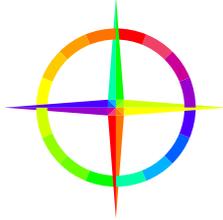


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Technical response to the ACMA consultation on the Queensland DRCP

for
EON Broadcasters

FINAL

**Dr. Les Sabel
6/11/2020**

V1.0



Executive summary

The ACMA consultation on the Queensland DRCP has proposed a new HRP for the Mt Coot-tha transmission for the Brisbane RA1 licence area. Our analysis of the impact of the proposed change which also includes increasing the ERP of the transmission to 50 kW shows that the changes will cause significant increases in the overspill into the Nambour only part of the Nambour licence area. Those increases are expected to provide Brisbane DAB+ services at suburban grade (54 dBuV/m @ 1.5m Rx height) to over 10% of the Nambour population and are considered to be excessive by EON Broadcasting.

While EON Broadcasting accept the right of the Brisbane RA1 commercial broadcasters to provide suitable coverage of the Caboolture shire overlap area the excessive overspill into current population centres is viewed as serious competition which has significant potential to impact the business viability of broadcasters in the Nambour licence area, and as such warrants adjustment to the proposed Mt Coot-tha antenna HRP and also the Mt Mee HRP.

EON Broadcasting proposes two steps to reduce the overspill while still maintaining the increased population coverage of the Brisbane RA1 LA.

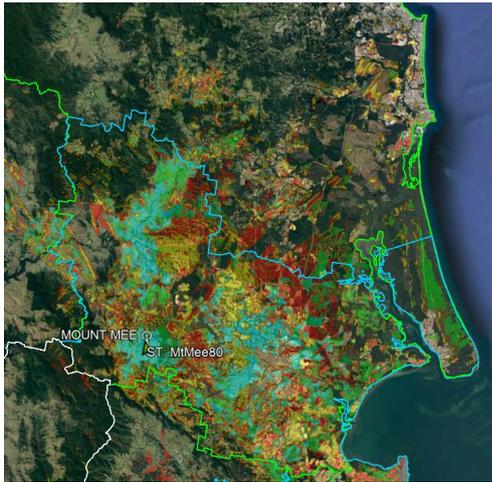
1. Adjust the Technical specifications in the ACMA proposal by inserting a small notch in the HRP in the sector 12° - 20° of 6dB. The proposed adjusted Technical Specification is provided in Table 4-1.
2. Adjust the bearing of the current Mt Mee repeater HRP from 80° to 170°.

The suggested changes will significantly reduce the amount of overspill into the Nambour only area and reduce the potential business viability impact on Nambour broadcasters while not impacting the population coverage increase that would be delivered by the ACMA proposed changes.

The population coverage of the Nambour only area at the comparison field strength of 54 dBuV/m are: Current = 10,075; ACMA proposed plus Mt Mee = 56,789; EON proposed plus Mt Mee on bearing 170° = 26,192. We note that there is significantly more overspill at vehicle grade coverage field strengths, see Table 3-2 and section 6.1 for details.

The coverage maps of the impacted areas for the current Mt Coot-tha transmission, the ACMA proposed plus Mt Mee at 500W ERP and the EON proposed AtI-1C which also includes the Mt Mee repeater at 500 W but on a bearing of 170° degrees are shown below.

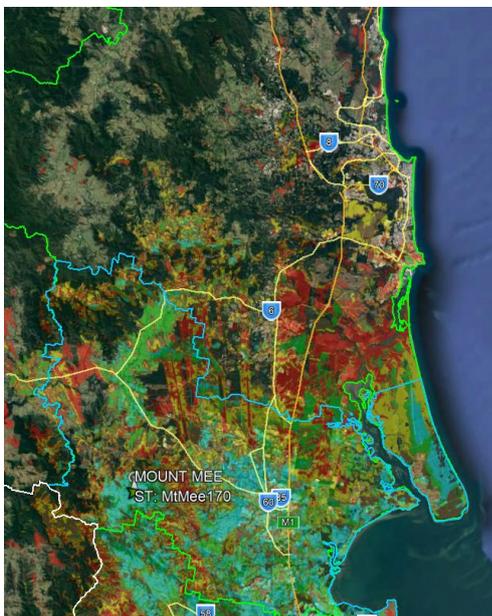
Detailed discussion, comparative coverage maps and population analysis are provided in the detailed technical report below.



Existing 23 kW Mt Coot-tha + Mt Mee @ 500 W



ACMA proposed at 50 kW + Mt Mee @ 500 W



EON proposed at 50 kW + Mt Mee @ 500 W @ 170°T



Contents

Executive summary.....	2
1. Introduction.....	5
1.1. Background.....	5
1.2. EON Broadcasting’s concerns.....	5
1.3. Analysis method.....	5
2. Current Brisbane transmissions.....	5
2.1. Existing coverage.....	5
2.2. Proposed coverage.....	11
2.3. Population coverage.....	16
2.4. Discussion.....	17
3. Analysis of possible adjustments to the ACMA proposal.....	18
3.1. Relative power increases.....	18
3.2. Mt Mee.....	19
3.3. Possible adjustments.....	19
3.3.1. Rotate the Mt Mee antenna by 90° clockwise.....	19
3.3.2. Adjust the Mt Mee antenna pattern.....	20
3.3.3. Reduce the Mt Coot-tha antenna gain towards the north – notch option Alt-1.....	21
3.3.4. Apply additional down tilt towards the north – option Alt-2.....	25
3.3.5. Population coverage analysis.....	28
3.4. Mt Mee coverage.....	30
3.5. Cost analysis.....	30
4. Conclusions and recommendations.....	31
5. References.....	32
6. Annexes.....	33
6.1. Population analysis details.....	33
6.2. Power towards target site examples.....	37
6.3. Current antenna mechanical arrangement.....	38
6.4. Coverage planning analysis details.....	38



1. Introduction

1.1. Background

The ACMA issued a proposal to vary the Queensland DRCP consultation paper in September 2020¹. The consultation proposes:

1. To add the Gold Coast Licence Area to the Queensland DRCP with specified transmission characteristics
2. To adjust the transmission characteristics of the Brisbane DAB+ transmissions

1.2. EON Broadcasting's concerns

EON Broadcasting (EON), an incumbent commercial radio broadcaster in the Nambour RA1 licence area, has assessed the overspill from the existing Brisbane DAB+ transmissions from Mt Coot-tha and found that there is considerable reception in a number of areas within the Nambour only LA, these include Caloundra, the Bruce Highway, Buderim and other areas. While the overspill of the current transmission is already of concern to EON's business with potential to capture audiences which are outside the Brisbane licence area, the proposed changes to the Mt. Coot-tha transmission pattern and the increase in power to 50 kW present significant business challenges.

This document provides an assessment of the proposed changes in terms of amount of overspill, its potential impact and possible ways to minimise the overspill while still providing the Brisbane broadcasters with appropriate coverage within their licence area.

EON has no comment on the proposed Gold Coast DAB+ transmission.

1.3. Analysis method

The coverage and population analysis was undertaken using the ATDI HTZ tools with the characteristics shown in section 6.4.

2. Current Brisbane transmissions

2.1. Existing coverage

The current technical specifications of the Brisbane DAB+ transmissions are shown in Table 2-1. The current antenna pattern HRP and VRP are shown in Figure 2-1 and Figure 2-2 respectively with the actual patterns used for coverage prediction shown in Figure 2-3.

¹ ACMA document: IFC-29-2020-Proposal-to-vary-the-Queensland-DRCP-consultation-paper.docx

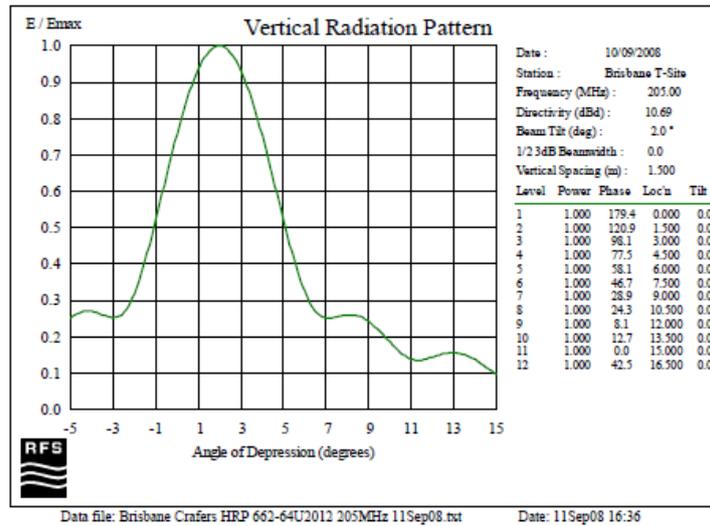


Figure 2-2: Brisbane current VRP with 2° down tilt

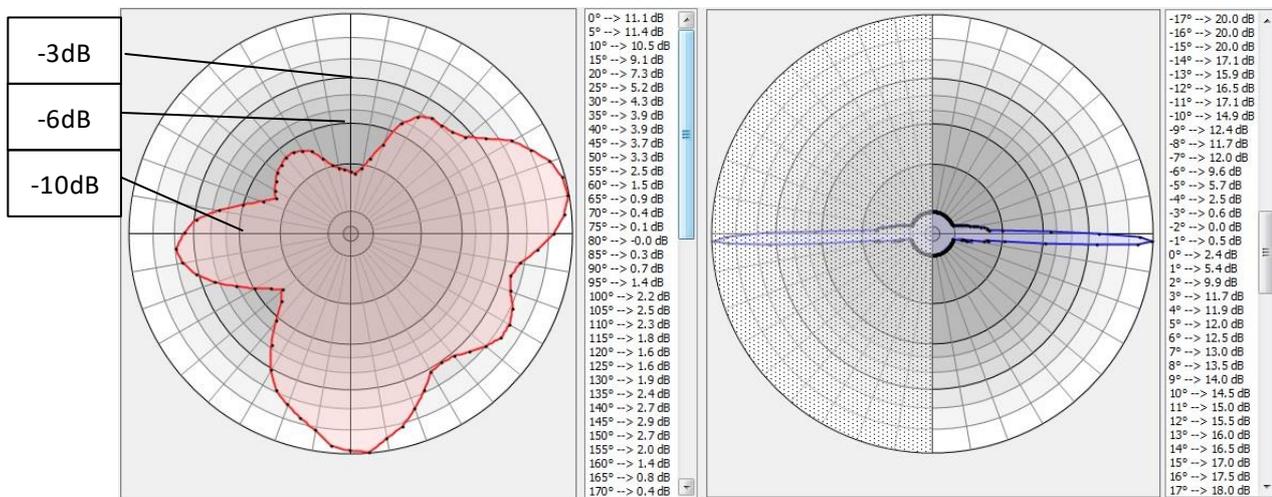


Figure 2-3: Antenna patterns used for coverage analysis – existing HRP and VRP with notch in place and ERP = 23 kW (dB scale)

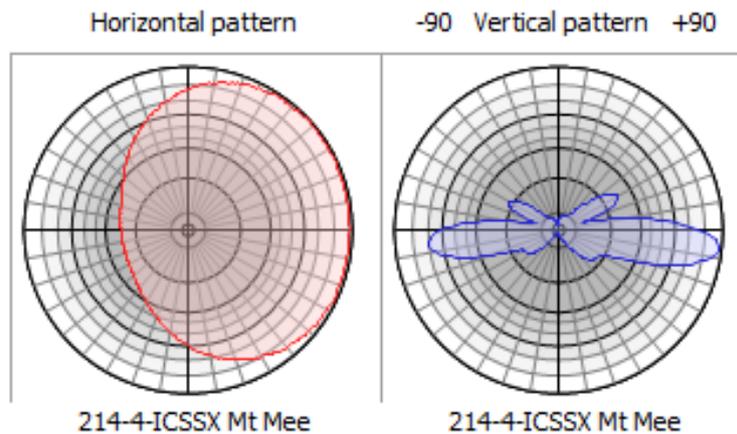


Figure 2-4: Mt Mee antenna pattern with bearing 80°T (dB scale)



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The coverage prediction for the current Mt Coot-tha transmission is shown in the figures below using the colour palette shown in Figure 2-6. The SE Queensland RA1 Licence area boundaries are shown as:

- Brisbane = Blue
- Nambour = Green
- Gold Coast = Yellow
- Ipswich = White

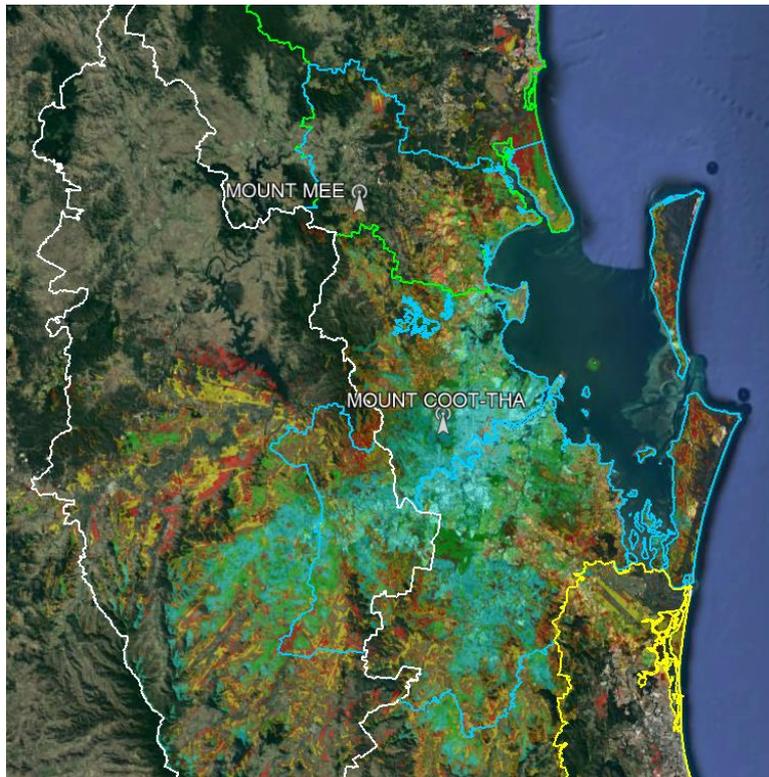


Figure 2-5: Current coverage from Mt Coot-tha at 23 kW – wide area

\geq dBu	dBu/dBm labels	
45	poor vehicle	Red
50	vehicle	Yellow
54	suburban	Brown
60	urban	Green
70	dense urban	Cyan

