supports a 15MHz block. One respondent advocates allocating 10 MHz lots with a cap of three.

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

12 respondents support establishing a Managed Park in this band, with two of them recommending that it be made smaller. In contrast, one respondent proposes creating two Managed Parks in this band. Two respondents advocate the commercial allocation of the whole band as Management Rights. One respondent opposes the establishment of a Managed Park if the 2.5GHz band cannot be made available for BWA soon.

The Ministry notes that there is strong support for reconfiguration and reallocation of frequencies between 2.3 GHz and 2.396 GHz (2.3 GHz spectrum) suitable for deployment of BWA networks.

The Ministry considers that a key issue for 2.3 GHz spectrum allocation is timing and that the interests of intending users of this band would best be served by an early decision as to its future configuration and ownership. Immediate release would be advantageous, as 2.3 GHz WiMax-based equipment is expected to be on the market in 2007.

The Ministry therefore envisages conducting an auction of the 2.3 GHz spectrum band as soon as practicable with the following conditions:

- 8 x10 MHz blocks from 2316-2396 MHz would be made available for competitive allocation as nationwide Management Rights.
- A spectrum cap of 30 MHz per organisation for two years from allocation would apply.
- The successful bidders would be subject to conditions of use or implementation clauses.

Subject to discussions with band managers for early relinquishment of current 2.3 GHz spectrum rights, some of the auctioned spectrum rights would be effective immediately after the auction, while a smaller amount may not be available for use until after current rights expire in 2010.

The Ministry also envisages allocating part of 2.3 GHz spectrum (from 2300-2316 MHz) as a Managed Park, available from 2010 or earlier. Eligibility criteria for access to and implementation rules of the Managed Park will be developed in consultation with industry.

## 4.8 Allocation Opportunities – 2.5 GHz

- 8a Do you have an interest in using the 2.5 GHz band?
- 8b What do you consider to be the optimum packaging for this band?
- 8c What do you consider to be the optimum use for this band?
- 8d Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?

There is considerable interest expressed in the 2.5 GHz band, with 25 respondents indicating plans to use this band.

### Optimal Usage:

The majority of respondents (19) advocate Mobile BWA as the optimal use for this band. Nine respondents specifically advocate Mobile/Nomadic WiMAX and five respondents support generic BWA applications.

Other applications recommended include: FWA (four respondents), IMT-2000 technologies (two respondents), a mixture of WiMAX/IMT-2000 technologies (two respondents) and TV OB linking (one respondent).

Two respondents advocate technology neutrality.

4RF recommends that this spectrum be shared between P-P and P-MP BWA applications so that economic advantages accrue to all potential users and suppliers. It also suggests that re-planning of this band consider both P-P and P-MP services in a technology independent manner.

Alcatel observes that the 2.5 GHz band is currently occupied in most countries by government applications and that it will be freed up for BWA use in 2008. It further notes that there are three distinct approaches to the future use of this band:

- Full compliance with 3GPP/IMT 2000 spectrum planning for exclusive use as a “3G extension” band
- A Technology and Usage neutral approach
- Opening of the 50 MHz central part of the band (lower and upper parts being paired for 3G FDD usage) – with the possibility of introducing new BWA technologies (which is under study in Sweden, Germany, France).

Alcatel recommends that access to at least part of the 2.5 GHz band for BWA should be considered as an alternative in countries lacking spectrum in the 3.5 GHz (or 2.3 GHz) band.

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

Both Mount Campbell Networks and SCORCH Communications propose that this band be packaged for WiMAX or an equivalent specification as they are of the view that OB links can easily be accommodated at much higher frequencies.

Nokia informs the Ministry that it supports the European Decision ECC/DEC(05)05, which designates this band for IMT-2000/UMTS. It argues that administrations should provide for harmonization and make this band available by 2008 as it has great potential to become a global extension band for IMT-2000/UMTS and its future enhancements.

Intel, Motorola and NORTEL, on the other hand, strongly urge the Ministry to open this band for BWA in a technology neutral manner so that service providers can choose the appropriate technology to meet their business model.

Both Intel and Motorola note that this band has very good potential for global harmonization for broadband wireless applications, including mobile WiMAX.

Motorola strongly believes that an ideal technology for this band is WiMAX and that there is a well established case to demonstrate that it is the most spectrally efficient wireless technology available.

Intel observes that the ITU-R Radio Regulations do not limit the use of this band to cellular and that administrations are allowed to assign the band to any technology. Several countries have already allocated the band in a technology neutral manner for BWA, including Brazil, Mexico and the United States. Other countries including Japan and Taiwan are in the process of allocating the band in a similar manner. Intel also notes that the United Kingdom will be releasing this band under a technology neutral framework during 2007.

IDC (in a report commissioned by Woosh) advises the government not to delay providing access to the 2.5 GHz spectrum.

NORTEL considers that the future use of this band could be for WiMAX, IMT 2000 or 4G and as such, it would be undesirable to impose a decision on the best technology. It further notes that depending on the amount of spectrum that is currently used for TV OB and the intensity of that use, it may be possible to quickly release sufficient spectrum for one WiMAX service in New Zealand.

NZWireless advocates that this band be packaged for WiMAX (TDD) as it considers IMT-2000 to be less viable, with fewer vendors looking to implement the IMT-2000 specification.

TelstraClear indicates its interest in this band for both IMT-2000 and WiMAX. It further notes that if the 850 and 900 MHz bands were to be reconfigured to enable new entrants to provide cellular services, its preference would be for the 2.5 GHz band to be used for WiMAX services. TelstraClear is of the view that WiMAX would perform well in this band, in terms of non-line-of-sight performance and reach.

The WiMAX Forum notes the 2.5GHz band is also one of the key bands upon which the WiMAX Forum is focused. It expects to see BWA activity in this band in North and South America, as well as in some parts of Asia and Europe, allowing full nomadic and mobile applications.

Woosh is of the view that this band could be made available for BWA and that broadcasters currently using the band for OB could be offered other spectrum such as 2.7-2.9 GHz.

### **Packaging:**

There are a number of packaging options advocated by the respondents.

Two submitters, 4RF and Alcatel, note that the WiMAX technical standard supports channel sizes ranging from less than 2 MHz up to 20 MHz.

Alcatel notes that the channel sizes planned for the 2.3 GHz band are 5, 8.75, 10 and 20 MHz. It further notes that a frequency re-use of three will be initially utilised, with a re-use of one applicable when more advanced interference techniques become available at the end 2007. It is also of the view that the optimum packaging for this band is contingent on competition policy and the desired bit rates of the wireless broadband network. Alcatel cites an example that, if the primary objective is to compete with wire-line services, then the largest channel sizes with a re-use of three would be required.

Both Araneo and TeamTalk advocate FDD-paired blocks of at least 15 MHz separated by 100MHz, to be used for FWA.

CallPlus is of the view that the technology developments in OB towards satellite linking may release a significant portion of the 2.5 GHz band in the near future and supports 6 x 30 MHz blocks for WiMAX and one 10 MHz block for a Managed Park.

Convergex considers that 30 MHz blocks (using 5 or 10 MHz channels) would be adequate to allow full broadband services in metropolitan areas.

A packaging similar to the proposed configuration in the Discussion Paper for 2.3 GHz is advocated by AirSpeed.

IDC notes that anything less than 20 MHz for WiMAX/HSDPA is really not very practical for a nationwide build-out.

The CDG recommends that any plan to allocate the 2.5 GHz band should follow the frequency arrangements described in the ITU-R Recommendation M.1036<sup>1</sup>:

---

<sup>1</sup> ITU-R Working Party 8F, Document 8/116-E, "Review of the Draft Revision of Recommendation of ITU-R M.1036-2 as Received from ITU-R Study Group 8," November 10, 2005.

**Table 1 - Frequency arrangements in the band 2 500-2 690 MHz**

Frequency arrangement	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	Centre gap usage
C1	2 500-2 570	50	2 620-2 690	120	TDD
C2	2 500-2 570	50	2 620-2 690	120	FDD DL (external)
C3	Flexible FDD/TDD				

NOTE 1 – Administrations can implement all or parts of these frequency arrangements, taking into account other services allocated in this band.

NOTE 2 – In C1, in order to facilitate deployment of FDD equipment any guard bands required to ensure adjacent band compatibility at the 2570 MHz and 2620 MHz boundaries will be decided on a national basis and taken within the band 2570-2620 MHz and should be kept to the minimum necessary, based on Report ITU-R M.2045.

NOTE 3 – In C3, Administrations can use the band solely for TDD or some combination of TDD and FDD. Administrations can use any FDD duplex spacing or FDD duplex direction. However, when Administrations choose to deploy mixed FDD/TDD channels with a fixed duplex separation for FDD, the duplex separation and duplex direction as shown in C1 are preferred.

Nokia advocates the frequency arrangement option ‘C2’ given in Table 1, with the 50 MHz mid band gap to be licensed either for IMT-2000 TDD or for IMT-2000 FDD downlink usage. It also identifies significant coexistence problems that could be encountered between TDD and FDD systems that are being operated in the same geographical area.

Nokia notes that substantial spectrum would need to be allocated (such as 20 MHz per operator) with regards to the expected capacity performance of Long Term Evolution<sup>2</sup> (LTE) systems to achieve the highest transmission rates, particularly in the downlink direction. It is also of the view that this band should only be used for fully mobile radio systems as defined in ITU-R and that fixed or nomadic wireless broadband systems should use the 3.5 GHz range.

In contrast, Vector considers that packaging of this band should support the development of emerging standards for both fixed and mobile broadband access.

Motorola advocates a plan that would allocate to each operator a minimum of 20-30 MHz of spectrum, with the freedom to deploy any channel bandwidth (the most likely being 3.5 MHz, 5 MHz and 10 MHz) within each allocation.

---

<sup>2</sup> Nokia supports the development of IMT-2000/UMTS, particularly the migration towards the HSDPA, HSUPA and LTE within ETSI and 3GPP.

## Spectrum allocation for broadband wireless applications: Summary of Submissions

Intel recommends an initial assignment of 40 MHz per licensee in a technology neutral manner with no preference for FDD or TDD.

NORTEL observes that the WiMAX Forum recommends providing 30 MHz of TDD spectrum in high traffic areas to each mobile WiMAX operator to allow for efficient provision of the full range of anticipated services in the coming years.

NATCOM recommends at least 30 MHz lots for FWA.

NetSmart advocates 5, 10 or 20 MHz channels for FWA.

Telecom regards it too early to consider packaging of the 2.5 GHz band.

Vodafone expresses its concerns at this band being considered for allocation and cautions that a pre-allocation of this band could potentially foreclose technology options for New Zealand.

Both Telecom and Vodafone note that although this band has been identified for IMT 2000 expansion and for Mobile WiMAX, packaging options are as yet unclear.

Telecom notes that European regulators are currently re-licensing the 900 MHz band for IMT-2000, and once that is completed, the licence options and therefore, the packaging options for the 2.5 GHz band will become clear. It also observes that the only known facts on WiMAX in this band are that initial profiles are TDD based and that a 5 MHz channel raster is to be used.

Vodafone proposes that this band not be considered for allocation until further information is available on the band plans.

TelstraClear advocates creating at least one large block (e.g. 100 MHz) for WiMAX in this band.

The WiMAX Forum recommends 30MHz per operator with 5 or 10MHz channels depending on services offered and local market conditions.

### Optimal Management Regime:

There are a range of views on the optimal management regime for this band.

	Public Park	Managed Park	Licensing	Area Spectrum Licences	Management Right Regime
4RF	x	x	With licence fees based on an operating revenue model	x	x
Airnet	x	✓	x	✓	x

## Spectrum allocation for broadband wireless applications: Summary of Submissions

	Public Park	Managed Park	Licensing	Area Spectrum Licences	Management Right Regime
AirSpeed	x	✓	x	x	✓
Araneo	x	✓	✓	x	x
CallPlus	x	✓	x	x	✓
Convergenx	x	x	x	x	With use-it-or-lose-it condition
Intel	x	x	x	x	✓
InternetNZ	x	x	Until OB operators are shifted to 2.7-2.9 GHz band	x	x
Motorola	x	x	With consulted deployment milestones	x	x
Mount Campbell	x	x	x	✓	x
NATCOM	✓	✓	x	x	x
NetSmart	x	✓	x	x	x
NZFire Service	✓	x	✓	x	x
NZ Police	✓	x	✓	x	x
NZ Wireless	x	Crown-managed	x	x	x
TeamTalk	x	✓	✓	x	x

Econet recommends “proper OECD spectrum licences” where behaviour, access and spectrum, is managed by the Regulator with appropriate safe harbour management to facilitate a countrywide network build in same technology competition.

Nokia is of the view that it is extremely important to facilitate interference-free operation of IMT-2000/UMTS systems.

SCORCH Communications considers it important that regional and sub-regional operators have opportunities to access this band, as small operators have the flexibility and speed to set up networks quickly and efficiently.

THL (BCL) recommends the continuation of the present regime of radio licences, with conditions requiring co-ordination for TVOB.

Vector advocates a combination of mechanisms, including a significant portion for a Managed Park.

The WiMAX Forum recommends conventional licensed use so that QoS and other aspects of performance are predictable. It is of the view that this will help to build market acceptance and establish market confidence in BWA for a wide range of applications.

### **Conclusions:**

The majority of respondents advocate using this band for BWA and there is strong support for clearing this band for a future BWA allocation. There is some debate whether the optimal application of BWA suitable for this band is for cellular expansions or for Mobile WiMAX. Many respondents also note that band plans for both technologies are still being developed. It is expected that sharing studies will be completed before and international spectrum allocations and (or) identifications will be negotiated at, the World Radio Conference 2007 (WRC-07). Furthermore, sharing studies between ENG (TVOB) links and BWA technologies may be developed in this timeframe.

