9 February 2000

Professor Richard Snape Presiding Commissioner Productivity Commission Locked Bag 2 Collins Street East Post Office Melbourne VIC 8003

Dear Professor Snape

Additional Information from the ABA - The Importance of Spectrum Clearing

In its draft report, *Broadcasting*, the Productivity Commission had identified 'spectrum clearing' as an important mechanism for ensuring that analog/digital simulcasting is confined to the statutory minimum period.

In its submission of 6 December 1999, the ABA reported that it was undertaking preliminary analysis of spectrum clearing opportunities and undertook to provide further advice on this issue as soon as practicable. During the subsequent public hearing in Sydney on 7 December, ABA witnesses stated that spectrum clearing was potentially an important initiative if a lengthy simulcasting period were to be avoided.

Experience with the political imperatives of broadcasting policy suggests the Productivity Commission is correct in its observation that the analog simulcasting period is likely to be extended until digital equipment has been very widely adopted. Indeed, the existence of any substantial pockets of analog-only receivers can be expected to result in pressure to postpone analog switch off. Such pockets may result from:

- 1. Reluctance or inability of a percentage of people in the market to 'trade up' to a digital set or set-top unit. A substantial 'tail' of analog-only viewers would appear inevitable if a simulcast period of only eight years is in contemplation; and
- 2. Gaps in the digital coverage area, within which viewers are forced to rely on analog reception. Even if the ABA and industry are successful in achieving 'same coverage and reception quality' as mandated in the conversion schemes, gaps in terrestrial reception are likely to remain, for example, where viewers in remote areas rely on so-called 'fortuitous' analog reception.

This suggests that a comprehensive spectrum clearing strategy may entail extension of digital signal coverage by terrestrial or other means as well as replacement or augmentation of domestic analog equipment.

More generally, the ABA submits that prior development of comprehensive strategies for managing analog switch-off is likely to be a prerequisite if the simulcasting period is not to extend beyond the statutory minimum period.

Timing of clearance

As suggested in the most recent Fairfax submission to the Productivity Commission, spectrum clearing need not wait until the end of the statutory simulcast period if the market for digital spectrum will sustain the costs of earlier clearance either in areas or Australia-wide. As to whether this is the case, the market is a better judge than the regulators. However, the ABA or ACA should retain the public interest role of determining the standards to which spectrum clearing should be undertaken before analog switch-off.

A spectrum clearing policy framework and timetable may be best developed initially through an iterative process of consultation involving broadcasters, government agencies and potential purchasers of digital spectrum. The likely need for changes to the present legal framework might suggest a coordinating role for the Department.

Limited clearance ahead of the end of the simulcast period would raise additional policy issues to those arising in relation to the end of simulcasting Australia-wide. For example, early clearance in a metropolitan market may require adjacent-area regional broadcasters' plans for providing a digital signal to be brought forward by several years – perhaps at the new market entrant's expense. Also, any one-off distribution of portable equipment such as set-top units in a suburb or town (as opposed to fixtures such as external antennas) may create ongoing problems as new residents move into the area. Undoubtedly, solutions could be found if the market for digital channels were strong enough.

'Low fruit'

As promised, the ABA's engineers have undertaken a preliminary search for individual channels in the Sydney region that could be made available for high power digital use for the price of relatively modest spectrum clearance before the end of the simulcast period. Further searches in other major markets could be undertaken.

The following observations are indicative only and more detailed planning would be required before reliable conclusions on spectrum planning options could be reached.

Based on the preliminary studies, the cheapest candidate for early spectrum clearing in the Sydney region may be UHF channel 35. This channel is currently in use to deliver analog television services in Wollongong (Brokers Nose), at Merewether and at Nowra North. The channel is also licensed for use at low power at Bouddi in the Central Coast area north of Sydney, however, the channel is not currently in use at this site.

Of the operating analog services on channel 35, Wollongong (Brokers Nose) would be most affected by a high power digital service from Sydney. It would need to be either moved to an alternative analog channel (if one could be found) or cleared and reception restored through the distribution of digital set-top boxes. It may be possible for the other existing services to co-exist, providing the Sydney digital service is restricted in the power it may radiate towards these services.

Clearance of analog channel 35 at Brokers Nose would affect up to 10,000 homes. As the cheapest clearance option in the short term would be simply to move the existing television service to another analog channel, the ABA's engineers have considered whether suitable analog capacity could be found. The only alternative analog channel for the Wollongong service, based on preliminary studies, appears to be channel 68, which is also under consideration as a high power Sydney channel.