Figure 2-6: Colour palette for field strength coverage

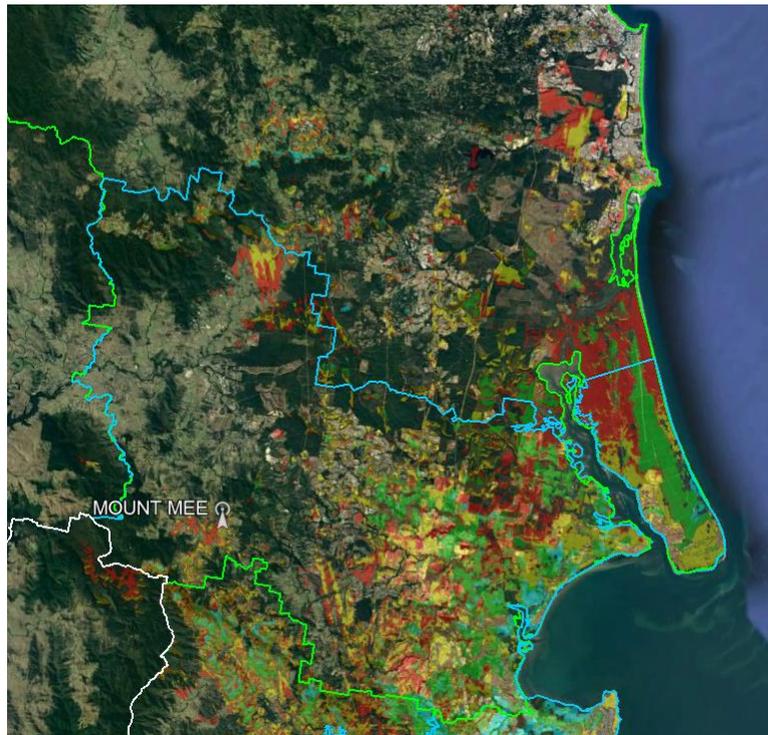


Figure 2-7: Current coverage from Mt Coot-tha at 23 kW – Northern area

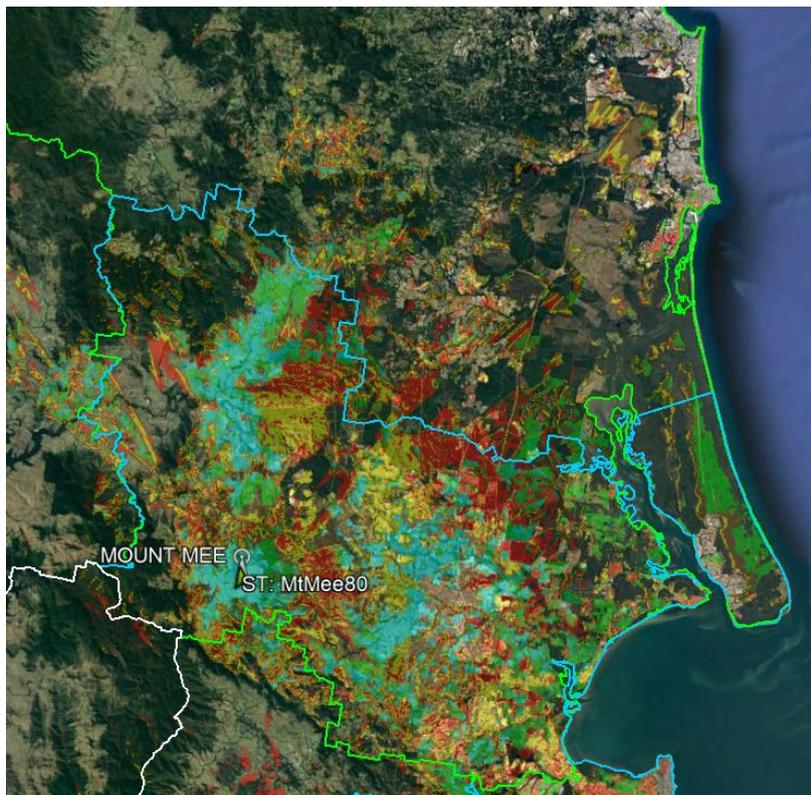


Figure 2-8: Expected coverage from Mt Mee at 500W ERP, bearing 80°T

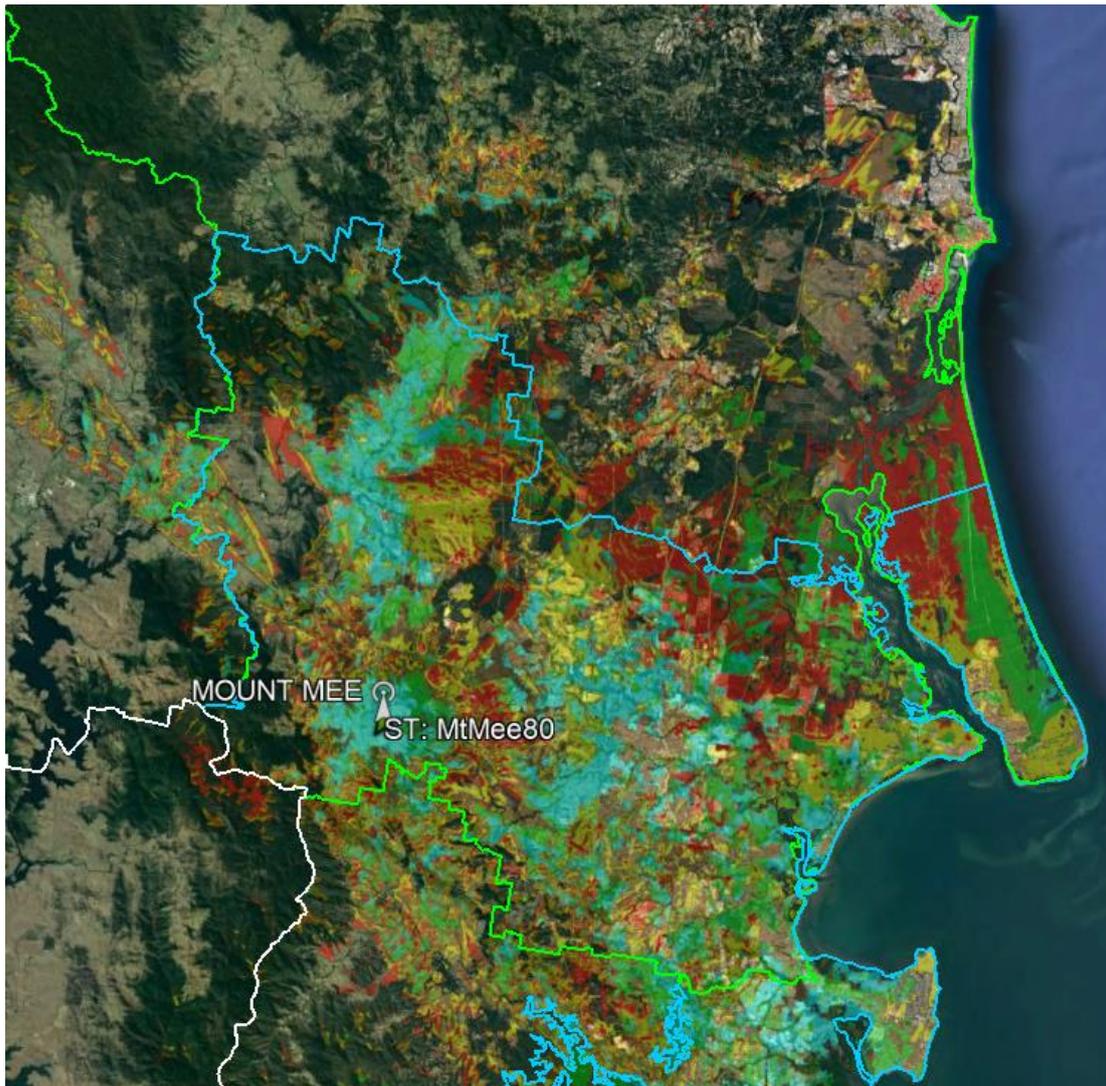


Figure 2-9: Expected composite coverage – Mt Coot-tha at 23 kW and Mt Mee at 0.5 kW – Northern area

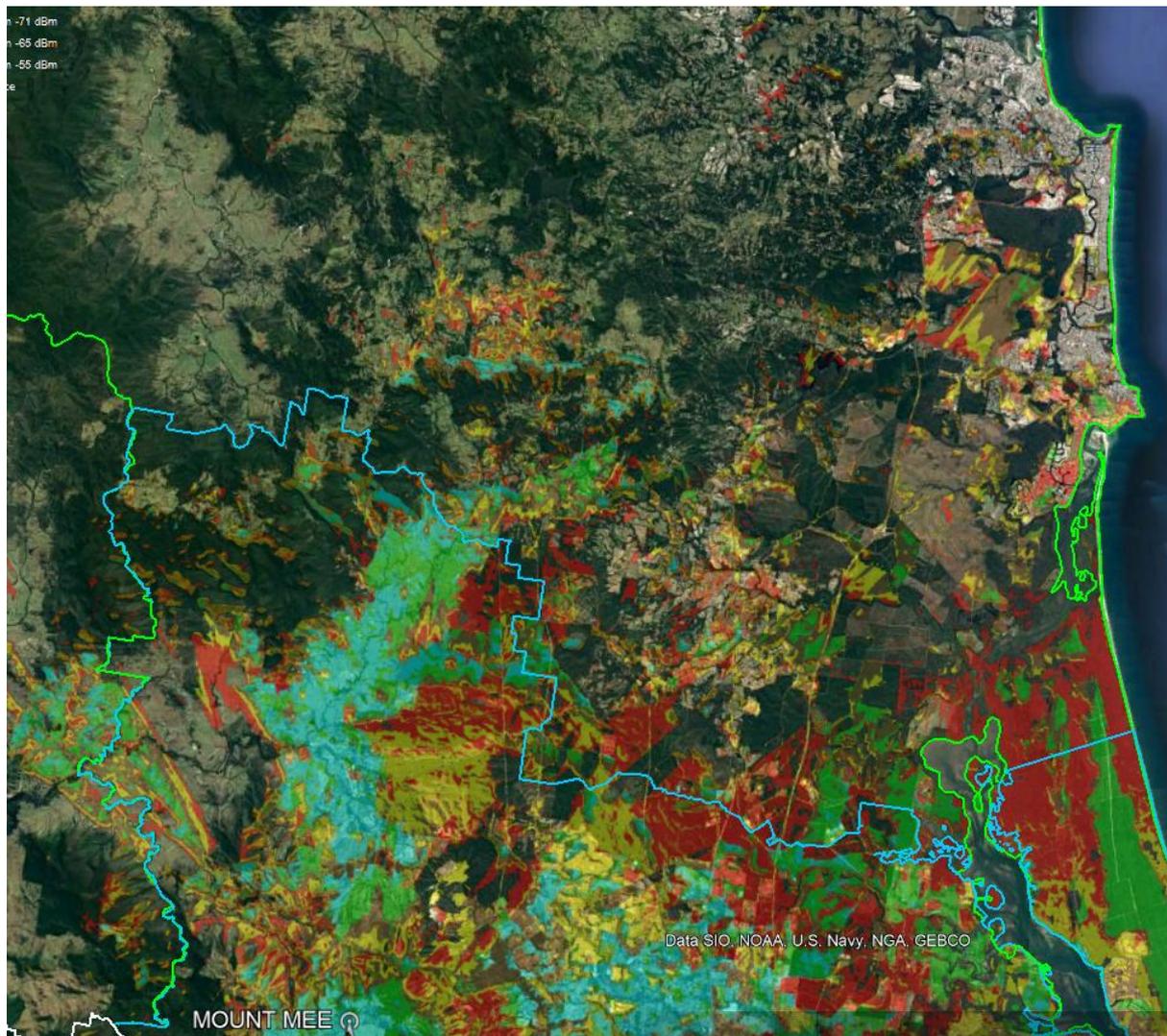


Figure 2-10: Expected composite coverage – Mt Coot-tha at 23 kW and Mt Mee at 0.5 kW – in Nambour only

The coverage prediction shows the field strength at the Mt Mee site at a height of 1.5m to be 48dB μ V/m.