The Ministry notes that a recommendation defining and describing BWA technologies that are considered IMT-Advanced applications (sometimes referred to as a 4G technology) and the principles for standardisation of IMT-Advanced applications are currently the topics of international work within the ITU-R. These are expected to be completed prior to WRC-07.

The Ministry therefore envisages developing a transition plan with a view to clearing this band for a future allocation for BWA in consultation with stakeholders. The Ministry notes that the 2.7 - 2.9 GHz band is already available for TVOB services.

The form and boundary conditions of an actual allocation for BWA will be considered once there is more clarity on band and channel plans of pertinent BWA applications in the 2.50-2.69 GHz band, likely to be after WRC-07.

## **4.9 Allocation Opportunities – 5.4 GHz**

9a Do you have an interest in using the 5.4 GHz band?

9b What do you consider to be the optimum use for this band?

9c Which form of management would you consider to be optimal for this band; radio licensing, public parks or Managed Parks?

## Spectrum allocation for broadband wireless applications: Summary of Submissions

Of the 43 submitters, 20 expressed interest and another two expressed a limited interest in using the 5.4 GHz band.

A wide range of uses are advocated for this band:

- WLANs - low power indoor to outdoor applications and networks (11 respondents)
- Fixed P-P (point-to-point) linking (three respondents)
- Licensed-exempt WiMAX (two respondents)
- FWA with 5, 10, 20 MHz channels, short range communications, Mobile VoIP, backhaul for BWA base stations and backhaul for cellular networks (one respondent each).

Out of the responders with an interest in this band, the majority (nine) advocate a Public Park regime whilst six prefer a Managed Park. Three respondents prefer either a Public Park or Managed Park or a combination thereof, two favour a Managed Park or a licensed (Management Rights or Radio licences) regime and four advocate licensing.

The NZ Police and the NZ Fire Service express a limited interest in this band for indoor operations and note that current meteorological radar operates above 5.6 GHz. Both suggest that the band should be retained under a licensed regime.

NetSmart questions the need for additional Public Park spectrum for WiFi type use and advocates a Managed Park regime.

Three major equipment manufacturers, Cisco, Intel and Motorola, however, are of the view that use of this band (5.470-5.725 GHz) should be in accordance with ITU-R Resolution 229. In some countries, this band is used by meteorological (weather) and military radar.

Cisco notes that, although used by radar, much of this spectrum, at any given time and in any given geography, is unused. Introducing low power devices that are agile enough to avoid incumbent radar systems so as not to cause harmful interference is noted by Cisco to be an ideal way of making good use of the spectrum, while ensuring that the primary users – the radars - are protected. It notes that rules governing dynamic frequency selection (DFS), which are in accordance with Resolution 229 to protect military and meteorological radar devices, have been finalised by the US Federal Communications Commission (FCC). Cisco expects to produce, market and sell DFS-equipped WLAN devices for the 5.4 GHz band in regions that have allowed WLAN use in this band. These include the US, Europe and the Asia-Pacific region. Motorola has also developed equipment with DFS capability that is compliant with ITU-R Resolution 229.

Cisco and Intel urge New Zealand to open up this band for WLAN use in accordance with ITU-R Resolution 229 in an expeditious manner.

Motorola recommends that New Zealand adopt a regulatory regime similar to that of the USA. THL (on behalf of BCL) advocates New Zealand's alignment with dominant international administrations and supports the above recommendation of adopting the US-FCC rules. Cisco also recommends that New Zealand align the band with the rest of the world's practices to ensure the country's consumers have access to the best and lowest cost WLAN technologies.

**Conclusions:** The majority of the respondents advocate using this band for WLANs. There are significant economic benefits (such as availability of equipment and economies of scale) in aligning New Zealand's use of this band with that of its major trading partners, in the context of global harmonisation. New Zealand has also been actively involved in the harmonisation process, including the development of the US-FCC rules and in ensuring that NZ meteorological radars are protected from WLANs.

The Ministry concludes that the best use of this band is for WLAN operating under a GURL with suitable protection for incumbent radar applications.

## **4.10 Allocation Opportunities – 60 GHz**

10a Do you have an interest in using the 60 GHz band?

10b What do you consider to be the optimum use for this band?

10c Which form of management would you consider to be optimal for this band: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?

Six submitters (out of 43) expressed interest in using this band. They are:

- AirSpeed (P-P High capacity links)
- Araneo (P-P links)
- Intel (WPANs)
- NetSmart (P-P links)
- NZWireless (P-P backhaul) and
- TeamTalk (P-P links).

Other specific uses advocated for this band include WPAN applications such as computer-to-computer file transfer, P-P high bandwidth video links, Bluetooth-type applications, localised mesh networks and short distance covert communications.

There is equal preference for a Managed Park or a Public Park, with four respondents each supporting the two regimes and one respondent not exhibiting any preference.

Two respondents, however, support a Managed Park regime or licensing whilst NZWireless advocates a Managed Park, administered by the Crown.

Internet NZ prefers a Managed Park, with an option to revert to a Public Park on a regional basis, where appropriate. THL (BCL) proposes a short-term trial of the Managed Park concept in this band.

Telecom expresses concern over any potential introduction of in-car radar systems or UWB devices in this band without sufficient analysis of its effects on existing services.

Intel's view is that the optimum use of this band (57-66 GHz) can be for WPAN. Applications of WPAN include, point-to-point communications for high bandwidth video links, as well as back haul connections. It notes that the IEEE 802.15.3C™, which has been operational since early 2005, has been active in developing a millimetre-wave-based alternative physical layer (PHY) for the existing 802.15.3 Wireless Personal Area Network (WPAN) Standard 802.15.3-2003. Intel notes that many countries, including the U.S., have already established rules for the band.

### **Conclusions:**

There appears to be strong interest from a small number of users (four), to use this band for Very short-haul P-P High capacity links, with one respondent planning to trial this system. The Ministry may consider the results of the trial to further inform its views with respect to this band. As it would be advantageous for New Zealand to align its spectrum allocations with the rest of the world, the work of the IEEE 802.15 group would also be taken into account.

Other nations have enabled Public Park access to the 60 GHz band for P-P High Capacity links. Furthermore, propagation characteristics, such as atmospheric/oxygen absorption unique to this band, lend this band suitable to un-coordinated licensing regimes. The Ministry therefore intends to enable access to this band using a suitably conditioned GURL. The conditions on such a GURL would be crafted to ensure that technology neutrality is balanced with spectrum utility and efficiency.

It is noted that Managed Parks may be trialled in the 70-90 GHz bands.

## **4.11 Allocation Opportunities – 70, 80 & 90 GHz**

11a Do you have an interest in using the 70, 80 and 90 GHz bands?

11b What do you consider to be the optimum use for these bands?

11c Which form of management would you consider to be optimal for these bands: management rights; spectrum licences under Crown management; public parks; Managed Parks; or a combination thereof?

Seven submitters (out of 43) expressed interest in using these bands. They are:

## Spectrum allocation for broadband wireless applications: Summary of Submissions

- Araneo (P-P links or LMDS)
- NetSmart (FW P-P linking )
- Nokia (BWA backhaul)
- NZART Council (short range communications)
- NZ Fire Service and the NZ Police (very short range data transfer and Vehicular collision avoidance radar)
- TeamTalk (P-P links or LMDS).

Out of the respondents who are interested in these bands, three submitters advocate a Managed Park regime or licensing, whilst the NZART supports a Public Park regime.

Both the NZ Police and the Fire Service do not express preference on how these bands should be allocated, whether as Managed Parks or Public Parks. THL (BCL) proposes a short-term trial of the Managed Park concept in these bands, as well as in the 60 GHz band.

InternetNZ advocates a combination of Managed Park in non-metro areas and spectrum licences under Crown management in densely populated areas. It notes that these bands could also be potentially used for Outside Broadcast linking.

Telecom expresses concern over any potential introduction of in-car radar systems or UWB devices in these bands, without sufficient analysis of its effects on existing services.

Nokia notes that it is planning on developing a point-to-point product, which will operate in the 71-76/81-86 GHz frequencies providing high capacity suitable for Gigabit Ethernet. It notes that this product will be usable in a BWA network, primarily for backhaul.

**Conclusions:** There appears to be some interest in using these high frequency bands for a variety of uses, including: short range communications, very short-haul P-P high capacity links, vehicular collision avoidance radar, BWA backhaul, LMDS and Outside Broadcast links. The majority of the respondents support the creation of Managed Parks in these bands.

It should be noted that the unique propagation conditions observed in the 60 GHz band are not evident in the 70-90 GHz range.

Following on from the Ministry proposal to treat the 60 GHz band as a Public Park, which would allow the early adoption of high-capacity short haul P-P linking, it is further proposed that the Managed Park approach be used to enable access to the 70/80/90 GHz bands to accommodate short range FWA and or P-P & P-MP BWA.

International planning of the band 77-81 GHz for UWB vehicular radar would be accommodated within the detailed band and channel planning of the Managed Park.

Such detailed band and channel planning and the specific conditions applicable to the implementation of a Managed Park will form the subject of a future consultation process.

## **4.12 Other bands not considered in the discussion paper**

12a Are there any other bands that you consider to be future candidates for BWA?

12b If so, which ones, why and when?

12c How do you think they should be allocated, taking into account current allocations and usage?

There is a range of interest from the respondents on a number of spectrum bands, which are summarised below.

### **330-512 MHz:**

4RF conveys their interest in this band being made available for BWA, as it has developed products which are popular and widely deployed in countries with rural broadband demand similar to that of New Zealand.

AirSpeed recommends considering the 450-470 MHz band for mobile broadband and promotes the Flarion F-OFDM FDD system with 1.25 MHz channel bandwidths and 10 MHz duplex separation. It notes that the typical capacity per channel is around 2.3 Mbps.

TelstraClear also considers this band (450-470 MHz) suitable for cellular broadband due to its extensive coverage and accrued significant cost advantages in network deployment.

The Ministry notes that the 230-400 MHz band is used for government services and the 400-502 MHz band is allocated and licensed for many fixed and mobile services. These licensed services are predominantly narrowband and options for accommodating broadband services would be limited and with impact to existing services. The Ministry therefore notes that these bands will not be available for BWA, at least in the short term.

### **502-806 MHz (Sub 1 GHz bands):**

4RF notes that in the US, parts of the 502-806 MHz spectrum is already in the process of changing hands - from broadcasting to BWA - and that 4RF is offering products at 700 and 900 MHz. It questions whether 30% of available spectrum below 1 GHz should be locked in for broadcast allocations or whether this should be used for more egalitarian broadband multimedia. 4RF welcomes additional spectrum in this range being made available for technology-independent BWA and associated linking.

## **Spectrum allocation for broadband wireless applications: Summary of Submissions**

Intel is of the view that spectrum below 1 GHz is likely to be a future candidate for BWA. Intel also notes that the US is currently planning an analogue to digital TV conversion, and upon completion around 2009, additional spectrum in the 700 MHz band will become available for BWA applications.

NORTEL advises the Ministry that there is considerable global interest in the 700 MHz band for mobile WiMAX. Some countries have licensed or are considering licensing BWA applications, as the transition to digital TV releases sizeable amounts of spectrum. NORTEL notes that it is important that this transition is well managed, to provide spectrum blocks of sufficient size that would allow the efficient provision of mobile broadband. Although the WiMAX Forum has not yet specified a profile for the 700 MHz band, NORTEL expects this to happen well before widespread mobile WiMAX deployments commence in this band.

Convergenx and NetSmart note that there are advantages in operating BWA/WiMAX systems in the sub 1 GHz bands, particularly for rural and remote areas. Convergenx envisages this spectrum becoming available when New Zealand's transition to digital television is completed and that fixed, nomadic, portable and mobile BWA systems can be deployed in these bands.

The WiMAX Forum informs the Ministry that it is evaluating the use of bands below 1 GHz, in order to enhance the provision of broadband wireless systems to rural areas, since such bands provide better propagation characteristics for low-density coverage. It also makes reference to the emerging opportunity of the 'digital dividend' that will result from the more efficient use of the spectrum by broadcasters after analogue switch-off. The Forum notes that the US has recently released spectrum in the 698-806 MHz frequency range for commercial and public safety wireless applications. Canada has made provisions for public safety applications and commercial services above 746 MHz while below 746 MHz, provisions have been made for the limited use of advanced communications in rural and remote areas.

The Ministry notes that planning is underway to enable the introduction of digital TV services. The Government has agreed to consult with the broadcasting industry in developing criteria and a process for analogue switch-off. BWA could be a contender for the vacated spectrum, along with DTT, after analogue switch-off. The Ministry notes that the consolidation of broadcasting licences after analogue switch-off could release significant amounts of contiguous spectrum for new services such as BWA.

A number of new technologies, such as Cognitive Radio, e.g. using the IEEE 802.22 standard, could assist BWA deployment by allowing services to share radiofrequency bands through the dynamic and efficient utilisation of unused or vacated spectrum. With the use of such new technologies, it may be possible to use the UHF TV band for BWA even prior to analogue switch-off.

To this end, the Ministry plans to convene a joint workshop with industry on smart technologies, such as Cognitive Radio, in November 2006.

## **800 and 900 Cellular Bands:**

TelstraClear advocates making these bands available to new entrants when current rights expire in 2010.

The Ministry notes that this matter will be addressed within its ongoing case-by-case review of cellular rights in these bands.

AirSpeed notes that the guard bands in the GSM 900 spectrum have been made available for voice and data private networks throughout the United Kingdom and recommends that this development be considered in New Zealand.

The Ministry notes that there is only one guard band existing between the Cellular Management Rights of Telecom (CDMA2000) and Vodafone (GSM) in New Zealand. The unused spectrum ranges 845-849 MHz and 935-939 MHz are being considered as candidates to accommodate Studio Transmitter Links (STLs), potentially displaced from the 915-921 MHz range. See the next section on '900 MHz Public Park Spectrum Band'.