The ABA intends to seek industry and public comment on the benefits and disadvantages of using either or both channels 35 and 68 for digital television or datacasting services in Sydney in the near future. This will occur as part of a process to vary the digital channel plan to add digital channel capacity for existing analog translator sites in the Sydney, Newcastle and Wollongong region. At the end of this process, the ABA will know whether there is an option of making channel 35 available in Sydney through early clearance of the Brokers Nose service to another analog channel.

If it proves impracticable to move the channel 35 service to another analog channel, channel 35 would remain a candidate for clearance through distribution of set-top boxes once a digital signal was available to all households served by the Brokers Nose facility. Any resultant additional channel in Sydney may still require either power limitations in the direction of the Merewether and Nowra North analog services or the clearance of those channels as well.

Early clearance of any other channel in the Sydney region is likely to come at a much higher cost. This is because most channels are in use either for high power services or at multiple locations for low power services. Thus, use of those channels for digital transmission would either require clearance across large areas or in several smaller areas served by co-channelled infill translators.

Attached is a report prepared for the ABA's Digital Committee in December last year into early clearance options. Note that channel 35 was not included in the analysis at the time the report was prepared because it was thought a suitable alternative analog channel could be found for Wollongong. (As discussed, this has since proved to be problematic). Hence, channel 35 did not appear to come within the scope of 'spectrum clearing' in the sense of analog reception being replaced by digital.

Also attached is a summary table of all available 7 MHz channels showing comments on their availability/suitability for use in Sydney for digital broadcasting or datacasting.

The ABA expresses no view as to whether or when early spectrum clearance in Sydney or the surrounding regions might be an attractive option to new market entrants.

Depending on the Productivity Commission's level of interest in these issues, it may be useful to meet with ABA staff to discuss the issues further. Alternatively, please feel free to telephone me on (02) 9334 7868 or Phyllis Fong on (02) 9334 7831 if you have any queries.

Yours sincerely

Giles Tanner General Manager

Attachment

Agenda Paper

Digital Committee				
Date: 10 December 1999	Agenda Item:			
	Contact Officer: Alastair Gellatly			
File No.:	Cleared by: Fred Gengaroli / Jonquil Ritter			

Consideration of spectrum clearing options as raised by the Productivity Commission Report

Purpose:

To inform the Digital Committee of initial analysis on spectrum clearing options undertaken by Planning and Licensing Branch.

Background:

- 1. The draft Productivity Commission report into Broadcasting Regulation suggested a process where aspirant digital broadcasters or datacasters could gain early access to spectrum through the clearing of analog television services.
- 2. A Fairfax submission to the Productivity Commission suggested that the Government could fund the supply of a digital television set-top box for every analog television set in Australia through revenue from spectrum sales.
- 3. The ABA's General Manager asked Planning and Licensing Branch to investigate opportunities for spectrum clearance on a smaller scale than the Fairfax proposal.

Issues:

- 1. One possible way of clearing spectrum would be to identify areas where a channel is used to provide coverage of relatively small areas with low population, and to provide Residents a digital set-top box. This would to permit reception of digital television services allowing one or more analog channels to be shut down. To evaluate the feasibility of such a proposal an analysis for spectrum usage in the vicinity of Sydney was undertaken.
- 2. The following analysis illustrates that most channels are in use either for high power services or at multiple locations for low power services. The Attachment provides a summary of channel usage within 200 km of Sydney. One difficulty with such a proposal is the timing of commencement of digital television services that could be used as an alternative source of services for areas being cleared of analog television. As many of the analog translators around Sydney are in regional television licence areas, there is unlikely to be an alternative digital service for a number of years after the commencement of Sydney digital services.
- 3. On the basis of a co-channel interference assessment only (not taking into account other interference mechanisms), two channels in use at Gosford appear to be possible spectrum clearance candidates. There are seven channels in use at Gosford with five of these channels also in use at Kings Cross. The two Gosford channels that are not also in use at Kings Cross, are channels 40 and 43. These

channels are used respectively by the NBN and NEN (Prime Television Ltd) regional services. There is no other usage of these channels within approximately 200 km of the Sydney high power sites.