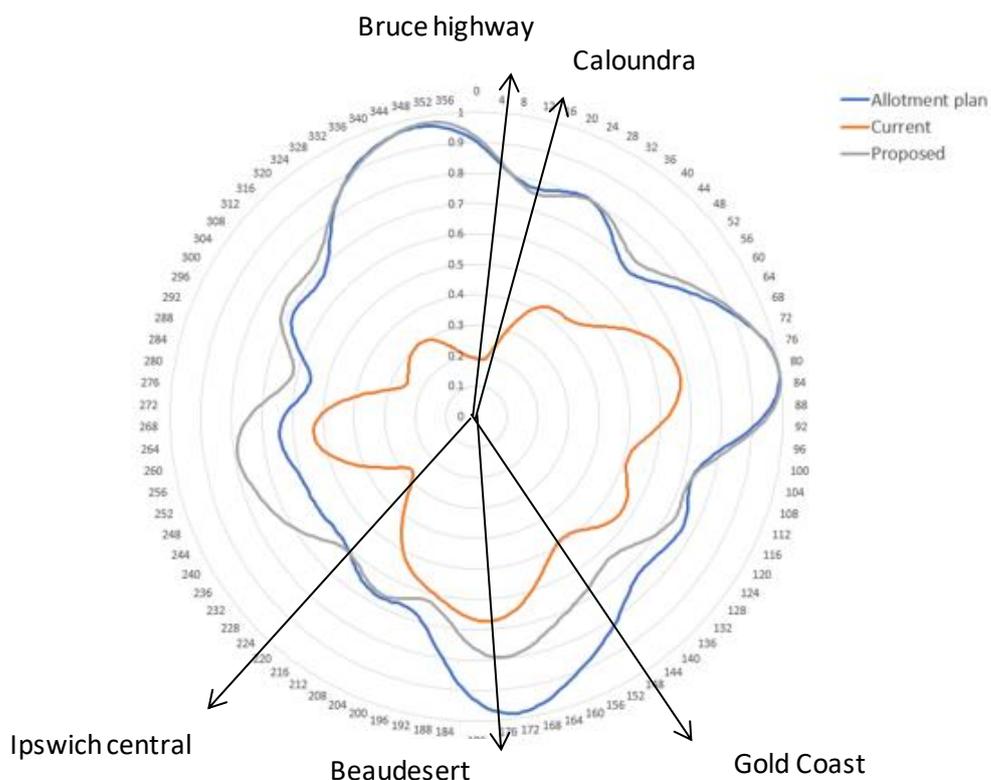
2.2. Proposed coverage

The proposed technical specifications are shown in Table 2-2. This specification includes the complete removal of the northern notch in the HRP and the power increase to 50 kW ERP. The resulting antenna HRP is shown in Figure 2-11 as the grey trace.



Description of proposed broadcasting site	TXA T-Site Tower 445 Sir Samuel Griffith Drive MOUNT COOT-THA		
RADCOM Site ID	12749		
Coordinates Information (GDA 94)	Lat. -27.46313015	Long. 152.94812959	
Frequency	Frequency Blocks 9A (202.928 MHz), 9B (204.640 MHz) and 9C (206.352 MHz)		
Polarisation	Vertical		
Maximum Antenna Height	192 metres		
Bearing or Sector (Clockwise direction)	Depression angle	Maximum ERP, above dividing line	Maximum ERP, below dividing line
0°T – 125°T	All angles	50 kW	
125°T – 160°T	0.35°	25.5 kW	50 kW
160°T – 215°T	All angles	50 kW	
215°T – 245°T	0.0°	26 kW	50 kW
245°T – 290°T	0.5°	26 kW	50 kW
290°T – 360°T	All angles	50 kW	

Table 2-2: Proposed technical specifications



Horizontal radiation patterns options (E/E_{max}^*)

* E_{max} value corresponding to 50 kW ERP was used to normalise all three patterns

Figure 2-11: Comparison of antenna patterns

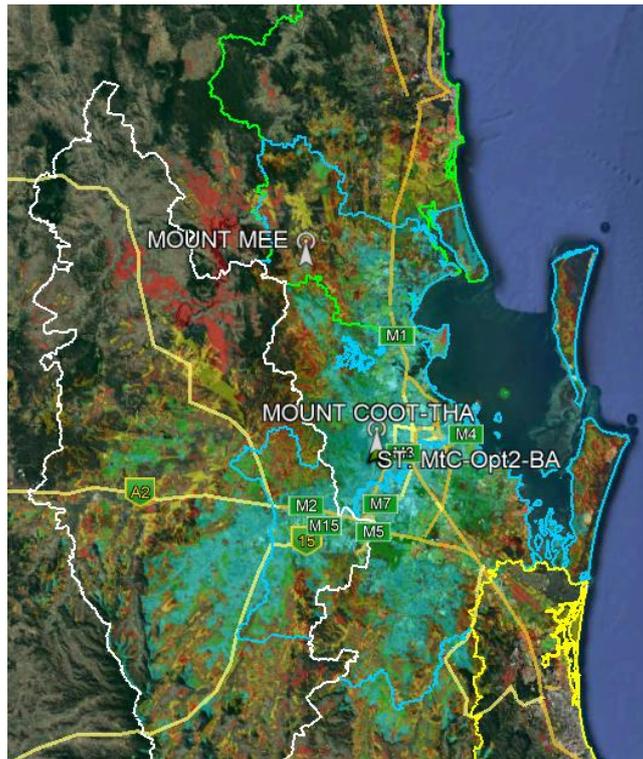


Figure 2-12: Coverage from Mt Coot-tha at 50 kW proposed HRP – wide area

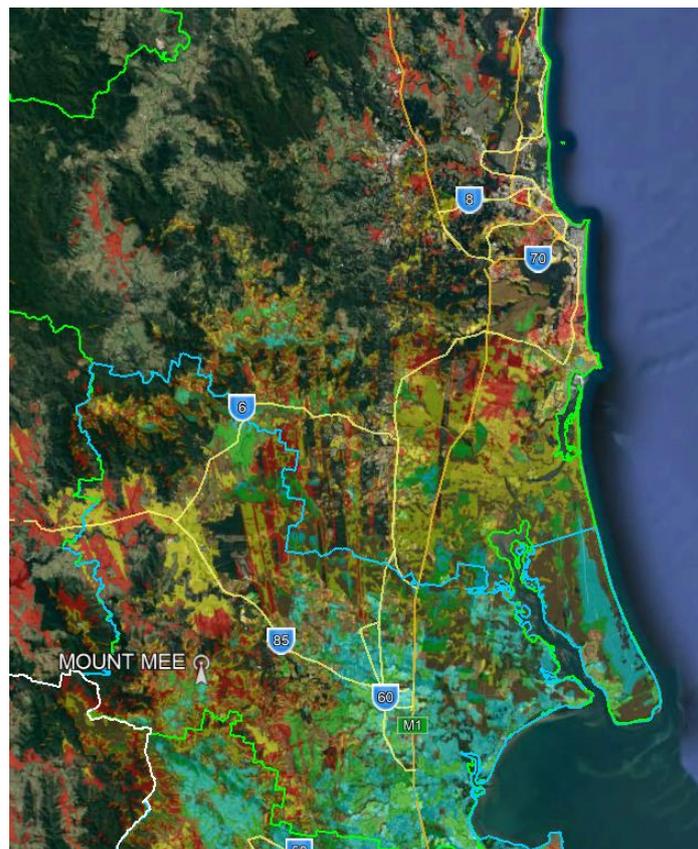


Figure 2-13: Coverage from Mt Coot-tha at 50 kW proposed HRP – northern area

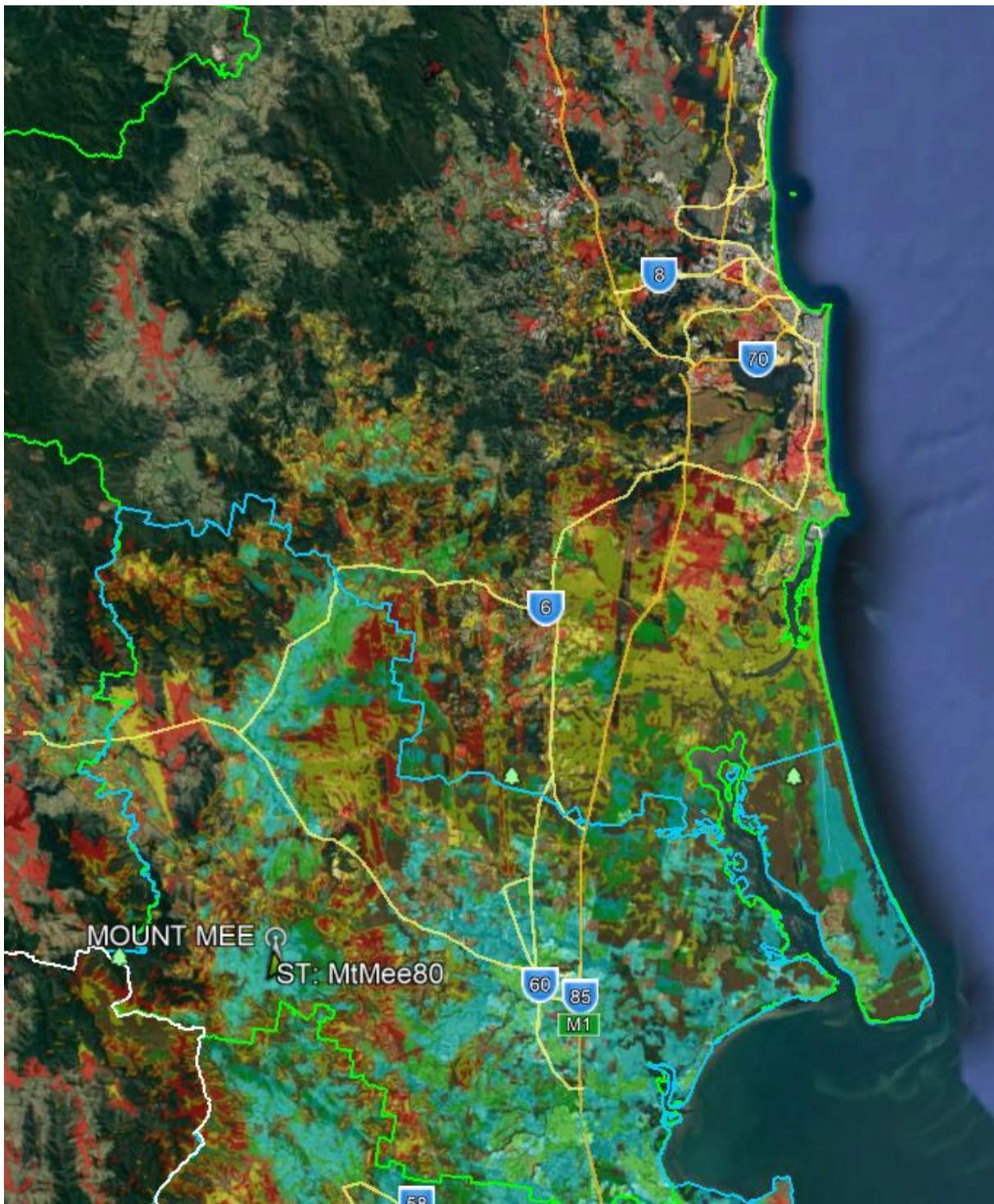


Figure 2-14: Coverage from Mt Coot-tha at 50 kW proposed HRP with Mt Mee at 500W – northern area

As shown in Figure 2-14 the coverage of the Caboolture shire area (the Nambour RA1 and Brisbane RA1 overlap area) is increased significantly to allow the Brisbane Broadcasters to cover that portion of their licence area. Much of the populated area coverage has been increased to Dense Urban grade, i.e. > 70 dBuV/m.



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Observing Figure 2-15 and Figure 2-16 we see that the coverage of the Nambour only area has also increased significantly and in some cases excessively. In particular we see highlighted in Figure 2-16 that some high population centres in Nambour have areas of coverage in excess of 70 dBuV/m as well as larger areas of urban grade >60 dBuV/m including Caloundra, the expanding areas of Caloundra west, Golden beach and Pelican waters, as well as the ridge in Buderim and the towns of Maleny and Peachester. Also, the Bruce highway has uninterrupted coverage from the northern boundary of the Brisbane RA1 licence area to the Caloundra road turn off 24 km to the north.

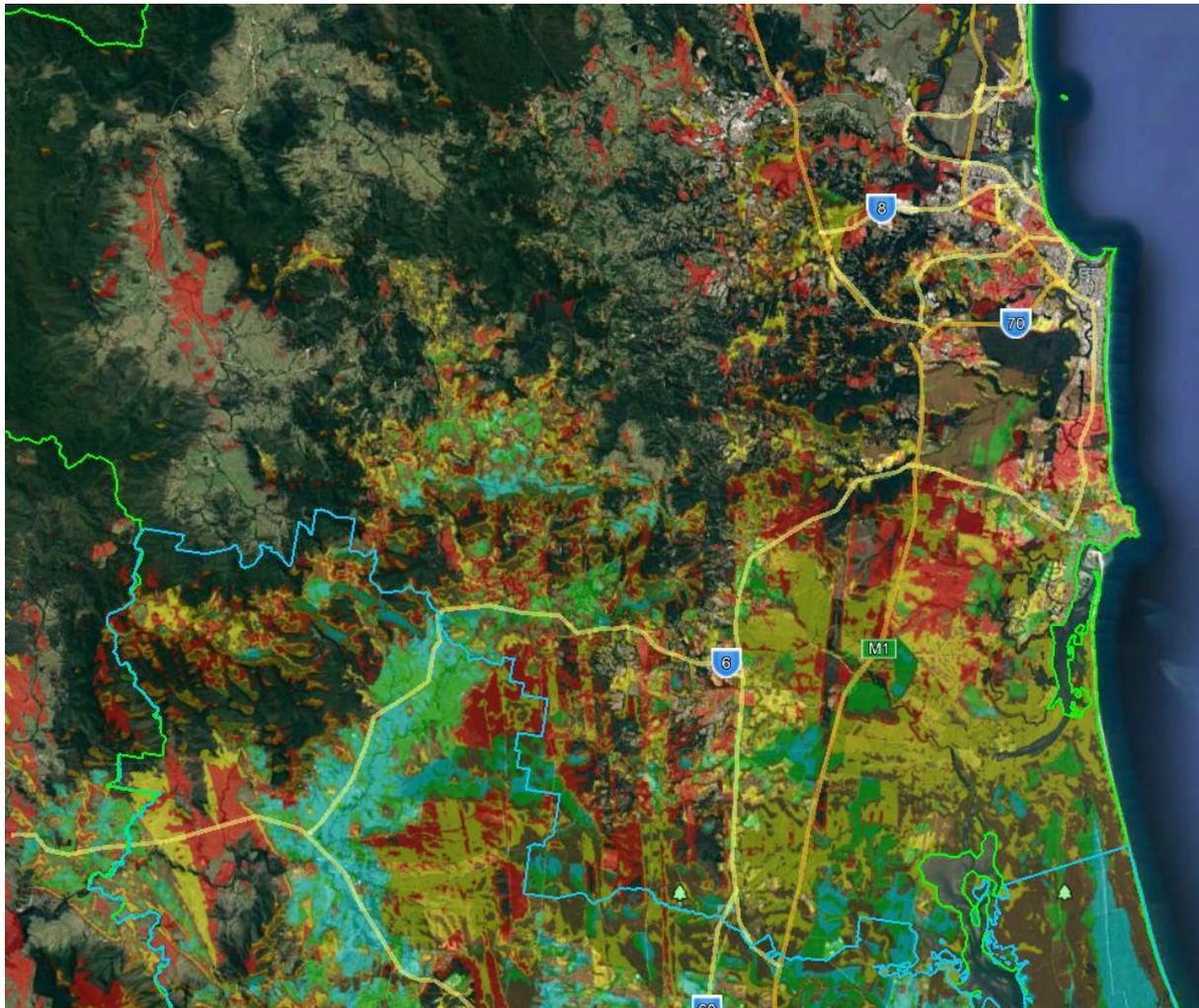


Figure 2-15: Expected composite coverage – Mt Coot-tha at 50 kW proposed HRP and Mt Mee at 0.5 kW – in Nambour only