## **900 MHz Public Park Spectrum Band:**

Mount Campbell and SCORCH both recommend that the Ministry actively pursue the alignment of the 900 MHz unlicensed band (Public Park spectrum) with its international equivalent.

SCORCH notes that internationally, this public park band ranges from 920-928 MHz. It further notes that the centre of the New Zealand band assignment is not aligned with currently available equipment manufactured to the international range.

The Ministry notes that in New Zealand, access to the 921-929 MHz band is granted by a General User Licence for Short Range Devices (SRDs). Expansion of the 921-929 MHz public park is currently restricted by radio licensing of STLs in the band 915-921 MHz. The Ministry is currently investigating the possibility of accommodating these licensed services in nearby unused spectrum bands (see previous section). Release of the 915-921 MHz range would enable alignment with Australian public park allocation and would allow for the introduction of RFID and RLAN type SRD technologies.

## **1.0-1.7 GHz Band:**

TelstraClear advocates this band being made available for BWA.

The Ministry notes that bands within this spectrum range have a number of service allocations in New Zealand including Aeronautical Radionavigation, Radiolocation, Satellite, Radio Astronomy, Fixed, Broadcasting, Mobile Satellite, Space Research and Meteorological Aids, with significant use.

## **3400-3410 GHz (and the corresponding pair):**

Airnet expresses interest in the 3400-3410 MHz and 3500-3510MHz bands.

The Ministry notes that the 3400-3410 MHz AMATEUR allocation is a concessionary allocation for radio amateurs, for not being able to use the 3410-3500 MHz band that they had prior access to. The amateurs may wish to license this band in the future.

The 3500-3510MHz band (which is paired with 3400-3410 MHz) is allocated to RADIOLOCATION service and is of significant importance to New Zealand's national and international interests.

### **4.9 GHz Band:**

Both the NZ Police and the NZ Fire Service note that the 4.9 GHz band is extensively promoted in the USA for public safety and emergency service applications. They strongly recommend that this band be introduced as a deployment band for public safety mesh networks and be allocated as an Emergency Service Band to be managed by the Public Safety Radio Frequency Management Group.

The Ministry notes that this band is being used by fixed links and that access to the 4.940-4.990 GHz would be dependant on the determination of access and sharing criteria agreed to by all parties, in accordance with the Preliminary Draft New Recommendation on Sharing studies that is currently being developed in ITU-R WP8A.

The Ministry also notes that the 5.850-5.925 GHz band may provide similar capabilities to the 4.9 GHz band and is also used for public safety purposes (ITU-R Resolution 646 (WRC-03) refers).

### **10.5 GHz Band:**

Both AirSpeed and Siemens express strong interest in using this band for P-MP applications, in addition to P-P applications.

Sub-band considerations identified are:

- Base Station Transmit - 10,150MHz to 10,300MHz, and
- Terminal Station Transmit - 10,500MHz to 10,650MHz.

AirSpeed recommends the allocation of this band as 28 MHz paired blocks coordinated with existing P-P links. It notes that there is no requirement for guard bands between FWA channels and that licences could be offered on a nationwide basis or on a per base station basis, with restrictions on the maximum output power and coverage.

JDA also expresses interest in having access to this band for high capacity short-haul data linking.

BCL is of the view that the 10.5 to 10.68 GHz band (links) may be suitable for P-MP site backhaul for BWA services, with the existing P-P fixed links being given continued access and re-channelled to maximise potential future use. BCL further notes that it may also be necessary to re-cast the band channelling to align with

equipment manufactured for this band and that future allocations should be restricted to P-MP systems.

The Ministry notes that in New Zealand, parts of this band are currently used by radiolocation and by P-P fixed links.

As there has been some strong interest in this band, the Ministry is investigating the viability of satisfying industry demand for P-MP applications.

### **26.5 GHz Band:**

AirSpeed expresses interest in using this band with the following sub-band consideration:

- Base Station Transmit – 24.549 GHz to 25.445 GHz, and
- Terminal Station Transmit – 25.557 GHz to 26.453 GHz.

The Ministry notes that this spectrum is in the hands of private managers, including TelstraClear, Vodafone, and BCL. It encourages AirSpeed to negotiate with the current managers for suitable access to this spectrum.

### **28 GHz Band:**

AirSpeed also expresses interest in using the 28 GHz band with the following sub-band consideration.

- Base Station Transmit – 27.5485 GHz to 28.4445 GHz, and
- Terminal Station Transmit – 28.5565 GHz to 29.4525 GHz.

The Ministry notes that the range identified above for base transmit is in private hands (TelstraClear) although the upper range, which is allocated to the FIXED and FIXED SATELLITE services, is currently unused.

## 5. Summary of Outcomes and Next Steps

---

This review, undertaken within the context of unfolding international developments on BWA, has identified a number of spectrum bands with allocation opportunities for BWA. It has also identified a number of issues in certain spectrum bands which require further study, before definitive decisions on allocation can be made. As a result of this consultation, the Ministry is undertaking the following steps:

### 5.1 2.3 GHz Band

After considering the submissions to the discussion paper and recent international developments, the Ministry notes that there is strong support for reconfiguration and reallocation of frequencies between 2.3 GHz and 2.396 GHz (2.3 GHz spectrum) suitable for deployment of BWA networks.

The Ministry therefore envisages conducting an auction of the 2.3 GHz spectrum band as soon as practicable with the following conditions:

- 8 x10 MHz blocks from 2316-2396 MHz would be made available for competitive allocation as nationwide Management Rights.
- A spectrum cap of 30 MHz per organisation for two years from allocation would apply.
- The successful bidders would be subject to conditions of use or implementation clauses.

Subject to discussions with band managers for early relinquishment of current 2.3 GHz spectrum rights, some of the auctioned spectrum rights will commence immediately after the auction, while a smaller amount may not be available for use until after current rights expire in 2010.

The Ministry also envisages allocating part of 2.3 GHz spectrum (from 2300-2316 MHz) as a Managed Park, available from 2010 or earlier. Eligibility criteria for access to and implementation rules of the Managed Park will be developed in consultation with industry.

### 5.2 2.5 GHz Band

The majority of respondents advocate using this band for BWA and there is strong support for clearing this band for a future allocation for BWA. There is some debate whether the optimal application of BWA suitable for this band, is for cellular expansions or for Mobile WiMAX. Many respondents also note that band plans for both technologies are still being developed. It is expected that sharing studies will be completed before and international spectrum allocations and (or) identifications will be negotiated at, the World Radio Conference 2007 (WRC-07). Furthermore, sharing studies between ENG (TVOB) links and BWA technologies may be developed in this timeframe.

The Ministry notes that a recommendation defining and describing BWA technologies that are considered IMT-Advanced applications (sometimes referred to as a 4G technology) and the principles for standardisation of IMT-Advanced applications are currently the topics of international work within the ITU-R. These are expected to be completed prior to WRC-07.

The Ministry therefore envisages developing a transition plan with a view to clearing this band for a future allocation for BWA in consultation with stakeholders. The Ministry notes that the 2.7 - 2.9 GHz band is already available for TVOB services.

The form and boundary conditions of an actual allocation for BWA will be considered once there is more clarity on band and channel plans of pertinent BWA applications in the 2.50-2.69 GHz band, likely to be after the WRC-07.

### **5.3 60 GHz Band**

There appears to be strong interest from a small number of users (four) to use this band for Very short-haul P-P High capacity links, with one respondent planning to trial this system.

Other nations have enabled Public Park access to the 60 GHz band for P-P High Capacity links. Furthermore, propagation characteristics, such as atmospheric/oxygen absorption unique to this band, lend this band suitable to un-coordinated licensing regimes. The Ministry therefore intends to enable access to this band using a suitably conditioned GURL. The conditions on such a GURL would be crafted to ensure that technology neutrality is balanced with spectrum utility and efficiency.

### **5.4 70, 80 & 90 GHz Bands**

There appears to be some interest in using these high frequency bands for a variety of uses, including: short range communications, very short-haul P-P high capacity links, vehicular collision avoidance radar, BWA backhaul, LMDS and Outside Broadcast links. The majority of the respondents support the creation of Managed Parks in these bands.

The Ministry proposes to use the Managed Park approach to enable access to the 70/80/90 GHz bands to accommodate short range FWA and/or P-P & P-MP BWA.

International planning of the band 77-81 GHz for UWB vehicular radar would be accommodated within the detailed band and channel planning of the Managed Park.

Such detailed band and channel planning and the specific conditions applicable to the implementation of a Managed Park will form the subject of a future consultation process.

## 5.5 Other Bands

There were a range of spectrum bands of interest to the respondents and the Ministry has considered if and how this industry demand can be met. As a result of this review, the Ministry is undertaking the following actions.

### **502-806 MHz (Sub 1 GHz bands):**

The Ministry plans to convene a joint workshop with industry on smart technologies, such as Cognitive Radio, in November 2006.

### **900 MHz Public Park Spectrum Band:**

Several respondents recommend that the 900 MHz Public Park spectrum be aligned with its international equivalent.

The Ministry notes that in New Zealand, access to the 921-929 MHz band is granted by a General User Licence for Short Range Devices (SRDs). Expansion of the 921-929 MHz public park is currently restricted by radio licensing of Studio Transmitter Links (STLs) in the band 915-921 MHz. The Ministry is currently investigating the possibility of accommodating these licensed services in nearby unused spectrum bands. Release of the 915-921 MHz range would allow alignment with Australian public park allocation and allow for the introduction of RFID and RLAN type SRD technologies.

### **10.5 GHz Band:**

The Ministry notes that in New Zealand, parts of this band are currently used by radiolocation and by P-P fixed links.

As there has been some strong interest in this band, the Ministry is investigating the viability of satisfying industry demand for P-MP applications.

## Appendix A

---

### List of Organisations who provided Submissions

Full name of Submitter	Abbreviation
4RF Communications	4RF
Airnet NZ	Airnet
AirSpeed Telecom	AirSpeed
Alcatel	Alcatel
Araneo	Araneo
AUSTAR	AUSTAR
CallPlus	CallPlus
CDMA Development Group (CDG)	CDG
Cisco Systems	Cisco
Compass Communications	Compass
Consultel Associates	Consultel
Convergex	Convergex
Econet Wireless	Econet
IDC (report commissioned by Woosh)	IDC
IEEE 802.18	IEEE 802
Intel	Intel
InternetNZ	InternetNZ
JDA	JDA

**Spectrum allocation for broadband wireless applications: Summary of Submissions**

<b>Full name of Submitter</b>	<b>Abbreviation</b>
Motorola Australia	Motorola
Mount Campbell Networks	Mount Campbell
NATCOM	NATCOM
NetSmart	NetSmart
Nokia	Nokia
NORTEL	NORTEL
New Zealand Amateur Radio Transmitters (NZART) Association	NZART
New Zealand Fire Service	NZ Fire Service
New Zealand Police	NZ Police
nzwireless	nzwireless
PlaNet	PlaNet
SCORCH Communications	SCORCH
Siemens (NZ)	Siemens
Sky Television	SKY
TeamTalk	TeamTalk
Telecom	Telecom
TelstraClear	TelstraClear
ThePacific.net	ThePacific.net
Transmission Holdings Limited (THL) on behalf of Broadcast Communications Limited (BCL)	THL (BCL)

## Spectrum allocation for broadband wireless applications: Summary of Submissions

<b>Full name of Submitter</b>	<b>Abbreviation</b>
Unwired Australia	Unwired
Vector Communications	Vector
Vodafone	Vodafone
WIC NZ Ltd	WIC
WiMAX Forum	WiMAX Forum
Woosh Wireless	Woosh

## Appendix B

### Summary of Analysis

Group One							
Question	4RF Communications	Airnet NZ	AirSpeed Telecom	Alcatel	Araneo	AUSTAR	
1a Do you have an interest in deploying services using FWA?	No. However, supplies equipment & services to existing and new wireless network operators	Yes	Yes	No. However, supplies equipment & services to existing and new wireless network operators	Yes - it is the primary business of Araneo	N/A	
1b If so, what technologies and standards would you consider and why?	In addition to the focus on BWA, as much attention should be given to backhaul	802.16 Fixed WiMAX	802.16e, 802.20, WiBro, 3GPP/3GPP2 (for 2.3/2.5 GHz bands) Proprietary standards for leased line services at 10.5, 26.5 and 28 GHz bands	BWA licences need to account for a much larger application domain, accessing a much larger range of spectrum, than earlier generation FWA systems	UMTS, WiMAX, WiBro, WiFi and SCADA	N/A	
1c Which bands do you consider to be the most suitable for this purpose and why?	N/A	3.5 GHz	2.3, 2.5GHz – nomadic and mobile broadband services 10.5, 26.5 and 28GHz – Leased line (IP, E1 and point to point circuits)	N/A	502-806: remote and rural 2300-2396: rural and suburban 2500-2690: suburban 5150-5825: suburban and urban 10.5-10.680: urban 25-28GHz: no spectrum available 57-66GHz: short distance p-p linking 71-95GHz: short -10km p-p linking & cell backhaul	N/A	
1d In which markets or regions would you consider deploying FWA and why?	Customers of 4RF tend to deploy P-P links in suburban and rural areas	Hawke's Bay and East Coast	Enterprise & SME markets in Auckland, Hamilton, Napier, Wellington and Christchurch	N/A	Nationwide	N/A	
1e What is your timeframe for deploying FWA and why?	N/A	[Information suppressed]	New entrant to NZ market Plans to commence services in early 2007	N/A	Currently deploying FWA for business customers nationwide A consumer offering is conditional on suitable spectrum being made available	N/A	
2a Do you have an interest in deploying WLANs and/or WiMAX?	Actively investigating WiMAX technical standards as future product strategy	Yes	Yes	Yes, as an equipment supplier	Yes	N/A	