- 4. Further analysis shows that the Manly/Mosman translators operate on adjacent channels (39 and 42). If high power digital services were to operate in Sydney on adjacent channels to the Manly/Mosman services interference to the reception of the Manly/Mosman services would be the likely result. The area of interference would be outside the immediate vicinity of Manly. Affected viewers would be those further West who rely on the Manly/Mosman translators to overcome shadowing or ghosting reception problems of the high power VHF services.
- 5. The potential for adjacent channel interference to Manly/Mosman also applies to channel 61 as the Seven Network service operates on channel 60. Channel 61 is the unused Gosford channel licensed to NRN (Telecasters Australia Ltd). NTL has proposed channel 61 as a high power Sydney digital channel, in their proposal for wide area single frequency networks.
- 6. The problem of interference to adjacent channel services would also apply to Kings Cross services and eliminates all channels between 38 and 67 inclusive from use as Sydney high power services. It may be possible to use such adjacent channels at lower power levels. Further analysis and possible test transmissions would be needed to determine a safe operating power level.
- 7. Planning and Licensing Branch intends to do further analysis of spectrum clearance options for Brisbane and then prepare a supplementary submission to the Productivity Commission on this issue.

Summary:

The relationship of channels in any area is complex. It is not simply a matter of clearing co-channel services. Even if a number of small translators could be cleared by some means (such as supplying digital set-top boxes to viewers of analog services in the translator coverage areas) there are likely to be other interference issues to block access to a channel for a high power service.

Recommendation:

The digital committee note the above issues and the proposed course of action at issue 7.

FOR INFORMATION

NOT CONFIDENTIAL

Attachment

Sydney Digital TV Channel Search

Site ID : 4045

Channel / DigitalBAND IIICO-CHANNEL INTERFERENCE6AnalogERP : 50 kWTS90006CBN6 Lithgow (Lic) Com30 W102 km174 to 181 MHzTS3002ABCN/6 Bathurst (Lic) ABC505 W156 kmDigitalTS10008984Sydney (Lic) 1350 kW0 km7AnalogTS86001ATN7 Sydney (Lic) Com200 kW0 km8TS86005ATN7/S Sydney (Lic) Com200 kW2 km8AnalogTS6002ABHN/8 Upper Hunter (Lic) ABC3 kW189 km181 to 188 MHzTS6002ABHN/8 Upper Hunter (Lic) ABC3 kW189 km188 to 195 MHzTS6002ABHN/8 Upper Hunter (Lic) ABC3 kW189 km188 to 195 MHzTS90001CBN8 Central Tablelands (Lic) Com200 kW2 km9AnalogSydney (Lic) 1350 kW2 km9AnalogTS87005TCN9/S Sydney (Lic) Com200 kW0 km195 to 202 MHzTS87005TCN9/S Sydney (Lic) Com200 kW2 km9AnalogTS87001TCN9 Sydney (Lic) Com200 kW2 km9AnalogTS87001TCN9 Sydney (Lic) Com200 kW2 km9AFS10008986Sydney (Pro) 13100 kW0 km202 to 209 MHzTS10008986Sydney (Pro) 13100 kW0 km202 to 209 MHzNot Available unless TEN10 Sydney changes frequency100
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209 to 216 MHz
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II Analog FDD : 50 kW TS00002 CDN11 Bathurst (Lio) Com 400 W 156 km
216 to 223 MHz Digital CDIVIT Damarst (LIC) COIII 400 W 150 Km
TS10008987 Sydney (Lie) 13 50 kW 0 km
Not Available : due to co-channel digital Sydney
12 Digital
$ERP \cdot 50 \text{ kW} = \frac{D \cdot g \cdot a}{TS10008988} Sydney (Aya) 13 = 50 \text{ kW} = 0 \text{ km}$
223 to 230 MHz Not available : due to co-channel digital Sydney