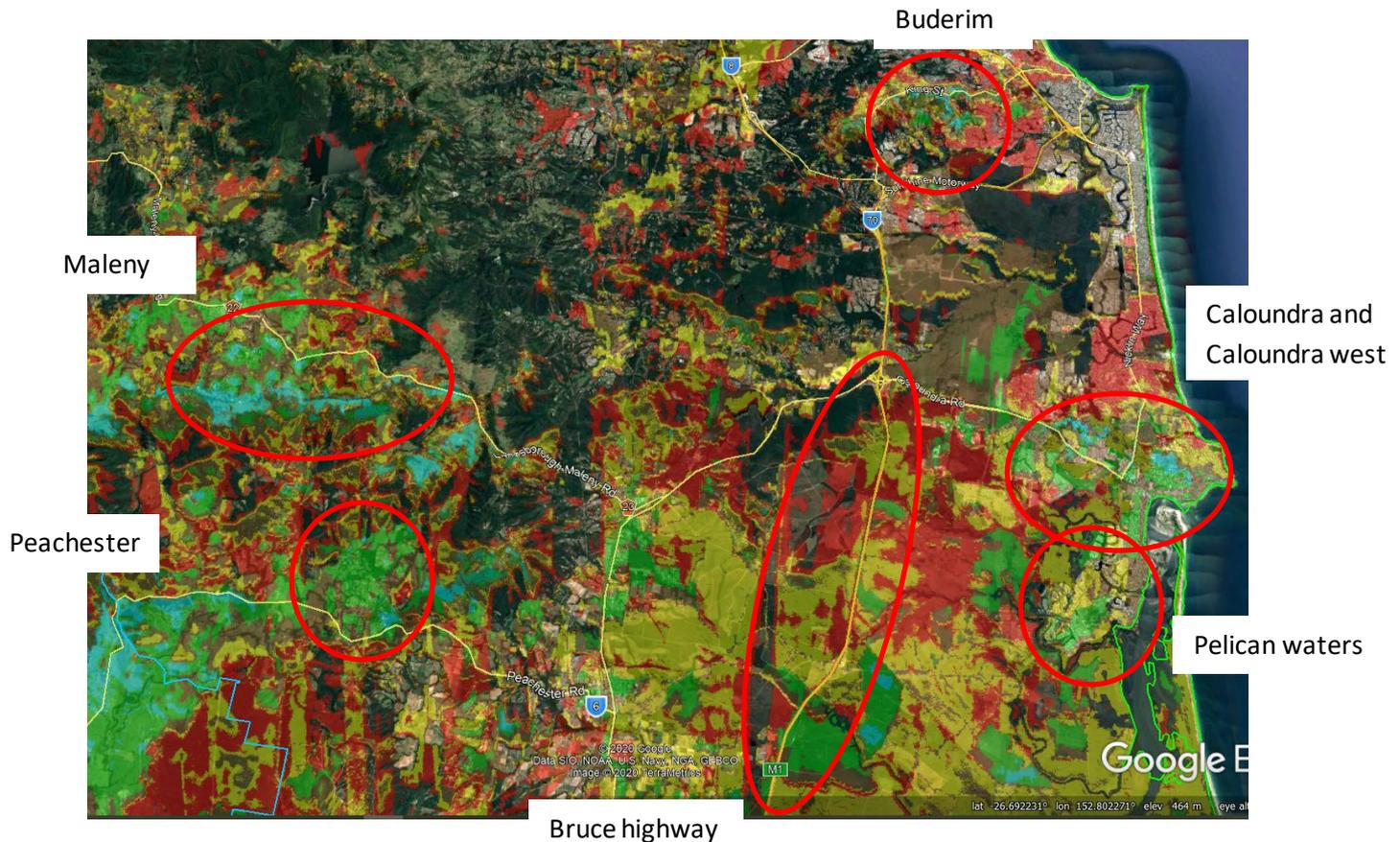


Figure 2-16: Expected composite coverage – Mt Coot-tha at 50 kW proposed HRP and Mt Mee at 0.5 kW – in Nambour only – zoomed in

2.3. Population coverage

The population analysis details are provided in section 6.1. The summary of the current and proposed impact on overspill into the Nambour only area are provided in Table 2-3.

Comparing the current transmission of 23 kW without Mt Mee we see that the addition of the Mt Mee repeater will increase the Nambour only overspill from 10,075 to 20,194 at the standard comparison field strength of 54 dBuV/m at receiver height of 1.5m. The use of the proposed antenna at Mt Coot-tha at 50 kW ERP with Mt Mee at full 500W ERP increases the overspill in the Nambour only area to 56,789.

This is a significant increase over the current overspill which already provides coverage of parts of Caloundra, the Bruce Highway, Buderim and the Beerburrum / Glass House Mountains / Beerwah areas and represents over 10% of the overall Nambour licence area population.

If we compare the road coverage at 50 dBuV/m the population affected by overspill rises to 99,249 and if we consider cars with good external antennas this rises further to 167,305.



	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
23 kW + 0	53,007	23,223	10,075	2,680
23 kW + 0.5	69,643	36,066	20,194	5,810
50 kW + 0	166,026	98,142	55,889	18,207
50 kW + 0.5	167,305	99,249	56,789	18,970

Table 2-3: Nambour only overspill population counts

2.4. Discussion

The increased coverage is considered to be excessive by EON. The proposed amount of overspill that is likely to occur is highly likely to have an impact on the commercial broadcaster's business.

While EON Broadcasting accept the right of the Brisbane RA1 commercial broadcasters to provide suitable coverage of the Caboolture shire overlap area the excessive overspill into current population centres as well as developing residential areas and the main roads warrants adjustment to the proposed Mt Coot-tha antenna HRP and also the Mt Mee antenna HRP.

Proposals are explored in section 3.



3. Analysis of possible adjustments to the ACMA proposal

3.1. Relative power increases

Reviewing the proposed updated power and pattern we can determine the relative power increases to the surrounding licence areas, these are summarised in Table 3-1.

Licence area	Target site location	Bearing (°T)	Distance (km)	Current HRP gain (dB)	ACMA proposed HRP gain (dB)	ACMA power increase relative to current (dB)
				23 kW	50 kW	50 kW
Nambour	Caloundra central	13	75	-9.7	-2.4	10.7
Nambour	Bruce highway at BNE RA1 boundary	4	53	-11.3	-1.3	13.4
Nambour	Mt Mee	340	47	-8.9	-0.5	11.8
Gold Coast	Gold Coast central	143	75	-2.8	-3.7	2.5
Ipswich	Ipswich central	226	25	-7.3	-4.2	6.5
RNEZ	Beaudesert central	175	58	0	-2	1.4

Table 3-1: Power increases in each adjacent licence area based on ACMA proposed HRP and 50 kW ERP²

The target location site details are:

- Caloundra central: Corner Bowman Rd and Arthur St
- Bruce highway: at the northern boundary of the Brisbane RA1 LA
- Mt Mee: base of the BA tower at Mt Mee
- Gold coast central: Nerang river bridge adjacent to Albert Park between Surfers Paradise and Broadbeach waters
- Ipswich central: corner of Brisbane St and East St
- Beaudesert central: corner of Eaglesfield St and Tina St

² Note the stated relative power increases only consider the HRP as the VRP is the same, details of the VRP impact on actual power towards the selected target site examples are provided in Table 6-5



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The analysis indicates that there is a marked increase in the power towards the populated areas in the Nambour RA1 only area particularly east of the Bruce highway.

3.2. Mt Mee

The proposed update to the Brisbane Mt Coot-tha transmission is expected to increase the field strength received at Mt Mee by 11.8 dB to approximately 69 dBuV/m at a height of 1.5 m. This should allow the Mt Mee repeater to operate at full 500 W ERP.

3.3. Possible adjustments

To better balance the coverage and overspill we have studied a number of alternatives to the changes proposed in the ACMA consultation paper.

3.3.1. Rotate the Mt Mee antenna by 90° clockwise

Rotating the current broad beamwidth antenna by 90° clockwise to a bearing of 170°T will significantly reduce the power transmitted to the north east and reduce overspill into Nambour. The power towards Caloundra will be reduced by around 6 dB.

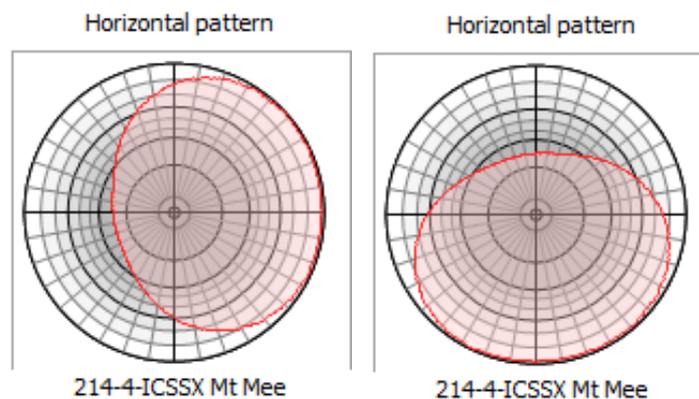


Figure 3-1: Mt Mee HRP at current bearing of 80°T (left) and with bearing of 170°T (right) (dB scale)

The coverage from Mt Mee is compared in Figure 3-2. Caboolture shire has very similar coverage while there is less overspill into the Maleny ridge and Caloundra. The D'Aguiar highway and Woodford areas retain good coverage.

The population coverage of the Mt Mee transmission at both 80°T and 170°T at the 500 W and at half power of 250 ERP are provided in Table 6-3. The analysis indicates that a rotation of 90° at 500 W will reduce the Nambour only coverage at 54 dBuV/m at 1.5m Rx height from 16,367 to 6,749 while only reducing the Caboolture shire population cover slightly from 94,644 to 92,935.

If the Mt Mee antenna is operated at half power at 170° then the Nambour only population is further reduced to 3,362.

We note the coverage of the Caboolture shire must be considered as a composite coverage as there will be locations where the Mt Coot-tha transmission provides better coverage than the Mt Mee



transmission. The composite population coverage is summarised in Table 3-2 with details in Table 6-2.

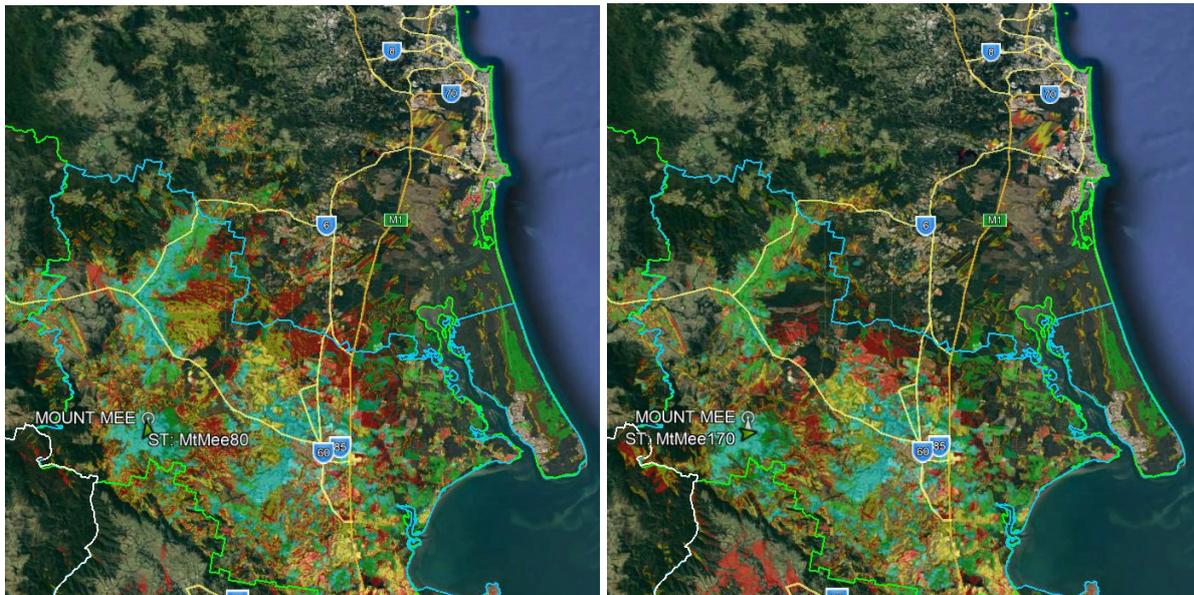


Figure 3-2: Coverage from Mt Mee HRP at current bearing of 80°T (left) and with bearing of 170°T (right)

3.3.2. Adjust the Mt Mee antenna pattern

The current antenna may be moved to be below the top of the tower at Mt Mee in a position of approximately the south west leg. The tower will then provide a coverage shadow to the north east sector towards Caloundra reducing coverage in the Nambour only area while still providing coverage to the east and south east sector of Caboolture shire as well as the section to the north of Mt Mee.