<b>Group One</b>									
<i>Question</i>	<i>4RF Communications</i>	<i>Airnet NZ</i>	<i>AirSpeed Telecom</i>	<i>Alcatel</i>	<i>Araneo</i>	<i>AUSTAR</i>			
2b If so, what technologies and standards would you consider and why?	WiMAX and Backhaul applications	802.11b/g WiFi 802.16e – Mobile WiMAX	802.16e – Mobile WiMAX	WiMAX	WLAN WiMAX WiBro	N/A			
2c Which bands do you consider to be the most suitable for this purpose and why?	N/A	2.xx GHz spectrum for Mobile WiMAX	2.3 GHz 2.5 GHz	2.3 GHz 2.5 GHz 3.5 GHz	2.3 GHz 2.5 GHz	N/A			
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	N/A	Hawke's Bay and East Coast	Enterprise & SME markets in Auckland, Hamilton, Napier, Wellington and Christchurch	N/A	All regions	N/A			
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	N/A	[Information suppressed]	Q1/Q2 2007 – Business 2008/ 2009 – Fully mobile	N/A	Currently deploying WLANs	N/A			
3a Do you have an interest in deploying satellite broadband services?	No – limitations of performance, cost and ownership	No	Not at this time	Full range of satellite products to enable broadband services	No	N/A			
3b If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	N/A	N/A	N/A			
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	N/A	DAB – L band Mobile TV – S band	N/A	N/A			
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	N/A	N/A	N/A	N/A	N/A			
3e What is your timeframe for deploying satellite broadband services and why?	N/A	N/A	N/A	N/A	N/A	N/A			
4a Do you have an interest in deploying cellular broadband services?	No	Yes - depending on the outcome of this process	Yes	N/A	Not interested	N/A			
4b Which bands do you consider to be the most suitable for this purpose and why?	N/A	Somewhere in the 2.xx area for high-density complete mobility	450 MHz, 2.3 GHz and 2.5 GHz	N/A	N/A	N/A			
4c If so, what technologies and standards would you consider and why?	N/A	Fully mobile 902.16e rather than nomadic	450 MHz – deployment most likely to be a F-OFDM-based network	N/A	N/A	N/A			
4d In which markets or regions would you consider deploying cellular broadband and why?	N/A	Hawke's Bay and East Coast	Will consider all markets	N/A	N/A	N/A			

<b>Group One</b>									
<i>Question</i>	<i>4RF Communications</i>	<i>Airnet NZ</i>	<i>AirSpeed Telecom</i>	<i>Alcatel</i>	<i>Araneo</i>	<i>AUSTAR</i>			
4e What is your timeframe for deploying cellular broadband and why?	N/A	Will need further indication arising from this process	24-month period before service availability	N/A	N/A	N/A			
5a Do you have an interest in deploying digital broadcast or convergent services?	No	Yes	Yes	Yes – hybrid mobile TV supplier	No	N/A			
5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	N/A	Terrestrial, for capacity and flexibility	Terrestrial and mobile	MBMS, HSDPA	N/A	N/A			
5c Which bands do you consider to be the most suitable for this purpose and why?	N/A	Up to 3.5 GHz	470-750 MHz	2.2, 2.3 GHz, designated IMT+ bands	N/A	N/A			
5d In which markets or regions would you consider deploying digital broadcast services and why?	N/A	Hawkes Bay / East Coast	Urban centres	N/A	N/A	N/A			
5e What is your timeframe for deploying digital broadcast services and why?	N/A	Depends on spectrum allocation process	3Q08	N/A	N/A	N/A			
6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?	Yes. May overcome spectrum lock-ups & increase opportunities	Yes. Provides a good balance between spectrum availability and management	Yes. Enabler for affordable services & promotes real competition	Yes. Alcatel is interested in the application of light licensing regimes to certain specific bands	Yes. Prevents problems associated with public parks without costly licences	N/A			
6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	Yes. Would help to reduce the challenges faced by regional operators	Yes. Should ONLY be available on a regional basis to prevent 'spectrum squatting'	Yes. Enables regional operators to deliver QoS with licensed technologies & low costs	N/A	Depends on how much spectrum is allocated & if they already have access to similar spectrum	N/A			
6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	Use operating revenue model to provide incentives to maximise sharing	Beauty contest with 'slow start' and ongoing justification of resource requirement	First come, first served with monitoring to ensure spectrum is being used	N/A	Give preference to players with the means to use the spectrum most efficiently	N/A			
7a Do you have an interest in using the 2.3 GHz band?	Band must be shared between Fixed and BWA services	Yes – "If allocation process is fair"	Yes	Interest in supplying WiMAX kit	Yes	N/A			
7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	Not qualified to comment	Yes. Well aligned with 802.16e	Yes	Unclear	30 MHz MR – WiMAX 36 MHz MR – WiBro	N/A			
7c What do you consider to be the optimum use for this band?	Both P-P and P-MP services in a technology independent manner	Mobile BWA	Mobile BWA	BWA	BWA	N/A			

<b>Group One</b>									
<i>Question</i>	<i>4RF Communications</i>	<i>Airnet NZ</i>	<i>AirSpeed Telecom</i>	<i>Alcatel</i>	<i>Araneo</i>	<i>AUSTAR</i>			
7d Which form of management would you consider to be optimal for this band?	Short term licence with licence fees based on operating revenue	N/A	MRs + Managed Park	N/A	30MSP/30MR/36MR	N/A			
8a Do you have an interest in using the 2.5 GHz band?	Band must be shared between Fixed and BWA services	Yes – "If allocation process is fair"	Yes	Intends to produce global standard product for this band	Yes	N/A			
8b What do you consider to be the optimum packaging for this band?	Not qualified to comment	Unknown right now	Should mirror similar approach as 2.3GHz packaging	Countries lacking spectrum for BWA in 3.5 GHz and 2.3 GHz should consider access to part of 2.5 GHz band for BWA	Paired blocks (separated by 100 MHz) of at least 15MHz width	N/A			
8c What do you consider to be the optimum use for this band?	Both P-P and P-MP services in a technology independent manner	Mobile BWA	Mobile BWA	N/A	FWA	N/A			
8d Which form of management would you consider to be optimal for this band?	Short term licence with licence fees based on operating revenue	Combination of Managed Park & Area Spectrum Licences	MRs + Managed Park	N/A	Combination of licensed and Managed Park blocks	N/A			
9a Do you have an interest in using the 5.4 GHz band?	No	Yes	No	No	Yes	N/A			
9b What do you consider to be the optimum use for this band?	N/A	WLAN 802.11a	WLAN and license-exempt WIMAX	N/A	Fixed P-P linking	N/A			
9c Which form of management would you consider to be optimal for this band?	N/A	Public Park	Managed Park	N/A	Managed Park	N/A			
10a Do you have an interest in using the 60 GHz band?	No	Doubtful	Yes	N/A	Yes	N/A			
10b What do you consider to be the optimum use for this band?	N/A	Very short range high capacity links, where fibre is impossible	Very short-haul P-P high capacity links	N/A	Fixed P-P links	N/A			
10c Which form of management would you consider to be optimal for this band?	N/A	N/A	Managed Park	N/A	Managed Park	N/A			
11a Do you have an interest in using the 70, 80 and 90 GHz bands?	No	Never	Not at this time	N/A	Yes	N/A			
1b What do you consider to be the optimum use for these bands?	N/A	N/A	Very short-haul P-P high capacity links	N/A	Fixed P-P links or LMDS	N/A			

<b>Group One</b>							
<i>Question</i>	<i>4RF Communications</i>	<i>Airnet NZ</i>	<i>AirSpeed Telecom</i>	<i>Alcatel</i>	<i>Araneo</i>	<i>AUSTAR</i>	
11c Which form of management would you consider to be optimal for these bands?	N/A	N/A	Managed Park	N/A	Managed Park or radio licences	N/A	
12a Are there any other bands that you consider to be future candidates for BWA?	Yes	Yes	Yes	Withheld	No	N/A	
12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	<u>330-512 MHz</u> : has a BWA product for rural BB demand <u>502-806 MHz (UHF TV band)</u> : has products at 700 and 900 MHz	<u>3400-3410 MHz</u> and the corresponding pair for BWA	<u>450 MHz</u> : for BWA <u>GSM 900 Band</u> : Guard bands for voice and data corporate private networks <u>10.5 GHz Band</u> : for P-P and P-MP <u>26.5 GHz Band</u> : for BWA <u>28 GHz Band</u> : for BWA	N/A	N/A	N/A	

<b>Group Two</b>						
<i>Question</i>	<i>CallPlus</i>	<i>CDMA Development Group (CDG)</i>	<i>Cisco Systems</i>	<i>Compass Communications</i>	<i>Consultel Associates</i>	<i>Convergex</i>
1a Do you have an interest in deploying services using FWA?	Yes	Member companies of the CDG have an interest	Equipment supplier for BWA	Yes – a significant provider of data & voice services using FWA	No - an independent telecommunications consultancy	Yes
1b If so, what technologies and standards would you consider and why?	802.16d	CDMA 2000	N/A	Proprietary and 802.16e	N/A	802.16d and 802.16e
1c Which bands do you consider to be the most suitable for this purpose and why?	3.5, 2.3 and 2.5 GHz bands - economies of global manufacturing	Bands should be licensed in a technology-neutral manner	N/A	3.5 GHz existing Management Rights 2.4 GHz and 5.3/5.8 GHz 2.3 GHz Also interested in 900MHz GUL (synchronized with Australia)	N/A	2.3-2.7 GHz band 3.3-3.8 GHz band

<b>Group Two</b>							
<i>Question</i>	<i>CallPlus</i>	<i>CDMA Development Group (CDG)</i>	<i>Cisco Systems</i>	<i>Compass Communications</i>	<i>Consultel Associates</i>	<i>Convergex</i>	
1d In which markets or regions would you consider deploying FWA and why?	Provincial coverage north of Auckland constrained by spectrum availability	In all markets with available spectrum and a perceived market opportunity To deliver FWA services to remote and underserved areas in NZ, 450 MHz band would be well-suited due to favourable propagation characteristics	N/A	National SME market and also the residential market Deploying 3.5 GHz equipment nationally and the 5.3/5.8 GHz network extends in patches from Queenstown to Whangarei covering all of the main centres	N/A	Metropolitan areas in NZ	
1e What is your timeframe for deploying FWA and why?	First deployment in 2006 in Whangarei, with plans to extend coverage in early 2007 60% coverage of population achievable within 5 years with suitable nationwide spectrum	Members are already providing FWA services CDMA2000 was first deployed in October 2000 (and in July 2002 in NZ)	N/A	Has been providing FWA services since circa 1997	N/A	Have wanted to deploy a FWA network for a number of years but no spectrum	
2a Do you have an interest in deploying WLANs and/or WiMAX?	Yes	N/A	Yes, as an equipment supplier	Yes	N/A	Yes	
2b If so, what technologies and standards would you consider and why?	802.16e	Various technologies	N/A	802.16e	N/A	802.16d and 802.16e	
2c Which bands do you consider to be the most suitable for this purpose and why?	3.5, 2.3 and 2.5 GHz	Various bands 2.5 GHz band only for IMT - 2000 based technologies	N/A	3.5 GHz 2.3 GHz	N/A	3.3-3.8 GHz for 802.16d 2.3 GHz and 2.5 GHz for 802.16e	
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	Dependent on having access to 2.3 GHz and 2.5 GHz spectrum	N/A	N/A	WLANs already deployed WiMAX - nationally	N/A	Metropolitan areas in NZ	
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	Dependent on how soon 2.3 GHz and 2.5 GHz spectrum will become available	N/A	N/A	WiMAX -2007	N/A	Accelerate the allocation of 2.3 GHz band, so that deployments could start no later than early 2008	
3a Do you have an interest in deploying satellite broadband services?	No	N/A	N/A	Yes	N/A	Yes – staff has some experience	

<b>Group Two</b>									
Question	CallPlus	CDMA Development Group (CDG)	Cisco Systems	Compass Communications	Consultel Associates	Convergex			
3b If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	As provided by satellite service	N/A	IPSTAR NZ services			
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	Any bands allocated by national regulatory authorities	N/A	As provided by satellite service	N/A	Ku band			
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	Remote and hard-to-reach regions	N/A	Nationally, all markets	N/A	Best suited to rural and remote applications			
3e What is your timeframe for deploying satellite broadband services and why?	N/A	N/A	N/A	None determined	N/A	Under evaluation at present			
4a Do you have an interest in deploying cellular broadband services?	Anticipates looking at mobile services as a logical extension of the fixed wireless deployment	Believes other members could be interested in deploying CDMA technologies	N/A	Interested	N/A	No interest in deploying traditional cellular services but would include mobility in its business case			
4b Which bands do you consider to be the most suitable for this purpose and why?	N/A	450-470 MHz, 806-890 MHz, 1710-1885 MHz, 1885-2025 MHz, 2110-2200 MHz, and 2500-2690 MHz	N/A	To be determined	N/A	N/A			
4c If so, what technologies and standards would you consider and why?	N/A	CDMA2000	N/A	To be determined	N/A	N/A			
4d In which markets or regions would you consider deploying cellular broadband and why?	N/A	Telecom (a member) has already deployed CDMA2000 in all major cities and towns	N/A	To be deployed into their existing national coverage and multiple markets	N/A	N/A			
4e What is your timeframe for deploying cellular broadband and why?	N/A	Telecom (a member) started deploying CDMA2000 1xEVDO in 2004	N/A	No timeframe has been determined	N/A	N/A			
5a Do you have an interest in deploying digital broadcast or convergent services?	N/A	N/A	N/A	Yes, but no evaluation to date	N/A	If sufficient spectrum is available			
5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	N/A	N/A	N/A	N/A	N/A	WiMAX 802.16e			
5c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	N/A	N/A	N/A	N/A			
5d In which markets or regions would you consider deploying digital broadcast services	N/A	N/A	N/A	N/A	N/A	N/A			