TV	Restrictions / Av	vailability of channel		
Channel				
BAND IV	CO-CHANNEI	L INTERFERENCE		
28	Analog			
ERP : 200 kW	TS10008118	SBS28 Vacy (Lic) SBS	100 W	148 km
526 to 533 MHz				
	TS136001	SBS28 Sydney (Lic) SBS	600 kW	2 km
	Not Available :	due to co-channel analog Sydney		
29	Analog			
ERP: 200 kW	TS10008264	SBS29 Lithgow (Lic) SBS	300 W	102 km
533 to 540 MHz	TS2233006	SBS/29 Nowra North (Lic) SBS	3200 W	124 km
	Digital	S	200 1-11/	0 1
	1510008990	Sydney (Ava) 13	200 K W	0 km
20	Not Available	: due to co-channel digital Sydney		
$\frac{50}{\text{EDD} \cdot 200 \text{ kW}}$	Analog	NEN20 Wyong (Lie) Com	5 1-W/	50 km
ERP : 200 KW 540 to 547 MHz	T\$2233003	SBS/30 Lilledulle (Lic) SBS	3 K W 80 FW	32 KIII 181 km
540 to 547 WILL	TS2233005	SBS/30 Stanwell Park (Lic) SBS	40 W	50 km
	TS10008315	SBS/30 Central Tablelands (Lic) SBS	2 MW	210 km
	TS2233004	SBS/30 Bowral/Mittagong (Lic) SI	BS 4	kW 101 km
	Not Available : due to co-channel analog Wyong, Bowral/Mittagong Stanwell Park			
31	Analog			
ERP: 200 kW	TS10008119	ABN31 Vacy (Lic) ABC	100 W	148 km
547 to 554 MHz	TS10004600	CTV31 Sydney (Lic) ONC 10 kV	V 5	km
	Not Available :	due to co-channel analog Sydney		
32	Analog			
ERP: 200 kW	TS2103001	ABN/32 Lithgow (Lic) ABC	300 W	102 km
554 to 561 MHz	TS2204003	SBS/32 Merewether (Lic) SBS	400 W	112 km
	T\$15008 T\$2233002	ABWN/32 Nowra North (Lic) ABC SBS/32 Wollongong (Lic) SBS	5200 W	124 KIII 68 km
	TS95020	NEN32 Bouddi (Lic) Com	2500 W	39 km
	Not Available :	due to co-channel analog Bouddi. Wollongo	ng. Lithgow	& Merewether
33	Analog	6 / 8	0/ 0	
ERP: 200 kW	TS96010	NRN33 Wyong (Lic) Com	5 kW	52 km
561 to 568 MHz	TS15005	ABWN/33 Ulladulla (Lic) ABC	80 kW	181 km
	TS15007	ABWN/33 Stanwell Park (Lic) ABC	40 W	50 km
	TS85012	CTC33 Central Tablelands (Lic) Com	2 MW	210 km
	1S15006 Not Available	ABWN/33 Bowral/Mittagong (Lic) ABC	4 KW littaaona Sta	101 km
34	Digital	uie to co-channet analog wyong, Bowraum	uugong Su	nwell F ark
ERP: 200 kW	TS10008991	Sydney (Ava) 13 200 kW	0 km	
568 to 575 MHz	Not Available	· due to co-channel digital Sydney	0 Mili	
35	Analog	. une to co channel argital Syancy		
ERP : 200 kW	TS6005	ABHN/35 Merewether (Lic) ABC	400 W	112 km
575 to 582 MHz	TS99036	WIN35 Nowra North (Lic) Com	3200 W	124 km
	TS15002	ABWN/35 Wollongong (Lic) ABC	5 kW 6	8 km
	TS96011	NRN35 Bouddi (Lic) Com 2500	W 3	9 km
	Not Available :	due to co-channel analog Bouddi (not opera	ting), Wollor	ngong &
	Merewether. No	ote Merewether would be ok if Sydney digita	l power restr	icted to 10 kW ERP.