The resulting antenna pattern is approximated in the HRP shown in Figure 3-3. This HRP is derived from a similar arrangement used for FM and is indicative of what could be achieved. The VRP has been left the same as the current antenna as shown in Figure 2-4.

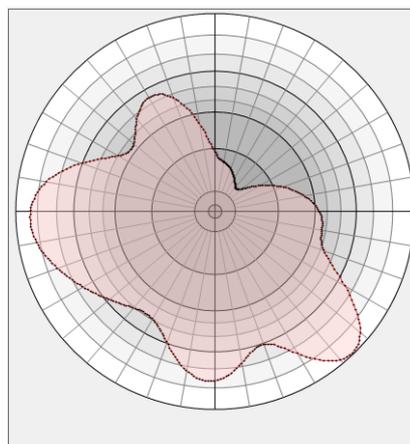


Figure 3-3: Mt Mee HRP used for the shadowed antenna option (dB scale)



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The resulting coverage provided by the shadowed option is shown in Figure 3-4. The resulting coverage provides moderate field strength into the main population area of Caboolture shire and along the main highway but is low in the east around Bribie Island.

The overspill into the Nambour only area is very limited.

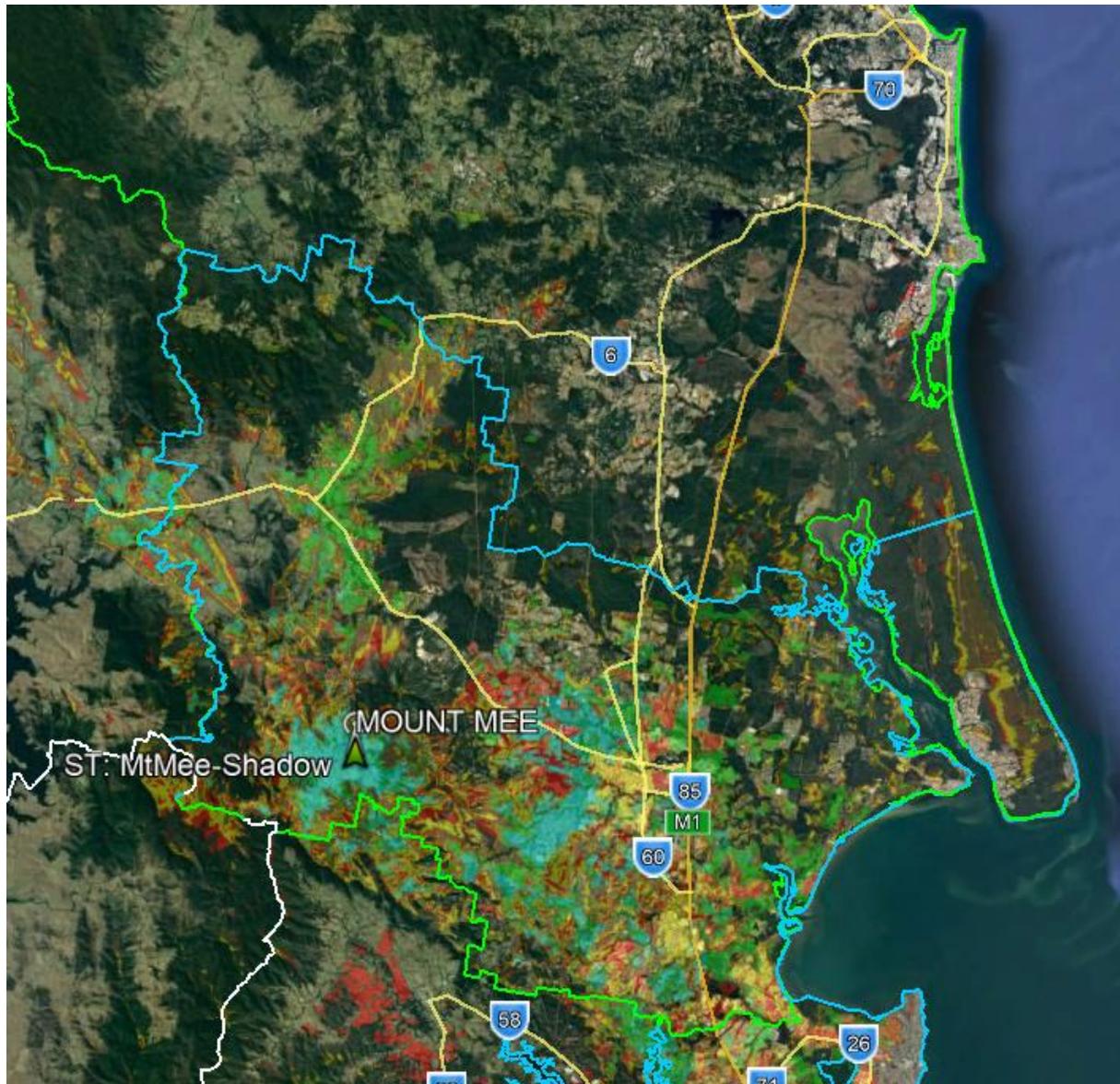


Figure 3-4: Coverage provided by the Mt Mee shadowed antenna option

3.3.3. Reduce the Mt Coot-tha antenna gain towards the north – notch option Alt-1

The area of primary concern is the sector 350° to 20° and more specifically the sector 5° to 15° which covers the area from the Bruce Highway east to the coast and covers the majority of the licence area population and residential growth areas. Given that the increase in field strength is expected to be



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around 10 -13 dB and a 10 dB increase on the vector 340° will allow Mt Mee to reach full operating power we propose that the HRP in the northern east sector be reduced in power by at least 4 dB.

1. This will reduce overspill from the main transmission towards the affected Nambour only areas. The coverage in the Caboolture shire area will be increased by both the Mt Coot-tha and the Mt Mee transmissions.
2. As the proposed specification is expected to increase the field strength received at Mt Mee by over 10 dB a small HRP notch in the sector 5° to 15° should be able to be achieved without significantly impacting the increased gain towards Mt Mee.
3. The depression angle to the northern boundary on the Brisbane licence area towards Caloundra is 0.3° which corresponds to a VRP loss of approximately 0.76 dB.
4. A proposed alternative HRP (Alt-1) is shown in Figure 3-5.

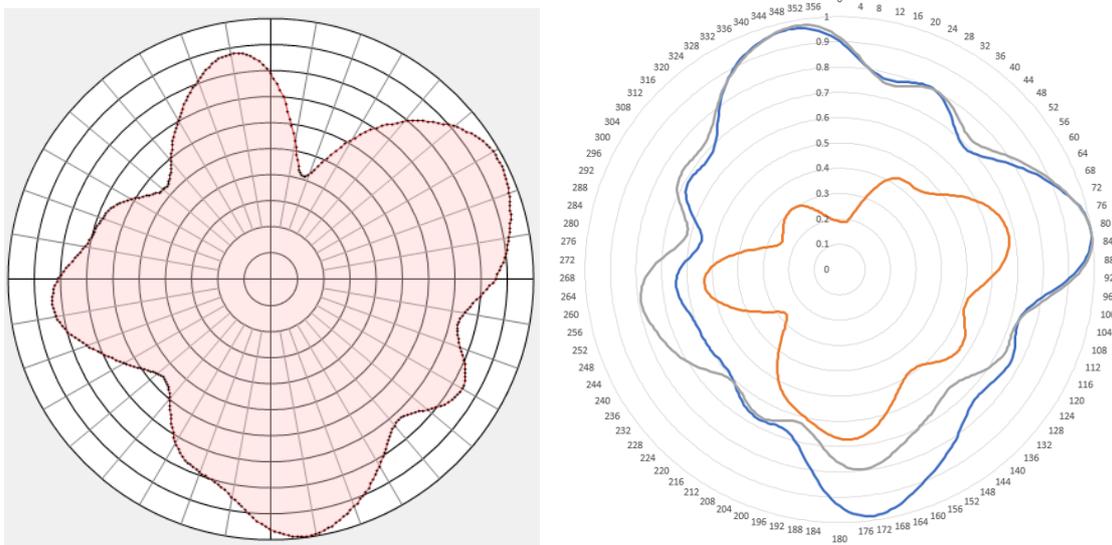


Figure 3-5: HRPs for the Alt-1 (left) and ACMA proposed (right) (E/Emax)

EON propose that an antenna pattern similar to the Alt-1 HRP shown in Figure 3-5 which limits the power to the sector 10-20 by 6 dB coupled with the rotation of the Mt Mee antenna by 90 clockwise will provide significantly reduced overspill into the Nambour only area. We refer to this combination as the Alt-1C proposal. Note this includes an ERP from Mt Coot-tha of 50 kW and uses the current VRP.

Note that this proposed HRP was produced by Radio Frequency Systems (RFS). Ideally EON would prefer the proposed north eastern notch to be from 5° - 20°T however discussions with RFS indicate that moving the notch further west will impact the power in the direction of Mt Mee. In the spirit of compromise EON have not at this stage proposed to move the notch shown in Figure 3-5 further to the west.

The field strength coverage provided by the Alt-1C proposal is shown in Figure 3-6 to Figure 3-8.