<b>Group Two</b>							
<i>Question</i>	<i>CallPlus</i>	<i>CDMA Development Group (CDG)</i>	<i>Cisco Systems</i>	<i>Compass Communications</i>	<i>Consultel Associates</i>	<i>Convergenx</i>	
and why?							
5e What is your timeframe for deploying digital broadcast services and why?	N/A	N/A	N/A	N/A	N/A	N/A	
6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?	Yes. But sparingly, and (only) in the 5.8 GHz and above bands	N/A	N/A	Yes. Improve spectrum usage and eliminate GUL-type interference	N/A	Would prefer to wait until separate consultation process to comment	
6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	No. This would detract from nationwide competition & investment	N/A	N/A	Yes. Improve access to spectrum for localized deployment	N/A	N/A	
6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	N/A	N/A	N/A	A points system with points given for desirable behaviour and deducted for undesirable behaviour	Beauty contest process	N/A	
7a Do you have an interest in using the 2.3 GHz band?	Yes – strong interest	N/A	N/A	Yes – better propagation for NLOS	N/A	Yes – should be released soon	
7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	Should be combined with 2.5 GHz and released as 9 30 MHz blocks – remainder as MSP	N/A	N/A	Yes - 3 x 20 MHz could also work	Yes	Yes 30 MHz with 5, 10 MHz channels 20 MHz blocks could also be useful	
7c What do you consider to be the optimum use for this band?	National BWA	N/A	N/A	TDD based FWA	N/A	BWA – all variants	
7d Which form of management would you consider to be optimal for this band?	MRs + small MSP	N/A	N/A	=>20 MHz MRs	N/A	Management Rights with use-it-or-lose-it condition	
8a Do you have an interest in using the 2.5 GHz band?	Yes – Interest in both 2.3 GHz and 2.5 GHz bands	Yes – for IMT-2000 and IMT.Advanced	N/A	Not currently	N/A	Yes – it is also a key WiMAX band	
8b What do you consider to be the optimum packaging for this band?	6 x 30 MHz blocks with one of 10 MHz for a Managed Park	As per ITU-R Recommendation M.1036	N/A	N/A	N/A	30 MHz blocks (using 5 or 10 MHz channels) would allow full BB services in metropolitan areas	
8c What do you consider to be the optimum use for this band?	802.16e	IMT-2000 and IMT.Advanced	N/A	N/A	N/A	BWA – fixed, nomadic, portable and mobile	
8d Which form of management would you consider to be optimal for this band?	Management Rights, possibly combined with a Managed Park	N/A	N/A	N/A	N/A	Management Rights with “use-it-or-lose-it” condition	

<b>Group Two</b>								
<i>Question</i>	<i>CallPlus</i>	<i>CDMA Development Group (CDG)</i>	<i>Cisco Systems</i>	<i>Compass Communications</i>	<i>Consultel Associates</i>	<i>Convergex</i>		
9a Do you have an interest in using the 5.4 GHz band?	No	No	Yes –is a leading manufacturer of WLAN equipment in this band	Yes	N/A	No		
9b What do you consider to be the optimum use for this band?	Backhaul	WLAN, FWA backhaul for cellular networks	Intelligent low power devices that can avoid radar use NZ band plan should align with the rest of the world	Fixed P-P links using TDD	N/A	N/A		
9c Which form of management would you consider to be optimal for this band?	Managed Park or Public Park	Supports Technology Neutral operations	Public Park	No specific view	N/A	N/A		
10a Do you have an interest in using the 60 GHz band?	No	N/A	N/A	No	N/A	No		
10b What do you consider to be the optimum use for this band?	Backhaul	Applications with very small operational range	N/A	N/A	N/A	N/A		
10c Which form of management would you consider to be optimal for this band?	Managed Park or Public Park	Public Park	N/A	N/A	N/A	N/A		
11a Do you have an interest in using the 70, 80 and 90 GHz bands?	No	N/A	N/A	No	N/A	No		
11b What do you consider to be the optimum use for these bands?	Backhaul	Applications with very small operational range	N/A	N/A	N/A	N/A		
11c Which form of management would you consider to be optimal for these bands?	Managed Park or Public Park	N/A	N/A	N/A	N/A	N/A		
12a Are there any other bands that you consider to be future candidates for BWA?	N/A	N/A	N/A	N/A	N/A	Yes		
12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	N/A	N/A	N/A	N/A	N/A	<u>Sub 1 GHz bands: WiMAX</u> for rural and remote areas after ASO		

<b>Group Three</b>								
Question	Econet Wireless	IDC (report commissioned by Woosh)	IEEE 802.18	Intel	InternetNZ	JDA		
1a Do you have an interest in deploying services using FWA?	No	N/A	N/A	Yes	N/A	Limited interest		
1b If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	802.16-2004 and 802.16e	N/A	Not decided		
1c Which bands do you consider to be the most suitable for this purpose and why?	Focus attention on equipment manufacturers	N/A	N/A	2.3-2.4 GHz, 2.5-2.69 GHz and 3.3-3.8 GHz bands	N/A	2.3-2.4 GHz and 10 GHz		
1d In which markets or regions would you consider deploying FWA and why?	N/A	N/A	N/A	Globally	N/A	Rural areas		
1e What is your timeframe for deploying FWA and why?	N/A	N/A	N/A	Service providers are either currently deploying or considering deploying BWA technologies	N/A	No timeframe yet		
2a Do you have an interest in deploying WLANs and/or WiMAX?	Yes	N/A	N/A	Yes	N/A	Yes		
2b If so, what technologies and standards would you consider and why?	Lowest cost, high consumer utility standards	N/A	N/A	WiFi- 802.11 standards WiMAX -802.16e	N/A	Not decided		
2c Which bands do you consider to be the most suitable for this purpose and why?	Bands used by EU manufacturers	N/A	N/A	WLANs 2.4 – 2.4835 GHz 5.15 - 5.35 GHz 5.47 - 5.725 GHz WiMAX 2.3 – 2.4 GHz 2.5 – 2.69 GHz 3.3 – 3.8 GHz	N/A	2.3 GHz 5.8 GHz		
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	N/A	N/A	N/A	Both technologies can be deployed nationwide	N/A	Rural areas, North Island and northern half of South Island & possibly West Coast		
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	N/A	N/A	N/A	WLAN technology available today WiMAX technology is also available today	N/A	Likely within next 5 years		
3a Do you have an interest in deploying satellite broadband services?	No	N/A	N/A	No	N/A	No		
3b If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	N/A	N/A	N/A		

<b>Group Three</b>									
<i>Question</i>	<i>Econet Wireless</i>	<i>IDC (report commissioned by Woosh)</i>	<i>IEEE 802.18</i>	<i>Intel</i>	<i>InternetNZ</i>	<i>JDA</i>			
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	N/A	N/A	N/A	N/A			
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	N/A	N/A	N/A	N/A	N/A			
3e What is your timeframe for deploying satellite broadband services and why?	N/A	N/A	N/A	N/A	N/A	N/A			
4a Do you have an interest in deploying cellular broadband services?	Yes	N/A	N/A	N/A	N/A	No			
4b Which bands do you consider to be the most suitable for this purpose and why?	900 MHz, 1800 MHz, and 2100 MHz	N/A	N/A	N/A	N/A	N/A			
4c If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	Supports technology-neutral approach	N/A	N/A			
4d In which markets or regions would you consider deploying cellular broadband and why?	Auckland, Wellington, and Christchurch and other regions depending on co-location agreements	N/A	N/A	N/A	N/A	N/A			
4e What is your timeframe for deploying cellular broadband and why?	18-month plan to deploy 450 cell sites, assuming rapid multi-site access to co-location is available	N/A	N/A	N/A	N/A	N/A			
5a Do you have an interest in deploying digital broadcast or convergent services?	Yes	N/A	N/A	Yes, very active	N/A	Yes, definite interest			
5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	Cheapest, largest economies of scale	N/A	N/A	IP-based technologies (eg, WiMAX)	N/A	DTTV-T, DTTV-H to DTTV-M			
5c Which bands do you consider to be the most suitable for this purpose and why?	Bands with best economies of scale	N/A	N/A	Any that is technologically neutral	N/A	Bands IV and V – equipment availability, propagation, transmission infrastructure			
5d In which markets or regions would you consider deploying digital broadcast services and why?	Whole of NZ	N/A	N/A	Global	N/A	Whole of NZ , particularly provincial and rural			
5e What is your timeframe for deploying digital broadcast services and why?	N/A	N/A	N/A	2008-2010	N/A	Immediate			
6a Should spectrum for future BWA	No. Idea is nonsense &	No. Should be licensed as	Yes. Place as few	No. QoS concerns. Area	Yes. But concept needs	Yes. But may depend on the			

<b>Group Three</b>									
<i>Question</i>	<i>Econet Wireless</i>	<i>IDC (report commissioned by Woosh)</i>	<i>IEEE 802.18</i>	<i>Intel</i>	<i>InterneNZ</i>	<i>JDA</i>			
deployment be reserved as a Managed Park? Why or why not?	plays into the hands of the incumbents	Area Spectrum Licences with stipulations	restrictions as possible on users	licences might a provide better solution	further development before full support can be given	band. Better access for small operators			
6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	N/A	N/A	N/A	N/A	Yes. Should be a primarily regional implementation	Yes. Better access for small operators			
6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	N/A	N/A	N/A	Auctions are preferred in situations where demand exceeds supply	'Use-it-or-lose-it' condition, entry restrictions, incentives to new entrants	Possible auction or first in lose-it' provision			
7a Do you have an interest in using the 2.3 GHz band?	Yes	N/A	N/A	Yes, as a supplier of kit	Supports WiMAX deployment	Yes			
7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	Yes -30MR/30MR/36MSP	No. Cannot deliver TV with 30 MHz	N/A	Yes – 30 MHz MRs No MSP (see response to Q 6b)	1x 30 MHz 2 + MSPs	Yes – maybe break down MSP into smaller lots			
7c What do you consider to be the optimum use for this band?	WiMAX	WiMAX	N/A	WiMAX	WiMAX	WiMAX			
7d Which form of management would you consider to be optimal for this band?	MR and MSP	50MR + MR+ ASLs	N/A	3 x 30 MRs	30MR/66MSPs	MR + MSP but no area licences			
8a Do you have an interest in using the 2.5 GHz band?	Yes	Yes (via Woosh)	N/A	Yes – a strong interest	N/A	No			
8b What do you consider to be the optimum packaging for this band?	N/A	Anything less than 20 MHz for WiMAX/HSDPA is really not very practical for a nationwide build-out	N/A	An initial assignment of 40 MHz per licensee in a technology neutral manner with no preference for FDD or TDD	N/A	N/A			
8c What do you consider to be the optimum use for this band?	WiMAX	WiMAX/HSDPA	N/A	Mobile WiMAX	N/A	N/A			
8d Which form of management would you consider to be optimal for this band?	Proper OECD spectrum licences	N/A	N/A	Management Rights	Spectrum licences under Crown Management for BWA until Ob operators are shifted to the 2.7-2.9 GHz band	N/A			
9a Do you have an interest in using the 5.4 GHz band?	No	N/A	N/A	Yes	N/A	Yes			
9b What do you consider to be the optimum use for this band?	N/A	N/A	N/A	WLANs in accordance with ITU-R Resolution 229	N/A	WLAN			

<b>Group Three</b>									
<i>Question</i>	<i>Econet Wireless</i>	<i>IDC (report commissioned by Woosh)</i>	<i>IEEE 802.18</i>	<i>Intel</i>	<i>InternetNZ</i>	<i>JDA</i>			
9c Which form of management would you consider to be optimal for this band?	N/A	N/A	N/A	Public Park for both indoor and outdoor use	N/A	Managed Park			
10a Do you have an interest in using the 60 GHz band?	No	N/A	N/A	Yes	N/A	No			
10b What do you consider to be the optimum use for this band?	N/A	N/A	N/A	WPANs	N/A	N/A			
10c Which form of management would you consider to be optimal for this band?	N/A	N/A	N/A	Public Park	Managed Park first with an option to revert to a Public Park on a regional basis where appropriate	N/A			
11a Do you have an interest in using the 70, 80 and 90 GHz bands?	No	N/A	N/A	N/A	N/A	No			
11b What do you consider to be the optimum use for these bands?	N/A	N/A	N/A	N/A	Outside Broadcast	N/A			
11c Which form of management would you consider to be optimal for these bands?	N/A	N/A	N/A	N/A	Combination of Managed Park in non-metros and spectrum licences under Crown management in densely populated areas	N/A			
12a Are there any other bands that you consider to be future candidates for BWA?	Unclear	N/A	N/A	Yes	N/A	Yes			
12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	N/A	N/A	N/A	Sub 1 GHz bands -700 MHz: for BWA after ASO	N/A	Parts of UHF Band IV & V: for DTTV 10.5 GHz: High capacity short-haul data linking			