RAND V	Restrictions / Au	vailability of channel		
	CO-CHANNEL INTERFERENCE			
36	Digital			
EDD · 500 LW	TS10009008	Illawarra (Ava) 13	250 kW 101 km	
EKF . 500 KW	TS10008992	Newcastle (Ava) 13	500 kW = 107 km	
J62 10 J69 WILL	Not Availe	able • due to co-channel digital Illa	warra & Newcastle	
27	Digital	ible . uue to co-channel uigitai ma	warra & reweaste	
3 /		Illowerre (Ave) 13	250 kW = 101 km	
EKP: 500 KW	TS10009009	Now angella $(A va)$ 13 500 kW	107 km	
589 10 590 MHZ	Not Available	Interversite (Ava) 15 SUU KVV		
20	Noi Available : a	uue to co-channet aiguat Ittawarra & Newo	cusue	
38		Illowana $(\Lambda_{\rm VO})$ 12	250 hW 101 hm	
ERP: 500 kW	TS10009010	Illawaffa (Ava) 13	250 KW 101 KM	
596 to 603 MHz	Not Augilable	Newcastle (Ava) 15 due to eo champel digital Illawarra & New	SUUKW 10/KIII	
	Not Available : a	aue to co-channel algual Illawarra & Newo	casile & aajaceni channel analog	
20	Analog			
39	TS2204002	SDS/20 Wyong (Lie) SDS	5 kW 52 km	
ERP: 500 kW	TS2204002 TS00007	WIN30 Stonwell Park (Lic) Com	3 KW $32 Km$	
603 to 610 MHz	TS00010	WIN39 Statiwen Fark (Lic) Com WIN30 Control Tablelands (Lic) Com	2 MW 210 km	
	T\$136005	SBS/39 Manly/Mosman (Lic) SBS	2 WW 210 Km	
	TS150005	WIN39 Bowral/Mittagong (Lic) Com	4 kW 101 km	
	Not Available •	due to co-channel analog Manby/Mosman	Wyong Stanwell Park & Rowral	
10	Analog	ine to co-channel analog manty/mosman,	Hyong, Stanwen Park & Dowran	
HU EDD : 500 kW	TS94006	NBN40 Gosford (Lic) Com	400 W 45 km	
EKF $. 500 \text{ KW}$	TS10007134	ABC40 East Grove (Lic) ABC	10 W 171 km	
	TS10007134	ABC40 Fast Grove (Lic) ABC	10 W 171 km	
	Not Available :	due to co-channel analog Gosford & adjac	ent channel analog	
	Manly/Mosman	ine to co channel anniog Gosjora & aujuci		
41	Analog			
$\mathbf{FRP} \cdot 500 \mathbf{kW}$	TS85017	CTC41 Lithgow (Lic) Com	300 W 102 km	
617 to 624 MHz	TS94010	NBN41 Merewether (Lic) Com	400 W 112 km	
017 to 021 MILE	TS85037	CTC41 Nowra North (Lic) Com	3200 W 124 km	
	TS99602	WIN41 Wollongong (Lic) Com	5 kW 68 km	
	TS94009	NBN41 Bouddi (Lic) Com 2500	W 39 km	
	Not Available :	due to co-channel analog Bouddi. Wollong	ong. Lithgow & Merewether &	
	adiacent channe	el analog Manlv/Mosman		
42	Analog			
$ERP \cdot 500 kW$	TS2604	ABN/42 Wyong (Lic) ABC	5 kW 52 km	
624 to 631 MHz	TS10007386	SBS42 Dungog (Lic) SBS	200 W 166 km	
02410 051 10112	TS99010	WIN42 Ulladulla (Lic) Com	80 kW 181 km	
	TS85030	CTC42 Stanwell Park (Lic) Com	40 W 50 km	
	TS2005	ABN/42 Manly/Mosman (Lic) ABC	4 kW 11 km	
	TS85031	CTC42 Bowral/Mittagong (Lic) (Com 4 kW 101 km	
	Not Available :	due to co-channel analog Manly/Mosman.	Wyong, Bowral/Mittagong.	
	Stanwell Park	,,,,,,,,	· · · · · · · · · · · · · · · · · · ·	
43	Analog			
ERP : 500 kW	TS95018	NEN43 Gosford (Lic) Com	400 W 45 km	
631 to 638 MHz	TS10007167	SBS43 East Grove (Lic) SBS	10 W 171 km	
	Not Available :	due to co-channel analog Gosford & adiac	ent channel analog	
	Manly/Mosman	and a contract and a conjoin a conjugation		