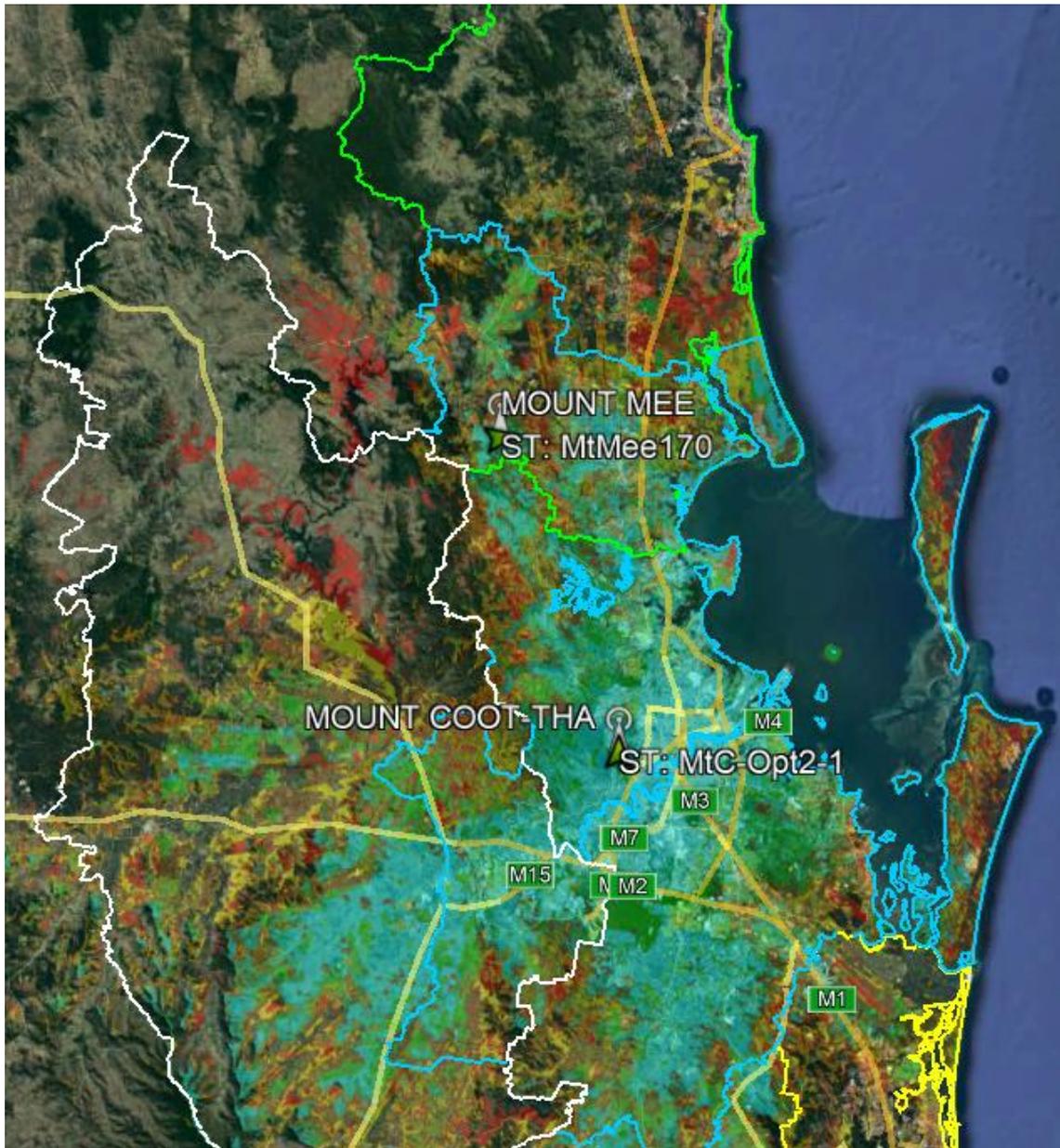


Figure 3-6: Composite coverage for the Alt-1C proposal – wide area

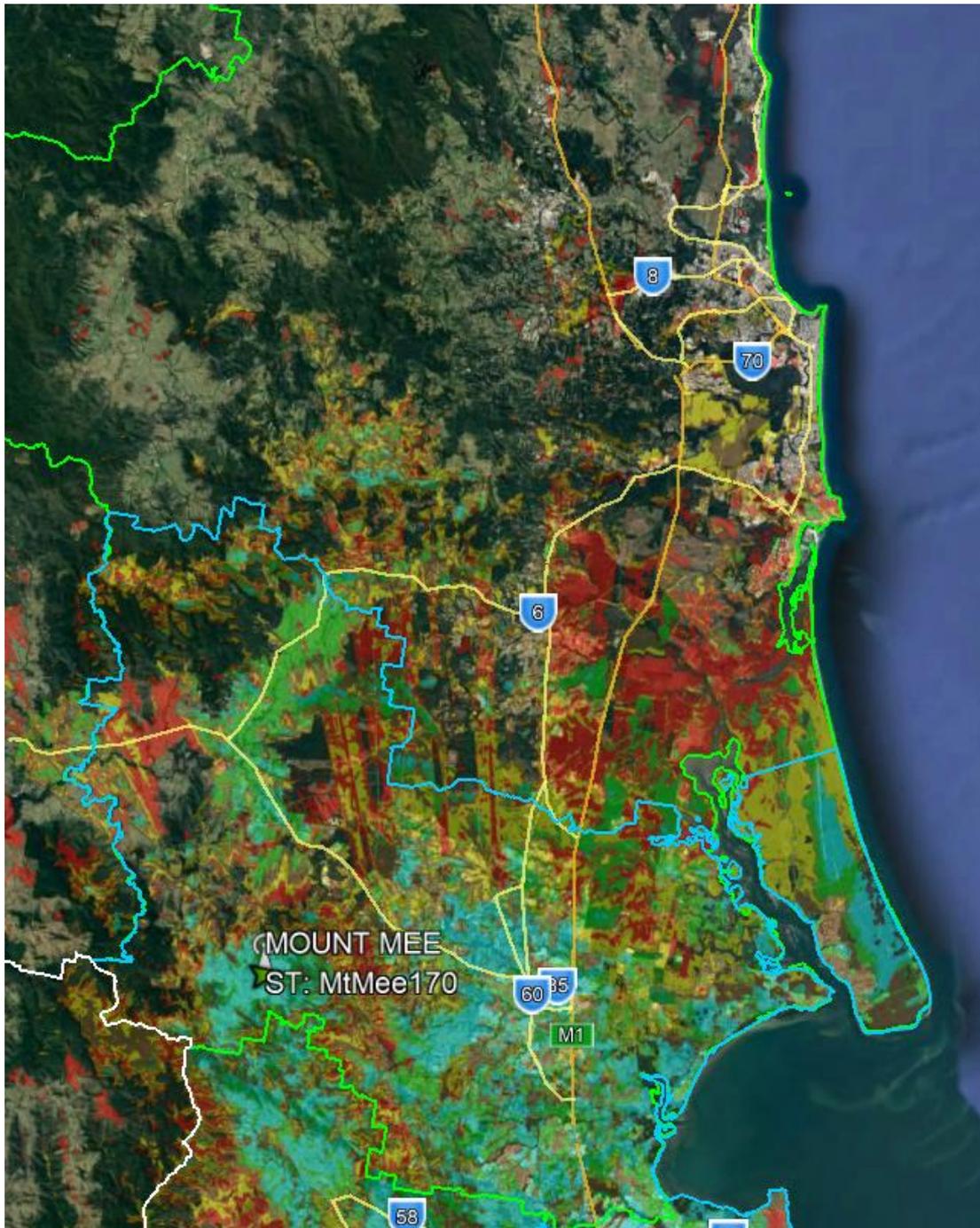


Figure 3-7: Composite coverage for the Alt-1C proposal – Northern area

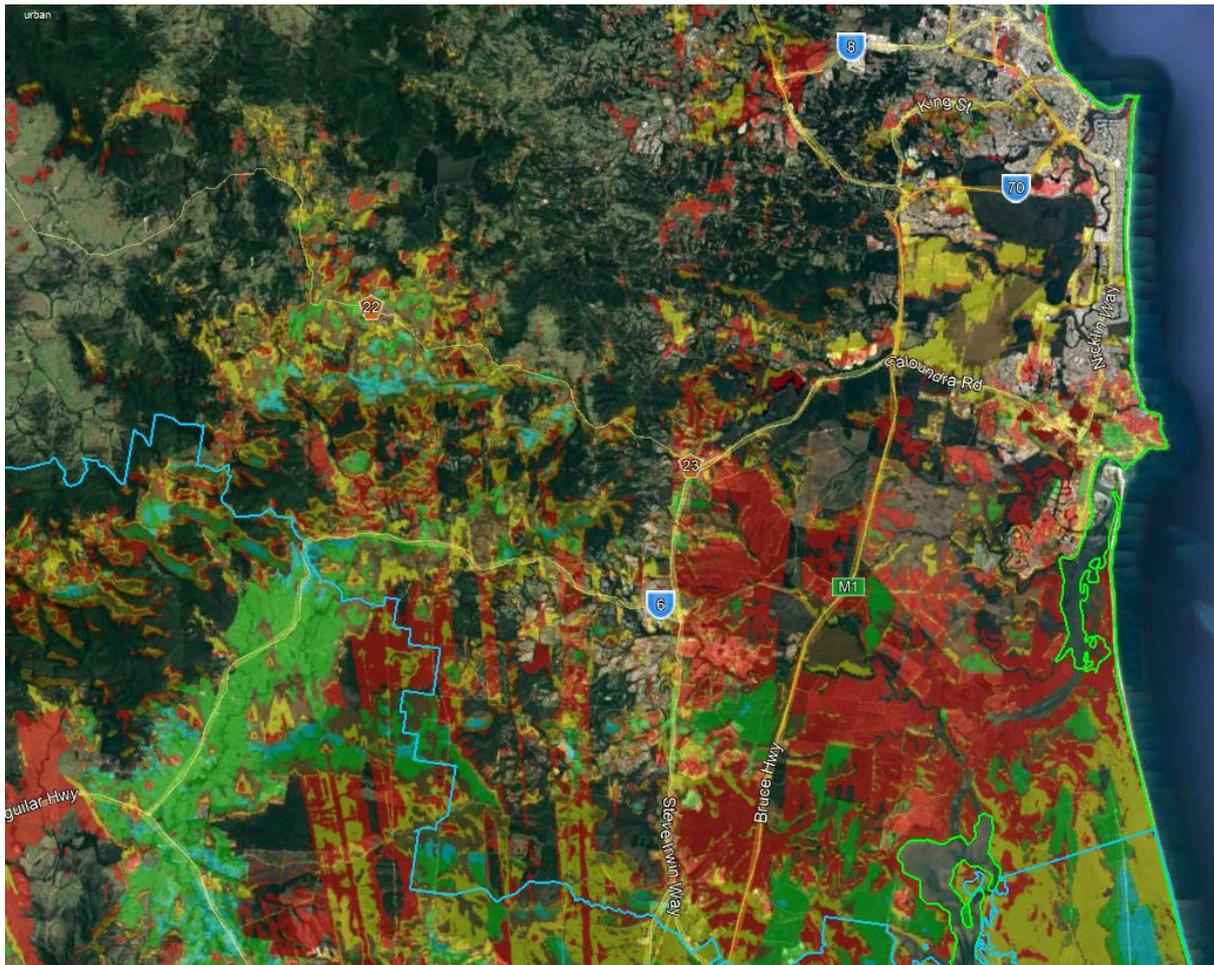


Figure 3-8: Composite coverage for the Alt-1C proposal – Nambour only area

3.3.4. Apply additional down tilt towards the north – option Alt-2

This option uses the ACMA proposed HRP but applies additional down tilt in the VRP towards the north on the antenna panel with bearing 344°T. This will result in a three dimensional antenna pattern where the east, south and west antenna panel arrays operate with 2° of down tilt while the northern facing panel array will operate with 4° of down tilt.

The HRP is the same as the ACMA consultation proposal as shown in Figure 2-11. The composite 3D HRP/VRP was supplied by RFS.

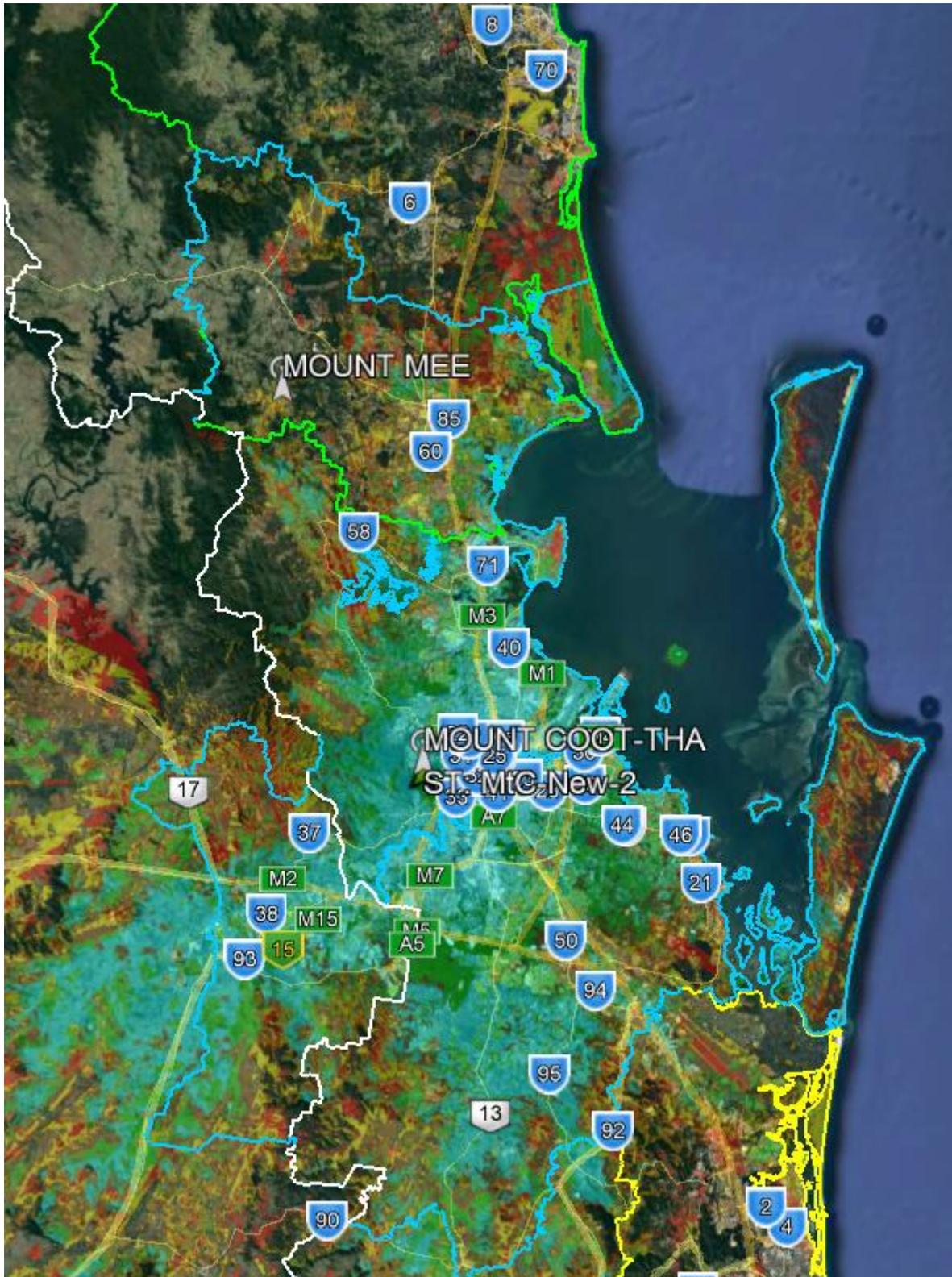
The resulting coverage provided by Mt Coot-tha is shown in Figure 3-9 and Figure 3-10 with the combination of the Mt Coot-tha transmission at 50 kW ERP and the Mt Mee transmission using the shadowed antenna option at 500 W ERP shown in Figure 3-11.

The coverage from the Mt Coot-tha transmission only provides good coverage of the main population centres in the Caboolture shire area as well as most of the main roads but fails to deliver any useful coverage in the very north west of the Brisbane RA1 licence area which is one of the



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targets of the Mt Mee repeater. Figure 3-11 shows that the north west area receives good coverage from Mt Mee with the exception of a 4.6 km section of the D'Aguiar highway which has shadowing from a local mountain.