<b>Group Four</b>							
<i>Question</i>	<i>Motorola Australia</i>	<i>Mount Campbell Networks</i>	<i>NATCOM</i>	<i>NetSmart</i>	<i>Nokia</i>	<i>NORTEL</i>	
1a Do you have an interest in deploying services using FWA?	N/A	Yes	Yes	Yes	Yes	N/A	
1b If so, what technologies and standards would you consider and why?	N/A	WiMAX and Motorola Canopy	Technology agnostic	WiFi	HSDPA 802.16e	N/A	
1c Which bands do you consider to be the most suitable for this purpose and why?	N/A	500-1000 MHz 2-3 GHz 4-5 GHz	900MHz or possibly lower broadcast spectrum 1.8GHz - possible WiBRO / WiMAX 2.3 GHz –WiBRO 2.4GHz -WiFi and WiFi MESH 3.5GHz WiMAX 5.8GHz WiMAX 5.9GHz - WiMAX variants	2.3-2.7 GHz range 4.9-6.1 GHz range	3.4-3.6 GHz 5.725-5.875 GHz	N/A	
1d In which markets or regions would you consider deploying FWA and why?	N/A	Rural and Sparsely populated areas	Regional New Zealand, as well urban centers	Currently Bay of Plenty , Waikato region with further expansion likely	Globally	N/A	
1e What is your timeframe for deploying FWA and why?	N/A	At initial stages of implementing FWA	Now		Mobile WiMax significant scale pre-commercial tests during 2007 and deployments during 2008	N/A	
2a Do you have an interest in deploying WLANs and/or WiMAX?	Yes	Yes	Yes	Yes	Yes	N/A	
2b If so, what technologies and standards would you consider and why?	WiFi WiMAX	WiMAX	WiFi, MESH WiMAX, WiBro	WiFi WiMAX	WiFi WiMAX WCDMA HSPA & LTE	N/A	
2c Which bands do you consider to be the most suitable for this purpose and why?	WLAN 900 MHz, 2.4 and 5 GHz WiMAX 2.3 , 2.5 and 3.5 GHz	500-1000 MHz 2-3 GHz 4-5 GHz	900MHz 2.3 GHz 2.4GHz 3.5GHz 5.8GHz	2.4 GHz and 5 GHz for WLAN Licensed bands for WiMAX	2.4 GHz and 5 GHz for WLAN 3.5 GHz for WiMAX	700 MHz, 2.3 GHz and 2.5 GHz for WiMAX	
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	Can be deployed nationally	Rural and sparsely populated areas	Trialling now with some deployments in Auckland. Satellite nationwide with WiFi off Satellite as well as HotSpots	WLAN hotspots nationwide	Globally	N/A	

<b>Group Four</b>									
<i>Question</i>	<i>Motorola Australia</i>	<i>Mount Campbell Networks</i>	<i>NATCOM</i>	<i>NetSmart</i>	<i>Nokia</i>	<i>NORTEL</i>			
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	WiFi Canopy technology is already deployed Engaged in WiMAX trials globally	At initial stages of implementing FWA	Trialling WiMAX now	Trials can begin within 12 months if suitable spectrum and equipment becomes available	Mobile WiMax significant scale pre-commercial tests during 2007 and deployments during 2008	N/A			
3a Do you have an interest in deploying satellite broadband services?	No	No	Yes, already trialling with WiFi	No	No	N/A			
3b If so, what technologies and standards would you consider and why?	N/A	N/A	SHIN satellite (for WiFi)	N/A	N/A	N/A			
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	SHIN satellite bands	N/A	N/A	N/A			
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	N/A	National 2Mdp service	N/A	N/A	N/A			
3e What is your timeframe for deploying satellite broadband services and why?	N/A	N/A	Already trialling	N/A	N/A	N/A			
4a Do you have an interest in deploying cellular broadband services?	Has a strong interest via the sale of its range of cellular handsets in the established 3G networks	Interested in developments on WiMAX for mobile applications	Yes	No interest at this time	Yes	N/A			
4b Which bands do you consider to be the most suitable for this purpose and why?	850 MHz, 1800 MHz, and 2100 MHz	No comment	N/A	N/A	900 MHz, 1800 MHz, 2 GHz, 2.6 GHz	N/A			
4c If so, what technologies and standards would you consider and why?	UMTS and HSDPA subset	No comment	WiBro, mobile WiMAX	N/A	IMT2000 / WCDMA with its evolution like HSPA and LTE	N/A			
4d In which markets or regions would you consider deploying cellular broadband and why?	Wherever networks are deployed	No comment	N/A	N/A	Preference is global deployment	N/A			
4e What is your timeframe for deploying cellular broadband and why?	Its products are available now	No comment	N/A	N/A	IMT2000 / WCDMA-based networks and HSDPA are being deployed right now; next steps will be HSUPA and I-HSPA; planning of LTE has already started	N/A			
5a Do you have an interest in deploying digital broadcast or convergent services?	Sale of equipment	Yes, provision of multiples services	Yes	No	Yes, mobile	N/A			

<b>Group Four</b>							
<i>Question</i>	<i>Motorola Australia</i>	<i>Mount Campbell Networks</i>	<i>NATCOM</i>	<i>NetSmart</i>	<i>Nokia</i>	<i>NORTEL</i>	
5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	DVB-H	NZ standard	All	N/A	Terrestrial, DVB-H and MBMS	N/A	
5c Which bands do you consider to be the most suitable for this purpose and why?	Recovered UHF-TV broadcasting bands	UHF-TV bands	Not specified	N/A	Below 750 MHz	N/A	
5d In which markets or regions would you consider deploying digital broadcast services and why?	As at present	Nelson - Marlborough	Nationally	N/A	Global	N/A	
5e What is your timeframe for deploying digital broadcast services and why?	Equipment will be in service when deployment begins	Subject to customer demand and spectrum availability	Following industry consultation	N/A	DVB now available, MBMS in 2008	N/A	
6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?	Can see the benefits if it works out in practice (but it may not work easily)	No. Develop radio licence regime to include tenure issues for BWA	Yes. This will require industry consultation	Yes. Will benefit from combining GURL with a basic level of engineering	More study needed to fully analyze benefits	Not convinced that this will provide any efficiency gains over current MRR	
6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	N/A	Yes. Any spectrum arrangement should allow for regional operators	Yes	Yes	N/A	N/A	
6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	N/A	N/A	Use it or lose it, with strong support for Regional Managed Parks	First come first served, Spectrum caps, use it or lose it	N/A	N/A	
7a Do you have an interest in using the 2.3 GHz band?	Yes – as WiMAX kit supplier	Yes	Yes	Yes	Not currently – no Nokia kit	Yes, as a WiMAX kit supplier	
7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	Favours 20-30 MHz blocks per operator allocated in a technology neutral manner	ASL package bid allocation	Yes	5, 10 and 20 MHz channels	N/A	30 MHz of TDD spectrum in high traffic areas to each mobile WiMAX operator	
7c What do you consider to be the optimum use for this band?	WiMAX	WiMAX or equivalent	BWA	FWA	N/A	WiMAX	
7d Which form of management would you consider to be optimal for this band?	Spectrum licences with deployment milestones	Area spectrum licences	MR+MSP	MSPs only	N/A	No MSPs	
8a Do you have an interest in using the 2.5 GHz band?	Yes – for WiMAX products	Yes	Yes	Yes	Yes	Yes	

<b>Group Four</b>									
<i>Question</i>	<i>Motorola Australia</i>	<i>Mount Campbell Networks</i>	<i>NATCOM</i>	<i>NetSmart</i>	<i>Nokia</i>	<i>NORTEL</i>			
8b What do you consider to be the optimum packaging for this band?	Minimum of 20-30 MHz blocks per operator, allocated in a technology neutral manner	Packaging should be for WiMAX or equivalent specification as OB links can be easily accommodated at much higher frequencies	At least 30 MHz lots	Allow for 5, 10 or 20 MHz channels	20 MHz paired per operator	30 MHz of TDD spectrum in high traffic areas to each mobile WiMAX operator			
8c What do you consider to be the optimum use for this band?	WiMAX	BWA - WiMAX or equivalent	FWA	FWA	UMTS/ IMT-2000 Evolutions	Could be one of WiMAX , IMT-2000, 4G etc			
8d Which form of management would you consider to be optimal for this band?	Spectrum licences with deployments milestones	Area spectrum licences	Combination of Managed Parks and Public Parks	Managed Park	Important to facilitate interference free operation	N/A			
9a Do you have an interest in using the 5.4 GHz band?	Yes – Has developed equipment for use in this band	Yes	Yes	Yes	Yes	N/A			
9b What do you consider to be the optimum use for this band?	WLANs in accordance with ITU-R Resolution 229 with a similar regulatory regime to USA	BWA	FWA	FWA with 5, 10, 20 MHz channels	WLAN including outdoor applications and networks	N/A			
9c Which form of management would you consider to be optimal for this band?	Public Park	Area spectrum licences	Combination of Managed Parks and Public Parks	Managed Park	N/A	N/A			
10a Do you have an interest in using the 60 GHz band?	No	No	N/A	Yes	No	N/A			
10b What do you consider to be the optimum use for this band?	N/A	N/A	N/A	FW P-P linking	N/A	N/A			
10c Which form of management would you consider to be optimal for this band?	N/A	N/A	N/A	Managed Park or licensing	N/A	N/A			
11a Do you have an interest in using the 70, 80 and 90 GHz bands?	No	No	N/A	Yes	Yes	N/A			
11b What do you consider to be the optimum use for these bands?	N/A	N/A	N/A	FW P-P linking	BWA backhaul	N/A			
11c Which form of management would you consider to be optimal for these bands?	N/A	N/A	N/A	Managed Park or licensing	N/A	N/A			
12a Are there any other bands that you consider to be future candidates for BWA?	Yes	Yes	N/A	Yes	Yes	Yes			

<b>Group Four</b>						
<i>Question</i>	<i>Motorola Australia</i>	<i>Mount Campbell Networks</i>	<i>NATCOM</i>	<i>NetSmart</i>	<i>Nokia</i>	<i>NORTEL</i>
12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	Wishes to be involved in any future discussions	900 MHz <u>Public Park</u> spectrum band: To align the NZ band to the international equivalent	N/A	Sub 1 GHz bands MHz: BWA for rural	Global harmonisation of spectrum to support mobile and wireless communications should be supported	Sub 1 GHz bands, in particular 700 MHz band

<b>Group Five</b>						
<i>Question</i>	<i>NZART</i>	<i>NZ Fire Service</i>	<i>NZ Police</i>	<i>NZWireless</i>	<i>PlaNet</i>	<i>SCORCH Communications</i>
1a Do you have an interest in deploying services using FWA?	N/A	Yes	Yes	Yes	Yes	Yes
1b If so, what technologies and standards would you consider and why?	N/A	Currently uses G703 (E1) Ethernet in the future	Currently uses G703 (E1) and Ethernet	802.11g –backhaul to rural 802.16d –telephony and internet WiBro	N/A	Unlicensed band wireless technology
1c Which bands do you consider to be the most suitable for this purpose and why?	N/A	Bands where equipment is commercially available	Bands where equipment is commercially available	2400 – 2450 MHz: 802.11g 2300 – 2396 MHz: WiBro/WiMAX or 802.16e (TDD). 2500 – 2690 MHz: WiMAX or 802.16e (TDD) 3410 – 3587 MHz: WiMAX or 802.16e (TDD) 5150 – 5825 MHz: WiMAX or 802.16e (TDD) 24.549 – 26.400 GHz: WiMAX or 802.16e (TDD) 26.400 – 28.350 GHz: WiMAX as per 1b or 802.16e (TDD)	Between 2-10 GHz	500-1000 MHz 2-3 GHz 4-5 GHz
1d In which markets or regions would you consider deploying FWA and why?	N/A	All of NZ	All of NZ	Initially deploying in Wellington/Lower Hutt due to spectrum availability However, keen to provide service in the urban areas that are near by	N/A	The most suitable markets for FWA are those where the returns on investment do not justify upgrades to existing fixed cable and exchanges

<b>Group Five</b>							
<i>Question</i>	<i>NZART</i>	<i>NZ Fire Service</i>	<i>NZ Police</i>	<i>NZWireless</i>	<i>PlaNet</i>	<i>SCORCH Communications</i>	
1e What is your timeframe for deploying FWA and why?	N/A	Within the next 5 years	Within the next 5 years	Have already deployed in Wellington and plan to deploy in both Wellington and Lower Hutt before the end of the year with a minimum coverage of 70% within a two year span	Have already deployed	Have been deploying since Nov '05	
2a Do you have an interest in deploying WLANs and/or WiMAX?	N/A	Yes	Yes	Yes	Yes	Yes	
2b If so, what technologies and standards would you consider and why?	N/A	WiFi WiMAX	WiFi WiMAX	WiMAX WiBro	N/A	WiMAX if TDD	
2c Which bands do you consider to be the most suitable for this purpose and why?	N/A	Towards 2 GHz Not higher than 5.8 GHz	Towards 2 GHz Not higher than 5.8 GHz	As in 1c	Between 2-10 GHz	700 MHz 900 MHz	
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	N/A	All of NZ	All of NZ	Rural and Urban	N/A	Rural and Urban	
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	N/A	Within the next 5 years	Within the next 5 years	Depends on availability of spectrum	Have already deployed WLANs	Immediately	
3a Do you have an interest in deploying satellite broadband services?	N/A	Current user	Yes	Yes, for remote regions	N/A	No	
3b If so, what technologies and standards would you consider and why?	N/A	Commercially available technology	Commercially available technology	As provided by satellite service	N/A	N/A	
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	12 GHz band (better propagation)	12 GHz band (better propagation)	As provided by satellite service	N/A	N/A	
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	Whole of NZ	Whole of NZ, particularly remote areas or special operations	Rural communities and iwi where WiMAX spectrum is not available	N/A	N/A	
3e What is your timeframe for deploying satellite broadband services and why?	N/A	10 year timeline (resource constraints)	10 year timeframe (resource constraints)	Negotiating with iwi to supply infrastructure within their interest areas	N/A	N/A	
4a Do you have an interest in deploying cellular broadband services?	No comment	No – user only	No – user only but could extend existing cellular services into Police-owned or operated buildings should cellular be proven to be more effective than WiFi	Yes – multiple services	N/A	Interested in deploying cellular broadband within WiMAX specifications that would accommodate mobile applications in the future	