44	Analog			
ERP : 500 kW	TS85025	CTC44 Wollongong (Lic) Com	5 kW	68 km
638 to 645 MHz	TS99024	WIN44 Lithgow (Lic) Com	300 W	102 km
	TS95034	NEN44 Merewether (Lic) Com	400 W	112 km
	TS86006	ATN44 Bouddi (Lic) Com	5100 W	39 km
	TS90033	CBN44 Nowra North (Lic) Com	3200 W	124 km
	Not Available :	due to co-channel analog Bouddi, Wollongo	ong, Lithgow	& Merewether
45	Analog		0, 0	
FRP · 500 kW	TS85032	CTC45 Ulladulla (Lic) Com	80 kW	181 km
645 to 652 MHz	TS90030	CBN45 Stanwell Park (Lic) Com	40 W	50 km
045 10 052 10112	TS3676001	ABN/45 Crookwell (Lic) ABC	80 W	174 km
	TS90027	CBN45 Bowral/Mittagong (Lic) Com	4 kW	101 km
	TS2204001	SBS45 Newcastle (Lic) SBS	1200 kW	107 km
	Not Available :	due to co-channel analog Stanwell Park. Ne	wcastle & B	owral/Mittagong &
	adiacent chann	el analog Kings Cross		a a a a a a a a a a a a a a a a a a a
16	Analog			
HU EDD - 5 00 I-W	TS2003	ABN/46 Gosford (Lic) ABC	$400 \mathrm{W}$	45 km
EKP : J00 KW	TS7522001	SBS46 Bathurst (Lic) SBS	$2 \mathrm{kW}$	156 km
032 10 039 MINZ	TS2002	ABN/46 Kings Cross (Lic) ABC	2600 W	9 km
	TS10007168	WIN46 Fast Grove (Lic) RT	10 W	171 km
	Not Available .	due to co-channel analog Kings Cross & G	nsford	171 KIII
47	Apalog	une to co-channel analog Kings Cross & Oc	sjora	
4/	TS00032	CBN47 Wollongong (Lic) Com	5 kW	68 km
ERP : 500 kW	TS96024	NBN47 Merewether (Lic) Com	J K W	112 km
659 to 666 MHz	T\$970024	TCN47 Bouddi (Lic) Com	5 kW	30 km
	T\$2322001	Nowra North () Com	3200 W	124 km
	Not Available .	due to co channel angles Wellengons & R	J200 W	124 MII
	channel analog	uue to co-channet anatog wouldngong & Do Kings Cross		eweiner & aujaceni
10	Analog	Kings Cross		
40	TS00031	CBN48 Ulladulla (Lic) Com	80 FW	181 km
ERP : 500 KW	T\$6001	ABHN/8 Newcastle (Lic) ABC	1200 LW	107 km
666 to 6/3 MHz	Not Available .	due to co-channel analog Newcastle & adia	1200 KW	analog Kings Cross
40	Analog	aue to co-channel analog tvewcastie & daja	cem chunnei	unutog Kings Cross
49	TS86003	ATN49 Gosford (Lic) Com	400 W	45 km
ERP: 500 KW	TS85013	CTC49 Bathurst (Lic) Com	$2 \mathrm{kW}$	156 km
075 10 080 MHZ	TS86002	ATN49 Kings Cross (Lic) Com	2600 W	9 km
	TS10007174	CBN49 Fast Grove (Lic) RT	10 W	171 km
	Not Available .	due to co-channel analog Kings Cross & G	nsford	171 KIII
50	Analog	une to co-channel analog Kings Cross & Oc	sjora	
	T\$88006	TEN50 Bouddi (Lic) Com	5100 W	30 km
ERP : 500 KW	Digital	TENSO Doudur (Ele) Com	5100 W	J) KIII
680 to 687 MHz	TS10009011	Illawarra (Δv_a) 13	250 kW	101 km
	Not Available .	due to co-channel angles Rouddi & co chan	2JUNN nnol diaital I	Ilawarra & adiasant
	channel analog	uue 10 co-chunnei unuiog Douuui & Co-Chui Kinas Cross	inei aigual I	uuwurru & aujacent
51	Digital	Imingo Cruss		
51		Illawarra (Ava) 13	250 FW	101 km
ERP : 500 kW	TS10009012	Mawalla (Ava) 13 Nawcastle (Ava) 13	230 K W 500 1-W	101 Mil 107 km
687 to 694 MHz	Not Available .	due to an abannol digital Illawarra & Name	JUUKW	10/ KIII
	Ivoi Available :	uue io co-channel aigual Illawarra & Newc	$usue \propto aafac$	em channel analog
	Kings Cross			