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Figure 3-9: Coverage from Mt Coot-tha using the Alt-2 pattern with northern down tilt – wide area

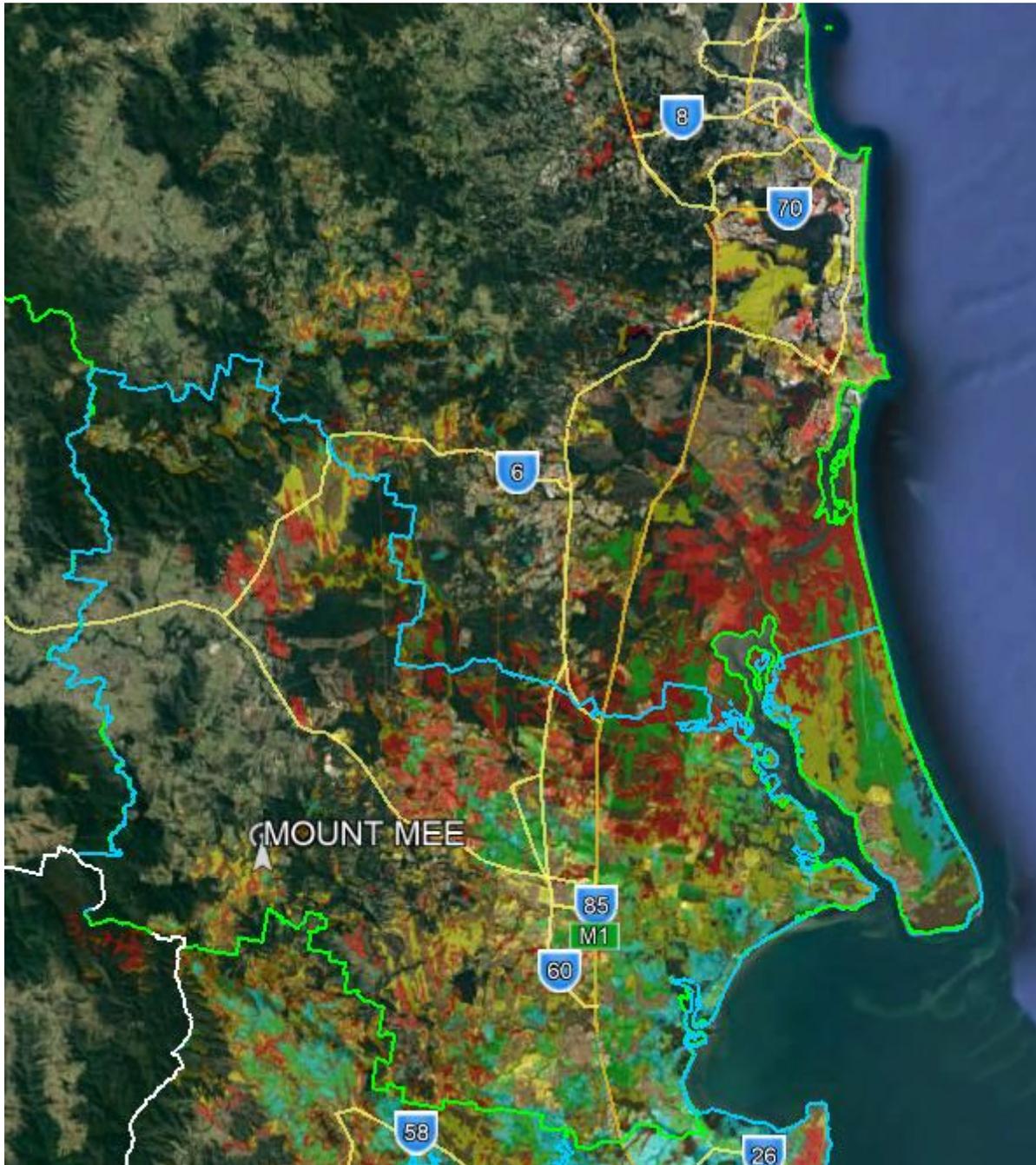


Figure 3-10: : Coverage from Mt Coot-tha using the Alt-2 pattern with northern down tilt – northern area

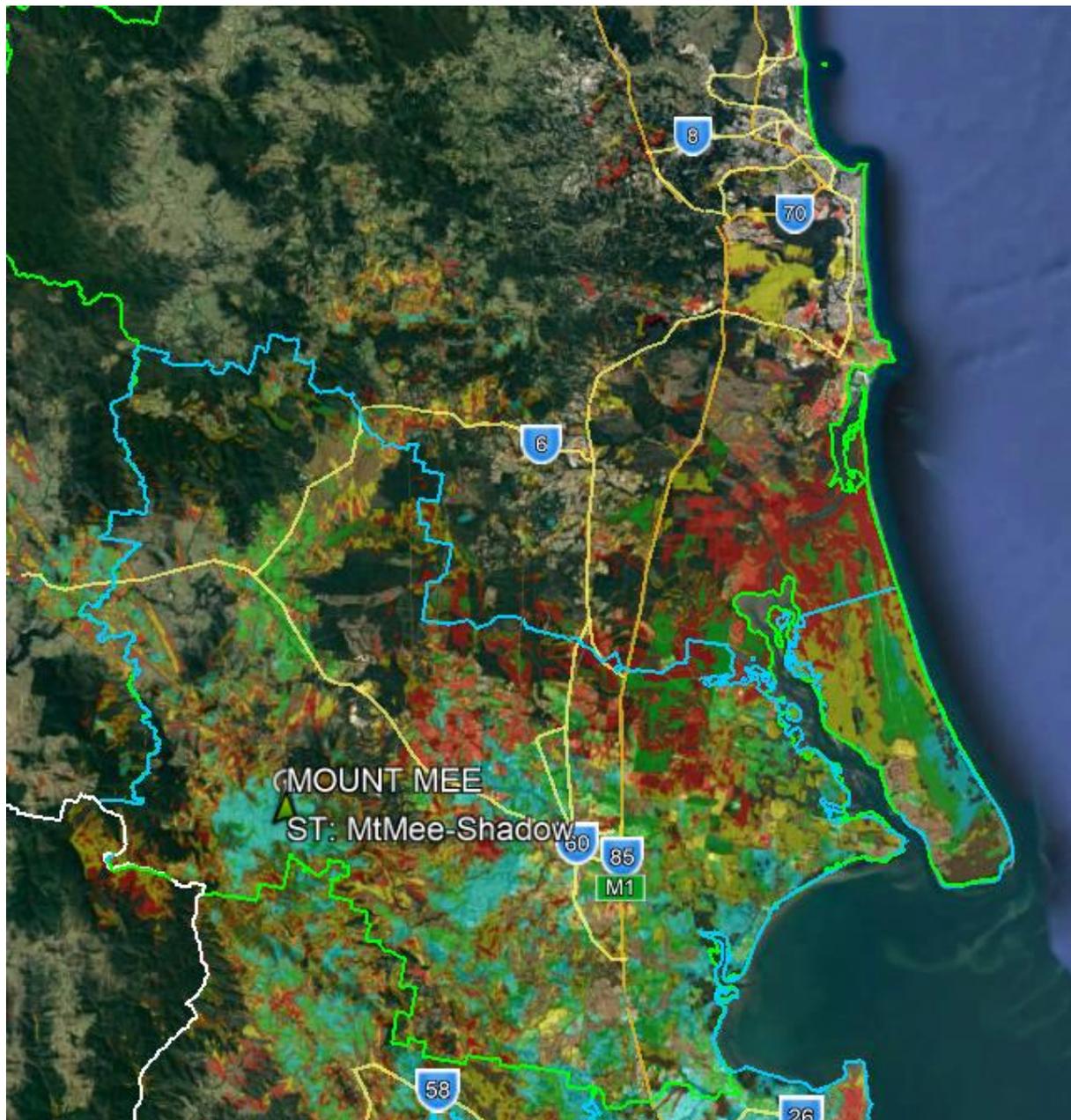


Figure 3-11: : Coverage from Mt Coot-tha using the Alt-2 pattern plus the Mt Mee repeater using the shadow option – northern area

3.3.5. Population coverage analysis

The detailed population coverage results for the overspill into the Nambour only area are provided in Section 6.1. The summary of the relative coverage and overspill into the Nambour only area are provided in Table 6-2 and summarized below.

The analysis of the EON Alt-1C option (#7) shows a significant reduction in overspill relative to the ACMA proposed HRP and the existing Mt Mee repeater at full power of 500 W ERP with the overspill count at suburban grade coverage (54 dBuV/m at 1.5m) of 26,192 compared with the ACMA proposed solution at 56,789 and the current operation at 10,075. We note however that the



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increase in overspill at vehicle grades are still double that of the current transmission and the coverage of suburban and urban grades is over double.

The analysis also shows that the overall coverage of the Brisbane RA1 will be slightly improved over the ACMA proposal for all grades of coverage although those increases are all less than 1%. The slight increase in coverage using the Alt-1 pattern can be seen in Table 3-2 by comparing options #3 and #5 where at 54 dBuV/m the population coverage increases are 160,855 and 161,049 respectively. The change is due to slight changes in the power directed to other areas caused by the changed antenna phasing that is necessary to form the notch towards Caloundra. The changes from the ACMA to the Alt-1 proposal are characterised by a 1.3 dB increase towards Gold Coast central, 2.0 dB increase towards Beaudesert and a -0.9 dB decrease towards Ipswich central as shown in Table 6-5.

The analysis of the Alt-2C option (#14) shows further reduction in the overspill to 16,817, however the increase in coverage of the Brisbane RA1 is slightly less than the ACMA proposed solution.

Nambour only summary						
	Antenna	ERP: MtC + MtM (kW)	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
#1	Current	23 + 0	53,007	23,223	10,075	2,680
#3	Proposed	50 + 0	166,026	98,142	55,889	18,207
#4	Proposed	50 + 0.5 @ 80	167,305	99,249	56,789	18,970
#5	Alt-1C	50 + 0	102,068	50,003	25,405	7,390
#6	Alt-1C	50 + 0.5 @ 80	107,458	54,210	30,011	9,376
#7	Alt-1C	50 + 0.5 @ 170	102,985	50,674	26,192	7,661
#13	Alt-2C	50 + 0	78,935	37,676	16,671	4,928
#14	Alt-2C	50 + 0.5 shadowed	79,099	37,830	16,817	5,017
Brisbane improvement - count						
	Antenna	ERP: MtC + MtM (kW)	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
#3	Proposed	50 + 0	45,264	89,034	160,855	311,557
#4	Proposed	50 + 0.5	46,593	92,009	164,521	317,147
#5	Alt-1C	50 + 0	47,300	95,603	161,049	317,001
#6	Alt-1C	50 + 0.5 @ 80	49,304	99,334	166,387	326,954
#7	Alt-1C	50 + 0.5 @ 170	48,842	98,680	165,848	326,579
#13	Alt-2C	50 + 0	32,668	63,591	107,309	218,452
#14	Alt-2C	50 + 0.5 shadowed	38,432	71,048	119,305	235,102
Brisbane improvement - %						
	Antenna	ERP: MtC + MtM (kW)	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
#3	Proposed	50 + 0	2.1%	4.1%	7.3%	14.2%
#4	Proposed	50 + 0.5	2.1%	4.2%	7.5%	14.4%
#5	Alt-1C	50 + 0	2.2%	4.3%	7.3%	14.4%
#6	Alt-1C	50 + 0.5 @ 80	2.2%	4.5%	7.6%	14.9%
#7	Alt-1C	50 + 0.5 @ 170	2.2%	4.5%	7.5%	14.9%
#13	Alt-2C	50 + 0	1.5%	2.9%	4.9%	9.9%
#14	Alt-2C	50 + 0.5 shadowed	1.7%	3.2%	5.4%	10.7%

Table 3-2: Nambour only overspill population counts for the proposed alternatives



3.4. Mt Mee coverage

The field strength estimates for Mt Mee at the base of the tower at 1.5 m are shown in Table 3-3. We estimate that the current field strength is 55 dBuV/m which is sufficient to run the Mt Mee OCR at 50W out of the maximum of 500W, i.e. 10 dB down. We estimate that the ACMA proposed solution will increase the field strength to 69 dB, i.e. 14 dB improvement while the EON proposal of Alt-1 will increase it to 68 dBuV/m, both will provide suitable field strength to operate the repeater at full power.

The Alt-2 proposal increases field strength to an estimated 58 dBuV/m which is +3 dB but unlikely to allow full power operation.

	Antenna	ERP: MtC + MtM (kW)	dBuV/m
#1	current	23 + 0	55
#4	Proposed	50 + 0	69
#6	Alt-1C	50 + 0	68
#13	Alt-2C	50 + 0	58

Table 3-3: Predicted field strength at 1.5 m for the current and proposed options

3.5. Cost analysis

The cost of both the proposed possible changes to the Mt Coot-tha antenna, i.e. Alt-1 and Alt-2 described above has been discussed with RFS the antenna manufacturer. RFS have stated that the cost of implementing either of the proposed alternatives will not cost anything more than that required to make the changes as described in the ACMA consultation.

The cost to make either of the changes to the Mt Mee antenna are low but non-zero:

1. The proposed 90° rotation
 - a. The rotation of the antenna will require riggers and will cost a small amount as the activity is minor
 - b. The OCR system will need to be retuned to ensure suitable isolation between the transmit and receive antennas – again this should be trivial and a small amount of work and will be required once Mt Coot-tha is updated to full power so no incremental cost
 - c. The coverage of the resulting Mt Mee antenna MAY be measured however any measurement would also likely be done anyway when it goes to full power hence this should not be included.
2. The shifting of the antenna to the side of the tower
 - a. The re-installation of the existing antenna on the side of the Mt Mee tower will require some additional mounting hardware and rigger time to install and so will cost more than the simple rotation option but will still be very minor compared to the cost of the Mt Coot-tha changes



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- b. The OCR system will need to be retuned to ensure suitable isolation between the transmit and receive antennas – this will be more complicated than the simple rotation option and may require some minor repositioning of the receive antenna, again this should be a small amount of work
- c. The coverage of the resulting Mt Mee antenna MAY be measured however any measurement would also likely be done anyway when goes to full power hence this should not be included.

In the spirit of compromise EON have not proposed more complicated changes to the existing systems to minimise the cost impact to the Brisbane JVC. Other more complicated solutions which could further minimise the overspill into the Nambour only area while providing suitable coverage within the Brisbane RA1 such as adding additional low power repeaters near the northern boundary of the Brisbane RA1 licence area could also be considered. Such solutions will further optimise coverage and minimise overspill but will cost more than the proposals described in this document.

4. Conclusions and recommendations

The ACMA consultation on the Queensland DRCP has proposed a new HRP for the Mt Coot-tha transmission for the Brisbane RA1 licence area. Our analysis of the impact of the proposed change which also includes increasing the ERP of the transmission to 50 kW shows that the changes will cause significant increases in the overspill into the Nambour only part of the Nambour licence area. Those increases are expected to provide Brisbane DAB+ services at suburban grade (54 dBuV/m @ 1.5m Rx height) to over 10% of the Nambour population and are considered to be excessive by EON Broadcasting.

While EON Broadcasting accept the right of the Brisbane RA1 commercial broadcasters to provide suitable coverage of the Caboolture shire overlap area the excessive overspill into current population centres is viewed as serious competition which has significant potential to impact the business viability of broadcasters in the Nambour licence area, and as such warrants adjustment to the proposed Mt Coot-tha antenna HRP and also the Mt Mee HRP.

EON Broadcasting proposes two steps to reduce the overspill while still maintaining the increased population coverage of the Brisbane RA1 LA.