<b>Group Five</b>							
<i>Question</i>	<i>NZART</i>	<i>NZ Fire Service</i>	<i>NZ Police</i>	<i>NZWireless</i>	<i>PlaNet</i>	<i>SCORCH Communications</i>	
4b Which bands do you consider to be the most suitable for this purpose and why?	No comment	N/A	N/A	At this time, 2400-2450 MHz and 2300-2396 MHz	N/A	No comment	
4c If so, what technologies and standards would you consider and why?	No comment	Will adopt technologies and standards that provide a reliable service in all conditions, with maximum coverage at an affordable cost	Will adopt commercially available technologies	802.16e (TDD implementations)	N/A	No comment	
4d In which markets or regions would you consider deploying cellular broadband and why?	No comment	N/A	N/A	Gradual deployment based on specific needs of particular regions	N/A	No comment	
4e What is your timeframe for deploying cellular broadband and why?	No comment	N/A	N/A	Would not want to consider this until 2008 to assess implementations of the 802.16e specification	N/A	No comment	
5a Do you have an interest in deploying digital broadcast or convergent services?	N/A	No	No	Yes	N/A	No	
5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	N/A	N/A	N/A	Terrestrial 802.16e (FDD), satellite, mobile 802.16e (TDD)	N/A	N/A	
5c Which bands do you consider to be the most suitable for this purpose and why?	N/A	Concern that digital b/casting bands NOT be adjacent to mobile service bands	N/A	Depends on equipment availability, spectrum availability, range of CPE	N/A	N/A	
5d In which markets or regions would you consider deploying digital broadcast services and why?	N/A	N/A	N/A	N/A	N/A	N/A	
5e What is your timeframe for deploying digital broadcast services and why?	N/A	N/A	N/A	N/A	N/A	N/A	
6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?	N/A	Yes. But for future BWA deployments, to minimise interference now	Yes. But for future BWA deployments, to minimise interference now	Yes. Would spur innovation	Yes. Increase competition, avoid inefficient over-use	Yes. Managed Park would be better than GUL	
6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	N/A	Yes. To manage the use of these bands and to minimise congestion	Yes	Yes. Will inspire more innovation	Yes. Increase opportunities for small to medium companies	Yes. BWA growth is being driven by small players operating in their own patch	

<b>Group Five</b>									
<i>Question</i>	<i>NZART</i>	<i>NZ Fire Service</i>	<i>NZ Police</i>	<i>NZWireless</i>	<i>PlaNet</i>	<i>SCORCH Communications</i>			
6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	N/A	First priority to non-commercial services then to those who meet Govt objectives	A licensing / registration scheme	Requirements for access, treat small & large firms the same	First come first served & beauty contest, use it or lose it, annual review	Trading option for new entrants to purchase access from incumbents			
7a Do you have an interest in using the 2.3 GHz band?	Yes	Yes – as a user	Yes – as a user	Yes	N/A	Yes, with access and exclusivity			
7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	30/30/30 with 10MHz upper guard band	N/A	N/A	No MRs	N/A	ASL package bid allocation			
7c What do you consider to be the optimum use for this band?	N/A	Mobile indoor/outdoor applications	Mobile indoor/outdoor applications	WIMAX TDD	N/A	WIMAX or equivalent			
7d Which form of management would you consider to be optimal for this band?	N/A	N/A	N/A	Conditional spectrum licences under Crown management	N/A	N/A			
8a Do you have an interest in using the 2.5 GHz band?	N/A	Yes	Yes	Yes – for WIMAX TDD	N/A	Yes- if there is international support from manufacturers			
8b What do you consider to be the optimum packaging for this band?	N/A	No comment	No comment	Crown Managed Park as an extension of the 2.3 GHz implementation	N/A	Packaging should be for WIMAX or equivalent specification as OB links can be easily accommodated at much higher frequencies			
8c What do you consider to be the optimum use for this band?	N/A	Mobile indoor/ outdoor communications	Mobile communication applications	WIMAX (TDD)	N/A	BWA - WIMAX or equivalent			
8d Which form of management would you consider to be optimal for this band?	N/A	A combination of management schemes, including Public Park and spectrum licensing	A combination of management schemes, including Public Park and spectrum licensing	Short-term spectrum licences under Crown management as Managed Parks	N/A	Managed Park or Management Rights Regime			
9a Do you have an interest in using the 5.4 GHz band?	Yes	Limited interest for indoor operations	Limited interest	Yes	Yes	Yes			
9b What do you consider to be the optimum use for this band?	Short range communications	Available for users not wanting to use or do not have access to Managed Parks	Available for users not wanting to use or not able to work in Managed Parks	WIMAX (TDD)	BWA	BWA			
9c Which form of management would you consider to be optimal for this band?	Public Park	Licensed	Licensed	Public Park	Managed Park	Managed Park or Management Rights			

<b>Group Five</b>							
Question	NZART	NZ Fire Service	NZ Police	NZWireless	PlaNet	SCORCH Communications	
10a Do you have an interest in using the 60 GHz band?	N/A	Not yet	No	Yes	N/A	No	
10b What do you consider to be the optimum use for this band?	N/A	Short distance linking	Short distance linking	P-P backhaul	N/A	N/A	
10c Which form of management would you consider to be optimal for this band?	N/A	Public Park	Public Park	Crown Managed Park	N/A	N/A	
11a Do you have an interest in using the 70, 80 and 90 GHz bands?	Yes – an existing user	Yes	Yes	No	N/A	No	
1b What do you consider to be the optimum use for these bands?	Short range communications	Very short range data transfer and Vehicular collision avoidance radar	Very short range data transfer and Vehicular collision avoidance radar	N/A	N/A	N/A	
11c Which form of management would you consider to be optimal for these bands?	Public Park	Public Park or Managed Park	Public Park or Managed Park	N/A	N/A	N/A	
12a Are there any other bands that you consider to be future candidates for BWA?	N/A	Yes	Yes	No	N/A	Yes	
12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	N/A	4.9 GHz Band: for Public safety mesh networks	4.9 GHz Band: for Public safety networks	N/A	N/A	900 MHz Public Park <u>spectrum band: To align the NZ band to the international equivalent</u>	

<b>Group Six</b>						
Question	Siemens (NZ)	Sky Television	TeamTalk	Telecom	TelstraClear	ThePacific.net
1a Do you have an interest in deploying services using FWA?	N/A	N/A	Yes	Yes	Yes	Yes
1b If so, what technologies and standards would you consider and why?	N/A	N/A	UMTS, WiMAX, WiBro, WiFi and proprietary	IMT 2000 family IEEE 802.xx family	WiMAX 802.16d/e	WiFi and WiMAX

<b>Group Six</b>							
<i>Question</i>	<i>Siemens (NZ)</i>	<i>Sky Television</i>	<i>TeamTalk</i>	<i>Telecom</i>	<i>TelstraClear</i>	<i>ThePacific.net</i>	
1c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	502-806: remote and rural 2300-2396: rural and suburban 2500-2690: suburban -5825: suburban and urban 10.5-10.680: urban 25-28GHz: no spectrum available 57-66GHz: short distance p-p linking 71-95GHz: short -10km p-p linking & cell backhaul	Does not consider that there is any need to channel spectrum specifically for FWA because there is nothing inherent in particular frequency bands that make them more or less attractive for FWA  New Zealand must take advantage of standards and operate hardware in bands where there are economies of scale and worldwide deployment	3.5 GHz band 2.3 GHz band	2.3 GHz band 2.4 GHz band 2.5-2.7 GHz band 5120-6100 MHz band	
1d In which markets or regions would you consider deploying FWA and why?	N/A	N/A	Nationwide	To complement existing cellular and fixed networks	Currently providing services to SME customers  Pre Wi-Max equipment has been deployed in Auckland, Nelson, Rotorua, Napier and Dunedin, though other towns are being actively considered	Rural and urban areas of the top of South Island  Considering expanding progressively South	
1e What is your timeframe for deploying FWA and why?	N/A	N/A	Already started	Dependent on certainty of tenure over the requisite spectrum	Has already deployed	Already deployed with the upcoming year being a year of growth	
2a Do you have an interest in deploying WLANs and/or WiMAX?	N/A	N/A	Yes	Yes	Yes	Yes	
2b If so, what technologies and standards would you consider and why?	N/A	N/A	WiFi WiMAX WiBro	WiFi WiMAX	WiMAX	WiFi WiMAX	
2c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	2.3 GHz 2.5 GHz	WLAN 2.4 and 5 GHz WiMAX 2.3 , 2.5 and 3.5 GHz	2.3 GHz 2.5 GHz 3.5 GHz	WLAN 2.4 and 5 GHz WiMAX 2.3 GHz	
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	N/A	N/A	All of NZ	Dependent on customer demand	Pre Wi-Max equipment has been deployed in Auckland, Nelson, Rotorua, Napier and Dunedin, though other towns are being actively considered	Urban, rural, residential and businesses throughout the top of South Island with plans to expand progressively south over the next year	

Group Six							
Question	Siemens (NZ)	Sky Television	TeamTalk	Telecom	TelstraClear	ThePacifiC.net	
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	N/A	N/A	Currently in planning and evolution	Already operates a WLAN service Timeframe for WiMAX deployment is dependent upon certainty of tenure over the necessary spectrum	Already deploying a Pre-WiMAX technology and is likely to upgrade this to WiMAX and considers it will only take about 2 months to upgrade	Expect to double the customer base over the next year	
3a Do you have an interest in deploying satellite broadband services?	N/A	N/A	Small interest – alternative for point-to-point links	Current retailer of satellite broadband	No, would use a partner service if needed	N/A	
3b If so, what technologies and standards would you consider and why?	N/A	N/A	As provided by satellite service	C and Ku bands	N/A	N/A	
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	As provided by satellite service	Ku band via NZLSAT, due to higher look angle & therefore smaller dish	N/A	N/A	
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	N/A	Remote rural regions	Remote and rural – cannot be reached by conventional terrestrial access technologies	N/A	N/A	
3e What is your timeframe for deploying satellite broadband services and why?	N/A	N/A	Soon	According to customer demand	N/A	N/A	
4a Do you have an interest in deploying cellular broadband services?	N/A	N/A	No current interest	Operates a cellular network based on the CDMA 1xRTT standard that is compliant with IMT2000; deployed CDMA Rev O and currently working to upgrade to CDMA Rev A	Yes – announced the deployment of broadband services, “Unplugged”, initially in Tauranga	N/A	
4b Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	N/A	850 MHz	2.1 GHz – but preference would be to use the 850 and/or 900 MHz bands	N/A	
4c If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	Technologies standardised by the ITU, ITEF and IEEE	GSM, 3GSM 3GPP standards	N/A	
4d In which markets or regions would you consider deploying cellular broadband and why?	N/A	N/A	N/A	Operates a nationwide network; <b>specific plans are commercially sensitive</b>	Initially, will deploy cellular broadband services in Tauranga	N/A	

<b>Group Six</b>							
<i>Question</i>	<i>Siemens (NZ)</i>	<i>Sky Television</i>	<i>TeamTalk</i>	<i>Telecom</i>	<i>TelstraClear</i>	<i>ThePacific.net</i>	
4e What is your timeframe for deploying cellular broadband and why?	N/A	N/A	N/A	Currently undertaking a work programme to upgrade to Rev A	Announced that its Unplugged cellular services will be launched in July 2007	N/A	
5a Do you have an interest in deploying digital broadcast or convergent services?	N/A	N/A	N/A	Yes	Yes – currently providing triple-play cable services	N/A	
5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	N/A	N/A	N/A	Terrestrial DVB-H for mobile services	No clear preference	N/A	
5c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	N/A	700 MHz band, with range from 470-862 MHz possible	1 and 1.5 GHz bands, in 100MHz blocks	N/A	
5d In which markets or regions would you consider deploying digital broadcast services and why?	N/A	N/A	N/A	No valid information	Dependent on spectrum availability	N/A	
5e What is your timeframe for deploying digital broadcast services and why?	N/A	N/A	N/A	None – uncertainty of spectrum access	Dependent on spectrum availability	N/A	
6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?	N/A	N/A	Yes. Ensures spectrum is available to those requiring it. Minimises interference	Yes. It is a concept worth exploring for particular technologies (not necessarily BWA)	Yes. Provides an effective means of enabling new entry into WiMax	Yes	
6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	N/A	N/A	Yes. Regional players should not have to purchase national rights	Yes. There should be a mixture of regional & nationwide blocks	Yes. Would be an effective means of facilitating WiMax entry	Yes. Competition must be encouraged	
6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	N/A	N/A	First in first served, use it or lose it, spectrum caps, restricted access	Markets are accepted as the best means of allocating a scarce resource	Auction or competitive tender to ensure that spectrum is allocated to highest value uses	Restrict access to existing providers. Use only for multi-point solutions	
7a Do you have an interest in using the 2.3 GHz band?	N/A	Yes (through Woosh)	Yes	Yes, for CMAR and WiMAX	Yes, for mobile WiMAX	Yes	
7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	N/A	Existing right holders to be offered renewal rights	No	Advises against re-packaging until ITU's IMT+ allocation is determined Band should be divided into TDD and FDD blocks	Yes, but 3 MRs	Should be packaged to support 5, 10, 20 MHz channels with at least a 40MHz block	
7c What do you consider to be the optimum use for this band?	N/A	WiMAX	BWA	Delay decision (see above)	WiMAX	N/A	