50	Analog			
54	TS 10009269	SDS52 Lithcom East (Lin) SDS	200 11	101 lm
ERP : 500 kW	1510008208	SB552 Litingow East (Lic) SB5	200 W	101 Km
694 to 701 MHz	158/003	ICN52 Gosford (Lic) Com	400 W	45 km
	TS99020	WIN52 Bathurst (Lic) Com	2 kW	156 km
	TS87002	TCN52 Kings Cross (Lic) Com	2600 W	9 km
	TS10007175	CTC52 East Grove (Lic) RT	10 W	171 km
	Not Available :	due to co-channel analog Kings Cross, Gosfor	rd & Lithgo	ow East
53	Analog			
ERP : 500 kW	TS2233001	SBS53 Illawarra (Lic) SBS	960 kW	101 km
701 to 708 MHz	Digital			
	TS10008996	Newcastle (Ava) 13	500 kW	107 km
	Not Available	e : due to co-channel analog Illawarra	& co-che	annel digital
	Newcastle &	adjacent channel analog Kings Cross		
54	Analog			
ERP : 500 kW	TS10004845	SBS54 Oberon (Lic) RT	20 W	124 km
708 to 715 MHz	TS900001	Portland/Wallerawang (Lic) SBS	790 W	122 km
	TS10008267	SBS54 Portland/Wallerawang (Lic) SBS	4 kW	122 km
	TS95015	NEN54 Newcastle (Lic) Com	1200 kW	107 km
	Digital			
	TS10009013	Illawarra (Ava) 13	250 kW	101 km
	Not Available :	due to co-channel analog Newcastle & co-cha	nnel digita	l Illawarra &
	adjacent chann	el analog Kings Cross	8	
55	Analog			
ERP : 500 kW	TS2103002	ABN/55 Lithgow East (Lic) ABC	200 W	101 km
715 to 722 MHz	TS2204004	SBS/55 Kotara (Lic) SBS	200 W	106 km
, 10 10 , 22 11112	TS88003	TEN55 Gosford (Lic) Com	400 W	45 km
	TS88002	TEN55 Kings Cross (Lic) Com	2600 W	9 km
	TS6530001	ABN/55 Goulburn (Lic) ABC	1 kW	168 km
	Not Available :	due to co-channel analog Kings Cross, Gosfor	rd, Kotara d	& Lithgow East
56	Analog			
FRP · 500 kW	TS15001	ABWN56 Illawarra (Lic) ABC	960 kW	101 km
722 to 729 MHz	Digital			
722 to 729 time	TS10008997	Newcastle (Ava) 13	500 kW	107 km
	Not Available :	due to co-channel analog Illawarra & co-cha	nnel digital	Newcastle &
	adjacent chann	el analog Kings Cross	0	
57	Analog			
ERP : 500 kW	TS10008603	ABN57 Oberon (Lic) ABC	20 W	124 km
729 to 736 MHz	TS10004846	ABC57 Oberon (Lic) RT	20 W	124 km
	TS2185001	ABCN/57 Portland/Wallerawang (Lic) ABC	4 kW	122 km
	TS96006	NRN57 Newcastle (Lic) Com	1200 kW	107 km
	Digital			
	TS10009014	Illawarra (Ava) 13	250 kW	101 km
	Not Available :	due to co-channel analog Newcastle & co-cha	nnel digita	l Illawarra &
	adjacent chann	el analog Kings Cross		