3. Adjust the Technical specifications in the ACMA proposal by inserting a small notch in the HRP in the sector 5 – 15 of 6dB. The proposed adjusted Technical Specification is provided in Table 4-1.
4. Adjust the bearing of the current Mt Mee repeater HRP from 80° to 170°.

The suggested changes will significantly reduce the amount of overspill into the Nambour only area and reduce the potential business viability impact on Nambour broadcasters while not impacting the population coverage increase that would be delivered by the ACMA proposed changes.



Description of proposed broadcasting site	TXA T-Site Tower 445 Sir Samuel Griffith Drive MOUNT COOT-THA		
RADCOM Site ID	12749		
Coordinates Information (GDA 94)	Lat. -27.46313015	Long. 152.94812959	
Frequency	Frequency Blocks 9A (202.928 MHz), 9B (204.640 MHz) and 9C (206.352 MHz)		
Polarisation	Vertical		
Maximum Antenna Height	192 metres		
Bearing or Sector (Clockwise direction)	Depression angle	Maximum ERP, above dividing line	Maximum ERP, below dividing line
0°T – 12°T	All angles	50 kW	
12°T – 20°T	0.5	15.4 kW	50 kW
20°T – 125°T	All angles	50 kW	
125°T – 160°T	0.35°	25.5 kW	50 kW
160°T – 215°T	All angles	50 kW	
215°T – 245°T	0.0°	26 kW	50 kW
245°T – 290°T	0.5°	26 kW	50 kW
290°T – 360°T	All angles	50 kW	

Table 4-1: Proposed adjusted Brisbane technical specification

5. References

- [1] ACMA document: IFC-29-2020-Proposal-to-vary-the-Queensland-DRCP-consultation-paper.docx
- [2] Technical Planning Parameters and Methods for Terrestrial Broadcasting, ACMA



6. Annexes

6.1. Population analysis details

The detailed population count analysis results are shown in the tables below.

#1	Antenna	ERP (kW)		
Brisbane	Current	23		
Mt Mee	4xdipole-80°	0		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,105,662	2,020,883	1,897,431	1,541,643
Nambour RA1	196,314	134,875	89,362	46,410
Nambour only	53,007	23,223	10,075	2,680
Caboolture shire	143,307	111,652	79,287	43,730

#2	Antenna	ERP (kW)		
Brisbane	Current	23		
Mt Mee	4xdipole-80°	0.5		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,122,614	2,047,948	1,932,912	1,575,660
Nambour RA1	228,587	173,758	133,462	81,921
Nambour only	69,643	36,066	20,194	5,810
Caboolture shire	158,944	137,692	113,268	76,111

#3	Antenna	ERP (kW)		
Brisbane	Proposed	50		
Mt Mee	4xdipole-80°	0		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,150,926	2,109,917	2,058,286	1,853,200
Nambour RA1	328,309	256,229	207,924	135,716
Nambour only	166,026	98,142	55,889	18,207
Caboolture shire	162,283	158,087	152,035	117,509

#4	Antenna	ERP (kW)		
Brisbane	Proposed	50		
Mt Mee	4xdipole-80°	0.5		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,152,255	2,112,892	2,061,952	1,858,790
Nambour RA1	330,805	260,017	212,102	141,809
Nambour only	167,305	99,249	56,789	18,970
Caboolture shire	163,500	160,768	155,313	122,839

Table 6-1: Estimated population coverage for the current and proposed Mt Coot-tha antenna patterns with and without the current Mt Mee repeater



#5	Antenna	ERP (kW)		
Brisbane	Alt-1	50		
Mt Mee	4xdipole-80°	0		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,152,962	2,116,486	2,058,480	1,858,644
Nambour RA1	263,498	204,261	160,413	100,290
Nambour only	102,068	50,003	25,405	7,390
Caboolture shire	161,430	154,258	135,008	92,900

#7	Antenna	ERP (kW)		
Brisbane	Alt-1	50		
Mt Mee	4xdipole-170°	0.5		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,154,504	2,119,563	2,063,279	1,868,222
Nambour RA1	265,695	207,468	165,466	109,317
Nambour only	102,985	50,674	26,192	7,661
Caboolture shire	162,710	156,794	139,274	101,656

Difference to ACMA proposed (=Alt-1-proposed) (no MtMee)

#5	Antenna	ERP (kW)		
Brisbane	Alt-1	50		
Mt Mee	4xdipole-80°	0		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,036	6,569	194	5,444
Nambour RA1	- 64,811	- 51,968	- 47,511	- 35,426
Nambour only	- 63,958	- 48,139	- 30,484	- 10,817
Caboolture shire	- 853	- 3,829	- 17,027	- 24,609

Difference to ACMA proposed (=Alt-1+MtM @170d - proposed+MtM @80d)

#7	Antenna	ERP (kW)		
Brisbane	Alt-1	50		
Mt Mee	4xdipole-170°	0.5		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,249	6,671	1,327	9,432
Nambour RA1	- 65,110	- 52,549	- 46,636	- 32,492
Nambour only	- 64,320	- 48,575	- 30,597	- 11,309
Caboolture shire	- 790	- 3,974	- 16,039	- 21,183

Difference to current (=Alt-1-current)

	Antenna	ERP (kW)		
Brisbane	Current	23		
Mt Mee	4xdipole-80°	0		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	47,300	95,603	161,049	317,001
Nambour RA1	67,184	69,386	71,051	53,880
Nambour only	49,061	26,780	15,330	4,710
Caboolture shire	18,123	42,606	55,721	49,170

Table 6-2: Estimated population coverage for the Alt-1 Mt Coot-tha antenna pattern with and without the Mt Mee repeater @ 170°



#7	Antenna	ERP (kW)		
Brisbane	Proposed	0		
Mt Mee	4xdipole-80°	0.5		
Model	ITU 525/526-15			
	Population coverage			
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	313,286	205,275	149,624	83,746
Nambour RA1	198,496	146,849	111,011	66,871
Nambour only	53,847	28,001	16,367	4,570
Caboolture shire	144,649	118,848	94,644	62,301
#8	Antenna	ERP (kW)		
Brisbane	Proposed	0		
Mt Mee	4xdipole-80°	0.25		
Model	ITU 525/526-15			
	Population coverage			
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	241,571	162,829	111,389	60,709
Nambour RA1	164,099	120,402	84,685	52,270
Nambour only	35,479	18,846	9,395	1,851
Caboolture shire	128,620	101,556	75,290	50,419
#9	Antenna	ERP (kW)		
Brisbane	Proposed	0		
Mt Mee	4xdipole-170°	0.5		
Model	ITU 525/526-15			
	Population coverage			
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	329,872	212,411	152,478	84,191
Nambour RA1	169,855	131,311	99,684	61,974
Nambour only	28,830	14,754	6,749	1,477
Caboolture shire	141,025	116,557	92,935	60,497
#10	Antenna	ERP (kW)		
Brisbane	Proposed	0		
Mt Mee	4xdipole-170°	0.25		
Model	ITU 525/526-15			
	Population coverage			
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	250,701	165,860	112,605	59,568
Nambour RA1	145,563	107,824	76,466	48,812
Nambour only	19,463	8,283	3,362	647
Caboolture shire	126,100	99,541	73,104	48,165

Table 6-3: Estimated population coverage for the Mt Mee repeater @ 80° and 170° at full 500 W and reduced to 250 W ERP



Mt Coot-tha with 4 degrees down tilt on north face				
#12	Antenna	ERP (kW)		
Brisbane	Alt-2	50		
Mt Mee	Shadow-1	0		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,138,330	2,084,474	2,004,740	1,760,095
Nambour RA1	232,705	175,982	125,073	69,595
Nambour only	78,935	37,676	16,671	4,928
Caboolture shire	153,770	138,306	108,402	64,667
#13	Antenna	ERP (kW)		
Brisbane	Alt-2	0		
Mt Mee	Shadow-1	0.5		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	281,582	186,564	129,357	71,100
Nambour RA1	135,060	107,848	78,158	50,378
Nambour only	7,052	2,548	1,027	210
Caboolture shire	128,008	105,300	77,131	50,168
#14	Antenna	ERP (kW)		
Brisbane	Alt-2	50		
Mt Mee	Shadow-1	0.5		
Model	ITU 525/526-15			
Population coverage				
	>45 dBuV/m	>50 dBuV/m	>54 dBuV/m	>60 dBuV/m
Brisbane RA1	2,144,094	2,091,931	2,016,736	1,776,745
Nambour RA1	237,838	182,884	136,458	85,356
Nambour only	79,099	37,830	16,817	5,017
Caboolture shire	158,739	145,054	119,641	80,339

Table 6-4: Estimated population coverage for the Alt-2 solution

6.2. Power towards target site examples

The power towards selected target sites for the current, ACMA proposed and Alt-1 antenna patterns is shown in Table 6-5. The powers shown on the left of the table for “targeted at site” include the impact of the VRP for a receiving antenna at 1.5m at the example sites described in section 3.1.

Licence area	Target site location	Bearing (°T)	Distance (km)	Current HRP gain (dB)	ACMA proposed HRP gain (dB)	Alt-1 HRP gain (dB)	ACMA power increase relative to current (dB)	Alt-1 power increase relative to current (dB)	Alt-1 power increase relative to ACMA (dB)	Target location depression angle	VRP gain (E/Emax)	VRP gain (dB)	Current power targeted at site	ACMA power targeted at site	Alt-1 power targeted at site
				23 kW	50 kW	50 kW	50 kW	50 kW	50 kW				23 kW	50 kW	50 kW
Nambour	Caloundra central	13	75	-9.7	-2.4	-6.6	10.7	6.5	-4.2	-0.3	0.84	-0.76	2.1	24.2	9.2
Nambour	Bruce highway at BNE RA1 boundary	4	53	-11.3	-1.3	-3.1	13.4	11.6	-1.8	-0.5	0.88	-0.56	1.5	32.6	21.6
Nambour	Mt Mee	340	47	-8.9	-0.5	-1.9	11.8	10.4	-1.4	0.0	0.75	-1.25	2.2	33.4	24.2
Gold Coast	Gold Coast central	143	75	-2.8	-3.7	-2.4	2.5	3.8	1.3	-0.3	0.84	-0.76	10.1	17.9	24.2
Ipswich	Ipswich central	226	25	-7.3	-4.2	-5.1	6.5	5.6	-0.9	-1.0	0.94	-0.27	4.0	17.9	14.5
RNEZ	Beaudesert central	175	58	0	-2	0	1.4	3.4	2.0	-0.4	0.86	-0.66	19.8	27.1	43.0

Table 6-5: Powers toward selected target sites

6.3. Current antenna mechanical arrangement

The mechanical details of the current Brisbane antenna are shown in the diagrams below.

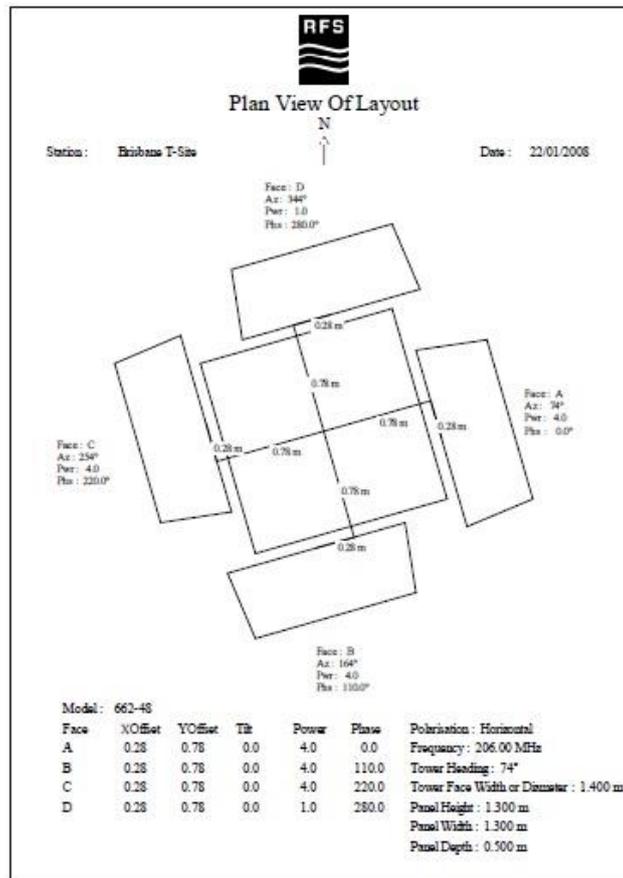


Figure 6-1: Brisbane / Mt Coot-tha antenna layout

The tower panels have the following azimuth angles

Face A 74°T

Face B 164°T

Face C 254°T

Face D 344°T

6.4. Coverage planning analysis details

The coverage analysis is performed using the ATDI HTZ software package.

The coverage is assessed using the ITU-R 525/526-15 propagation model with Bullington diffraction geometry and sub-path attenuation methods.

The Terrain and clutter is based on a 20m step Digital Terrain Model.



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The population data is based on the Australian 2016 census.





Clutter code	Name	dB/km - Atten (dB)		Clutter height
0	Open	0.0	0.0	0
1	Rural	0.0	0.0	5
2	suburban	0.0	0.0	6
3	urban	0.0	0.0	8
4	industrial	0.0	0.0	6
5	forest	0.0	0.0	10
6	hydro	0.0	0.0	0
7	High urban/bulk	0.0	0.0	40
8	park/vegetation	0.0	0.0	10
9 *	High rise	0.0	0.0	50
10	Railways	0.0	0.0	0
11	Roads	0.0	0.0	0

Figure 6-2: Brisbane and Nambour area clutter model

Document update history

Revision number	Date	Action	Comments
0.1x	13/10/20	Initial review of coverage	
0.2	21/10/20	Initial draft for discussion	
0.3-0.4	28/10/20	Revisions and additions	
0.5	28/10/20	Final draft for review	
0.6	29/10/20	Draft release to Brisbane JVC for discussion	
1.0	6/11/20	Final for release to the ACMA	

----- *End of Report* -----