<b>Group Six</b>							
<i>Question</i>	<i>Siemens (NZ)</i>	<i>Sky Television</i>	<i>TeamTalk</i>	<i>Telecom</i>	<i>TelstraClear</i>	<i>ThePacific.net</i>	
7d Which form of management would you consider to be optimal for this band?	N/A	N/A	20-year rights too inflexible More study needed. MSPs more flexible than MRs	Delay decision (see above)	All MRs, no MSP	N/A	
8a Do you have an interest in using the 2.5 GHz band?	N/A	N/A	Yes	Yes	Yes	N/A	
8b What do you consider to be the optimum packaging for this band?	N/A	N/A	Paired blocks (separated by 100 MHz) of at least 15MHz width	Too early to consider packaging this band	At least one large block e.g. 100 GHz, to be created in this band	N/A	
8c What do you consider to be the optimum use for this band?	N/A	N/A	FWA	Too early to comment	WiMAX	N/A	
8d Which form of management would you consider to be optimal for this band?	N/A	N/A	Combination of Radio licences and Managed Park blocks	Too early to comment	Both Management Rights and a Managed Park	N/A	
9a Do you have an interest in using the 5.4 GHz band?	N/A	N/A	Yes	Yes – for WiFi	Yes	Yes	
9b What do you consider to be the optimum use for this band?	N/A	N/A	Mobile WLAN	Unlicensed RLAN	P-P DMR links		
9c Which form of management would you consider to be optimal for this band?	N/A	N/A	Managed Park or Radio licensing	Public Park	Radio licences	Managed Park or Public Park	
10a Do you have an interest in using the 60 GHz band?	N/A	N/A	Yes	No	No	N/A	
10b What do you consider to be the optimum use for this band?	N/A	N/A	Fixed P-P links	Too early to comment	N/A	N/A	
10c Which form of management would you consider to be optimal for this band?	N/A	N/A	Managed Park or Radio licensing	Too early to comment	N/A	N/A	
11a Do you have an interest in using the 70, 80 and 90 GHz bands?	N/A	N/A	Yes	No	No	N/A	
11b What do you consider to be the optimum use for these bands?	N/A	N/A	Fixed P-P links or LMDS	Too early to comment	N/A	N/A	
11c Which form of management would you consider to be optimal for these bands?	N/A	N/A	Managed Park or Radio licensing	Too early to comment	N/A	N/A	
12a Are there any other bands that you consider to be future candidates for BWA?	Yes	N/A	No	No	Yes	N/A	

<b>Group Six</b>							
Question	Siemens (NZ)	Sky Television	TeamTalk	Telecom	TelstraClear	ThePacific.net	
12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	10.5 GHz Band: for P-MP	N/A	N/A	N/A	450 MHz: for Cellular BB 850 and 900 Cellular Bands: should be made available to new entrants when current rights expire in 2010 1.0- 1.7 GHz Band: for BWA	N/A	

<b>Group Seven</b>							
Question	THL	Unwired Australia	Vector Communications	Vodafone	WIC NZ	WiMAX Forum	
1a Do you have an interest in deploying services using FWA?	Yes	N/A	Limited interest	No	No	N/A	
1b If so, what technologies and standards would you consider and why?	Should align with international standards	N/A	VoIP over BWA	N/A	N/A	WiMAX	
1c Which bands do you consider to be the most suitable for this purpose and why?	Should align with internationally allocated bands	N/A	N/A	N/A	N/A	2.3-2.7 GHz 3.3-3.8 GHz 5.725-5.85 GHz	
1d In which markets or regions would you consider deploying FWA and why?	Commercially sensitive	N/A	N/A	N/A	N/A	Global	
1e What is your timeframe for deploying FWA and why?	Commercially sensitive	N/A	N/A	N/A	N/A	Need exists now	
2a Do you have an interest in deploying WLANs and/or WiMAX?	Yes	N/A	Yes	No	Yes	N/A	
2b If so, what technologies and standards would you consider and why?	WiMAX	N/A	WiFi WiMAX	N/A	WiFi WiMAX	WiMAX	
2c Which bands do you consider to be the most suitable for this purpose and why?	Should align with internationally allocated bands	N/A	2.5 GHz	N/A	3.5 GHz	2.3-2.7 GHz 3.3-3.8 GHz 5.725-5.85 GHz	
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	Commercially sensitive	N/A	Auckland and Wellington with national expansion dependent on commercial success	N/A	Commercial and residential - Dunedin City and Otago region	Global	

Group Seven								
Question	THL	Unwired Australia	Vector Communications	Vodafone	WIC NZ	WiMAX Forum		
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	Commercially sensitive	N/A	Dependent on gaining access to suitable spectrum	N/A	WLAN –current and on-going WiMAX- mid to late 2007	Need exists now		
3a Do you have an interest in deploying satellite broadband services?	N/A	N/A	N/A	No	No	N/A		
3b If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	N/A	N/A	N/A		
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	N/A	N/A	N/A	N/A		
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	N/A	N/A	Remote and rural	N/A	N/A		
3e What is your timeframe for deploying satellite broadband services and why?	N/A	N/A	N/A	N/A	N/A	N/A		
4a Do you have an interest in deploying cellular broadband services?	No comment	N/A	No current interest	Committed to rolling out HSDPA	No	Not directly involved with cellular broadband but intends to ensure a high degree of services and operations interoperability with other wireless platforms		
4b Which bands do you consider to be the most suitable for this purpose and why?	N/A	N/A	N/A	900 MHz	N/A	N/A		
4c If so, what technologies and standards would you consider and why?	N/A	N/A	N/A	GSM family, including HSDPA	N/A	N/A		
4d In which markets or regions would you consider deploying cellular broadband and why?	N/A	N/A	N/A	Nationwide	N/A	N/A		
4e What is your timeframe for deploying cellular broadband and why?	N/A	N/A	N/A	Commercially sensitive	N/A	N/A		
5a Do you have an interest in deploying digital broadcast or convergent services?	Part of core business of providing transmission services	N/A	N/A	Yes	No	Yes, via BWA		
5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	DVB-T, DVB-S, DVB-H, DVB-M and MediaFLO	N/A	N/A	MBMS and DVB-H	N/A	Broad range		

Group Seven							
Question	THL	Unwired Australia	Vector Communications	Vodafone	WIC NZ	WiMAX Forum	
5c Which bands do you consider to be the most suitable for this purpose and why?	502-806 MHz (terrestrial), KU bands (satellite)	N/A	N/A	MBMS - 3G bands DVB-H 470-802 MHz	N/A	Broad range	
5d In which markets or regions would you consider deploying digital broadcast services and why?	Commercially sensitive	N/A	N/A	N/A	N/A	All	
5e What is your timeframe for deploying digital broadcast services and why?	Commercially sensitive	N/A	N/A	N/A	N/A	Dependent on business models	
6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?	Yes. But further details required for full support	N/A	Yes. A mix of exclusive rights & Managed Parks may provide optimal use of spectrum	Yes. Vodafone supports the idea of Managed Parks in principle	Yes	N/A	
6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	Yes	N/A	Yes	N/A	Yes. To facilitate local, regional, and community initiatives at low cost	N/A	
6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	Geographical approach for spectrum charges. Caps on spectrum usage	N/A	Restrict licences available or call for parallel bids based on number of operators	Auction process. Similar to Auction 6 in December 2003	Short to medium term licence grants, with review	N/A	
7a Do you have an interest in using the 2.3 GHz band?	Yes	N/A	Yes	No	No	Yes	
7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	No. Prefer 8 x 10 MHz blocks for competitive allocation + MSP. Hence, 8 x 10 MHz MRs, 3 x 5 MHz MSPs	N/A	No. Prefer 3MRs and MSP with access for MR-holders	Smaller blocks preferred	N/A	Yes	
7c What do you consider to be the optimum use for this band?	WiMAX	N/A	WiMAX	N/A	N/A	Mobile BWA	
7d Which form of management would you consider to be optimal for this band?	MRs, MSPs	N/A	MRs + MSP	N/A	N/A	N/A	
8a Do you have an interest in using the 2.5 GHz band?	Yes	N/A	Yes	Yes	No	Yes	
8b What do you consider to be the optimum packaging for this band?	The present OB linking channel plan	N/A	Packaging should support the development of emerging standards for fixed and mobile broadband access	Concerned that MED is considering the allocation of this spectrum	N/A	30MHz per operator with 5 or 10MHz channels	

<b>Group Seven</b>							
<b>Question</b>	<b>THL</b>	<b>Unwired Australia</b>	<b>Vector Communications</b>	<b>Vodafone</b>	<b>WIC NZ</b>	<b>WiMAX Forum</b>	
8c What do you consider to be the optimum use for this band?	Itinerant TV OB linking	N/A	Mobile broadband networks- mobile WiMAX & IMT-2000 technologies	Should not be considered for allocation until further information is available on the band plan	N/A	BWA, allowing full nomadic and mobile applications	
8d Which form of management would you consider to be optimal for this band?	Present regime of radio licences with conditions requiring co-ordination	N/A	Combination of mechanisms including a significant portion for a Managed Park	N/A	N/A	Conventional licensed use	
9a Do you have an interest in using the 5.4 GHz band?	No	N/A	No	No	Yes	No	
9b What do you consider to be the optimum use for this band?	Meteorological radar and either unlicensed or licensed BWA	N/A	WLAN	N/A	Mobile VoIP	N/A	
9c Which form of management would you consider to be optimal for this band?	Wait for international regulations are available	N/A	Public Park	N/A	Public Park	N/A	
10a Do you have an interest in using the 60 GHz band?	No	N/A	No	No	No	No	
10b What do you consider to be the optimum use for this band?	Fixed service usage	N/A	N/A	N/A	N/A	N/A	
10c Which form of management would you consider to be optimal for this band?	A short-term trial of the Managed Park concept	N/A	N/A	N/A	N/A	N/A	
11a Do you have an interest in using the 70, 80 and 90 GHz bands?	No	N/A	No	No	No	No	
1b What do you consider to be the optimum use for these bands?	Fixed service usage	N/A	N/A	N/A	N/A	N/A	
11c Which form of management would you consider to be optimal for these bands?	A short-term trial of the Managed Park concept	N/A	N/A	N/A	N/A	N/A	
12a Are there any other bands that you consider to be future candidates for BWA?	Yes	N/A	N/A	N/A	No	Yes	
12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	<u>10.5 GHz Band</u> for P-MP BWA backhaul	N/A	N/A	N/A	N/A	<u>Sub 1 GHz Bands</u> : for low density coverage	

<b>Group Eight</b>			
<b>Question</b>	<b>Woosh</b>	<b>Question</b>	<b>Woosh</b>

<b>Group Eight</b>					
Question	Woosh	Question	Woosh	Question	Woosh
1a Do you have an interest in deploying services using FWA?		4b Which bands do you consider to be the most suitable for this purpose and why?	N/A	8a Do you have an interest in using the 2.5 GHz band?	Unclear
1b If so, what technologies and standards would you consider and why?	N/A	4c If so, what technologies and standards would you consider and why?	N/A	8b What do you consider to be the optimum packaging for this band?	N/A
1c Which bands do you consider to be the most suitable for this purpose and why?	N/A	4d In which markets or regions would you consider deploying cellular broadband and why?	N/A	8c What do you consider to be the optimum use for this band?	Could be made available for BWA and the broadcasters offered other spectrum
1d In which markets or regions would you consider deploying FWA and why?	N/A	4e What is your timeframe for deploying cellular broadband and why?	N/A	8d Which form of management would you consider to be optimal for this band?	N/A
1e What is your timeframe for deploying FWA and why?	N/A	5a Do you have an interest in deploying digital broadcast or convergent services?	No	9a Do you have an interest in using the 5.4 GHz band?	N/A
2a Do you have an interest in deploying WLANs and/or WiMAX?	Yes	5b If so, what technologies and standards (terrestrial, satellite, mobile) would you consider and why?	N/A	9b What do you consider to be the optimum use for this band?	N/A
2b If so, what technologies and standards would you consider and why?	WiMAX	5c Which bands do you consider to be the most suitable for this purpose and why?	N/A	9c Which form of management would you consider to be optimal for this band?	N/A
2c Which bands do you consider to be the most suitable for this purpose and why?	2.3 GHz 2.5 GHz	5d In which markets or regions would you consider deploying digital broadcast services and why?	N/A	10a Do you have an interest in using the 60 GHz band?	N/A
2d In which markets or regions would you consider deploying WLANs and/or WiMAX and why?	N/A	5e What is your timeframe for deploying digital broadcast services and why?	N/A	10b What do you consider to be the optimum use for this band?	N/A
2e What is your timeframe for deploying WLANs and/or WiMAX and why?	Dependent on certainty of tenure of 2.3 GHz spectrum	6a Should spectrum for future BWA deployment be reserved as a Managed Park? Why or why not?	N/A	10c Which form of management would you consider to be optimal for this band?	N/A
3a Do you have an interest in deploying satellite broadband services?	N/A	6b Should a Managed Park allocated for BWA deployment be available to regional providers? Why or why not?	No. Regional allocations are an inefficient use of spectrum	11a Do you have an interest in using the 70, 80 and 90 GHz bands?	N/A

<b>Group Eight</b>					
Question	Woosh	Question	Woosh	Question	Woosh
3b If so, what technologies and standards would you consider and why?	N/A	6c How should access to Managed Parks be controlled when entrant demand in a particular area exceeds the sharing capability of the band?	N/A	11b What do you consider to be the optimum use for these bands?	N/A
3c Which bands do you consider to be the most suitable for this purpose and why?	N/A	7a Do you have an interest in using the 2.3 GHz band?	Yes	11c Which form of management would you consider to be optimal for these bands?	N/A
3d In which markets or regions would you consider deploying satellite broadband services and why?	N/A	7b Do you consider the proposed re-packaging to be appropriate for this band? If not, what do you consider to be the optimum packaging for this band?	Require a minimum of 50 MHz Existing right holders to be offered renewal rights	12a Are there any other bands that you consider to be future candidates for BWA?	N/A
3e What is your timeframe for deploying satellite broadband services and why?	N/A	7c What do you consider to be the optimum use for this band?	N/A	12b If so, which ones, why and when? How do you think they should be allocated, taking into account current allocations and usage?	N/A
4a Do you have an interest in deploying cellular broadband services?	N/A	7d Which form of management would you consider to be optimal for this band?	N/A		