-0	A 1				
58	Analog		100 111	4.5.1	
ERP : 500 kW	TS136003	SBS/58 Gosford (Lic) SBS	400 W	45 km	
736 to 743 MHz	TS90007	CBN58 Lithgow East (Lic) Com	200 W	101 km	
	TS6006	ABHN/58 Kotara (Lic) ABC	200 W	106 km	
	TS136002	SBS/58 Kings Cross (Lic) SBS	2600 W	9 km	
	TS232601	SBS58 Goulburn (Lic) SBS	1 kW	168 km	
	Not Available :	due to co-channel analog Kings Cross, Gosf	ord, Kotara	& Lithgow East	
50	Analog				
EDD - 500 I-W	TS99001	WIN59 Illawarra (Lic) Com	950 kW	101 km	
ERP : 500 KW	TS96008	NRN59 Upper Hunter (Lic) Com	$20 \mathrm{kW}$	189 km	
/43 to /50 MHZ	T\$96037	NRN59 East Rossgole (Lic) Com	1300 W	100 km	
	Not Available .	due to co-channel analog Illawarra & adia	1300 W	analog Kings Cross	
	Rol Available . & Manby/Mosn	uue io co-channei anaiog iiawarra '& aajac		unutog Kings Cross	
(0)	Analaa	un			
60	Analog	CTC(0 Observer (Lin) DT	20 11	124 1	
ERP : 500 kW	1510004847	ADCN(0 Kender (Lic) ADC	20 W	124 Km 152 have	
750 to 757 MHz	1510007050	ABCINOU KARIOS (LIC) ABC	600 W	152 Km	
	1586004	ATN60 Wyong (Lic) Com	5 KW	52 km	
	1\$86007	ATN60 Manly/Mosman (Lic) Com	4 KW	11 km	
	TS90005	CBN60 Portland/Wallerawang (Lic) Com	4 kW	122 km	
	TS6007	ABHN/60 Dungog (Lic) ABC	200 W	166 km	
	Not Available :	due to co-channel analog Manly/Mosman &	: Wyong		
61	Analog				
ERP : 500 kW	TS96009	NRN61 Gosford (Lic) Com	400 W	45 km	
757 to 764 MHz	TS85018	CTC61 Lithgow East (Lic) Com	200 W	101 km	
	TS94011	NBN61 Kotara (Lic) Com	200 W	106 km	
	TS99014	WIN61 Goulburn (Lic) Com	1 kW	168 km	
	Not Available :	due to co-channel analog Gosford (Not oper	ating), Kota	ra & Lithgow East &	
	adjacent chann	el analog Manly/Mosman			
62	Analog				
$ERP \cdot 500 kW$	TS85024	CTC62 Illawarra (Lic) Com	950 kW	101 km	
764 to 771 MHz	TS937001	Kirkconnell ()	1 W	130 km	
	TS95017	NEN62 Upper Hunter (Lic) Com	20 kW	189 km	
	TS95040	East Rossgole () Com	1300 W	190 km	
	Not Available : due to co-channel analog Illawarra & adjacent channel analog				
	Manly/Mosmar	ı		0	
63	Analog				
FRP · 500 kW	TS10004848	WIN63 Oberon (Lic) RT	20 W	124 km	
771 to 778 MHz	TS85015	CTC63 Kandos (Lic) Com	600 W	152 km	
//110 //0101112	TS87004	TCN63 Wyong (Lic) Com	5 kW	52 km	
	TS87007	TCN63 Manly/Mosman (Lic) Com	4 kW	11 km	
	TS85016	CTC63 Portland/Wallerawang (Lic) Com	4 kW	122 km	
	TS95016	NEN63 Dungog (Lic) Com	200 W	166 km	
	Not Available .	due to co-channel analog Manly/Mosman &	Wyong	100 km	
64	Analog		. Hyong		
U4	TS10004300	SBS64 Patonga (Lic) RT	1 W	29 km	
EKP : 500 KW	TS136004	SBS/64 Bouddi/Broken Bay(Lic) SBS	5100 W	20 km	
//8 to /85 MHz	TS150004	NEN64 Kotara (Lic) Com	200 W	106 km	
	TS95055	WIN64 Lithgow East (Lie) Com	200 W	100 Mil	
	TS00012	CRN64 Coulburn (Lic) Com	200 W	101 KIII 168 km	
	1370012 Not Augilahla	due to an ehannel angles Deteros Der 11:	IKW Kotana P I	100 KIII	
	Ivoi Available :	aue to co-channel andlog Palonga, Bollaal,	лонага & Ll	ingow East &	
	aajacent chann	ei anaiog Maniy/Mosman			

65	Analog				
ERP : 500 kW	TS90024	CBN65 Illawarra (Lic) Com	950 kW	101 km	
785 to 792 MHz	Not Available :	due to co-channel analog Illawarra & adjac	ent channel	analog	
	Manly/Mosma	n			
66	Analog				
ERP : 500 kW	TS10004849	CBN66 Oberon (Lic) RT	20 W	124 km	
792 to 799 MHz	TS99022	WIN66 Kandos (Lic) Com	600 W	152 km	
	TS88004	TEN66 Wyong (Lic) Com	5 kW	52 km	
	TS88007	TEN66 Manly/Mosman (Lic) Com	4 kW	11 km	
	TS99023	WIN66 Portland/Wallerawang (Lic) Com	4 kW	122 km	
	TS96007	NRN66 Dungog (Lic) Com	200 W	166 km	
	Not Available : due to co-channel analog Manly/Mosman & Wyong				
67	Analog				
ERP : 500 kW	TS2006	ABN/67 Bouddi/Broken Bay (Lic) ABC	5100 W	39 km	
799 to 806 MHz	TS96025	NRN67 Kotara (Lic) Com	200 W	106 km	
	Not Available : due to co-channel analog Bouddi & Kotara & adjacent channel analog				
	Manly/Mosman				
68	Analog				
ERP : 500 kW	TS94008	NBN68 East Rossgole (Lic) Com	1600 W	190 km	
806 to 813 MHz	Available (but	outside frequency range of existing viewer an	tennas)		
69	Analog				
ERP : 500 kW	TS94007	NBN69 Wyong (Lic) Com	5 kW	52 km	
813 to 820 MHz	TS94602	NBN69 Dungog (Lic) Com	200 W	166 km	
	Not Available : due to co-channel analog Wyong				