

Antenna survey report

Summary of the 2022 household TV antenna survey – Queensland

FEBRUARY 2023

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Executive summary

Background

Household antenna surveys were conducted in Queensland between May and June 2022 by an external provider under contract to the ACMA. The surveys were conducted in the areas around local repeaters in the Brisbane TV1 metro licence area. The key objective of this exercise was to identify areas where household antennas are pointed to the local repeaters instead of the main transmitters. This would give an indication of the number and location of households using the local repeaters for the reception of terrestrial television services, which would potentially be affected by any changes to channel arrangements at those sites.

The survey areas included:

1. Brisbane South East
2. Currumbin and the Gold Coast Southern Hinterland area
3. Boonah, Mount Alford, Kooralbyn and Rathdowney areas
4. Brisbane North West and Esk areas
5. Canungra in the east of the Scenic Rim region.

We determined the general size and location of the survey areas using computer modelling and the 'best server' approach, that is, identifying areas where local repeaters provide better coverage (in terms of the signal strength), compared to the main Brisbane site. Detailed implementation considerations were determined by the contractor undertaking the surveys.

The survey results collected a large amount of data and descriptive information about viewer antenna pointing behaviour, which is presented in detail in this report.

Findings

The survey's findings were broadly consistent with the expected pointing behaviour of antennas based on our computer-generated predictions.

However, a key observation was that in Brisbane South East surveyed areas, households are mainly relying on coverage from the main high-power Brisbane (Mount Coot-tha) site, even in some areas where the predictions show that the local repeater may provide a stronger signal. The proportion of antennas pointing to the local repeater was found to decrease with the distance from the repeater site.

In some cases, the choice of antenna pointing appears to reflect historical reasons, for example, many antennas were generally installed before the new repeater sites were established and therefore households who did not experience reception difficulties had no reason to change their antennas. In areas with known reception issues from the main sites, for example, due to terrain obstructions or tall buildings, it was observed that households generally chose to point their antennas towards the local repeater. Generally household antennas in all other surveyed areas were pointing towards local repeaters, in those areas where the reception from the main Brisbane site is obstructed due to terrain.

In the Gold Coast surveyed areas, the results varied, especially in the Gold Coast Hinterland area, showing that in large parts of this area the practical choice of a preferred, or only available transmitter would be made on a very localised basis. These observations are consistent with the predictions showing mixed coverage from the 3 sites due to undulated and hilly terrain. In the suburbs surrounding the Currumbin site (south of Burleigh Heads), it was observed that the antennas were predominantly pointing towards the local Currumbin site.

In the areas closer to the local repeaters, an increase in antennas pointing towards local repeaters was observed. Households in newer developments generally showed a trend of pointing their antennas towards the local repeaters, and this trend is expected to continue with the new developments, or as existing antenna installations are replaced due to old age and/or corrosion.

In the Brisbane South East area, Currumbin Valley area and Kooralbyn area, the majority of antennas were installed at roof height (nominally at 5 m) and some at 10 m above the ground level. In Currumbin, Moore, Kilcoy and Beechmont areas, the majority of observed antennas were installed above the roof height of up to 10 m above the ground level. In Boonah Central, Hoya and Toogoolawah, a similar proportion of antennas observed were installed both at roof height (nominally at 5 m) and at 10 m above the ground level. In all other surveyed areas, observed antennas were installed at roof height (nominally at 5m).

1. Introduction

The ACMA has conducted a survey of households' television (TV) antenna type (VHF and/or UHF), orientation and height in identified areas. The aim of this work is to support the evidence base for the considerations of the potential impact to consumers under different TV channel planning scenarios that may arise from a potential future restack channel planning exercise to support terrestrial television technology transition.

This work is one component of technical research conducted under the Television Research and Policy Development Program¹. This work was also foreshadowed in the [Five-year spectrum outlook 2022–27](#) and 2022-23 work program.

The work program consists of preparatory activities to ready the ACMA to undertake TV channel replanning activities, if required to support possible future government policy decisions that may require replanning of TV channels.

An approach to market for antenna surveys in Victoria, New South Wales and Queensland was advertised on 11 March 2022, with responses closing on 11 April 2022. The contractor engaged was Erkmar Australia Pty Ltd.

The surveys in Brisbane and surrounding areas commenced in May 2022 and were completed in June 2022. This report provides a summary of the results of the surveys conducted in Queensland.

Purpose and scope

The purpose of this work was to survey households' TV antenna type, orientation and height in identified survey areas.

The aim was to inform a reliable estimation of:

- > the number and location of the households in a particular survey area that rely on (point their antenna to) the local TV (repeater) sites versus the main TV site for TV reception
- > in the case of areas covered by a single frequency network (SFN), the number and location of households that rely on (point their antenna to) a particular TV transmission site (within a SFN) for TV reception.

The Brisbane TV1 licence area² is served by the high-power main Brisbane VHF transmitter that operates on Block A, which is located on the top of Mount Coot-tha. In addition, part of the licence area that includes Gold Coast and surrounding areas is served by the Gold Coast (Mt Tamborine) medium-high UHF power site that operates on Block D and lower part of Block E. A number of lower-power repeaters located about the Brisbane TV1 licence area are also used to address local coverage issues.

The Gold Coast area is an overlap area³ between Brisbane TV1 and Northern NSW TV licence areas. The sites in this area (Gold Coast, Gold Coast Southern Hinterland and Currumbin) provide 8 services in total – 3 Brisbane metro commercial, 3 regional Northern NSW commercial and 2 national services.

¹ [Budget Paper No. 2](#), 2022-23 (p. 145) included in the [Appropriation Bill \(No. 3\) 2021-22](#) (p. 61)

² Details of broadcasting licence areas are available on the [ACMA website](#).

³ An overlap area in this context is an area where two TV licence areas overlap. Gold Coast is in an overlap area between Brisbane TV1 and Northern NSW TV1 licence areas.

The survey included areas around local repeaters within the Brisbane TV1 licence area. The sites which were included in the studies are shown in **Error! Reference source not found.**. The list of the sites and the corresponding survey areas is shown in **Error! Reference source not found.**.

Figure 1: TV broadcast transmission sites included in the household antenna survey in Queensland (Shaded area is Brisbane TV1 licence area)

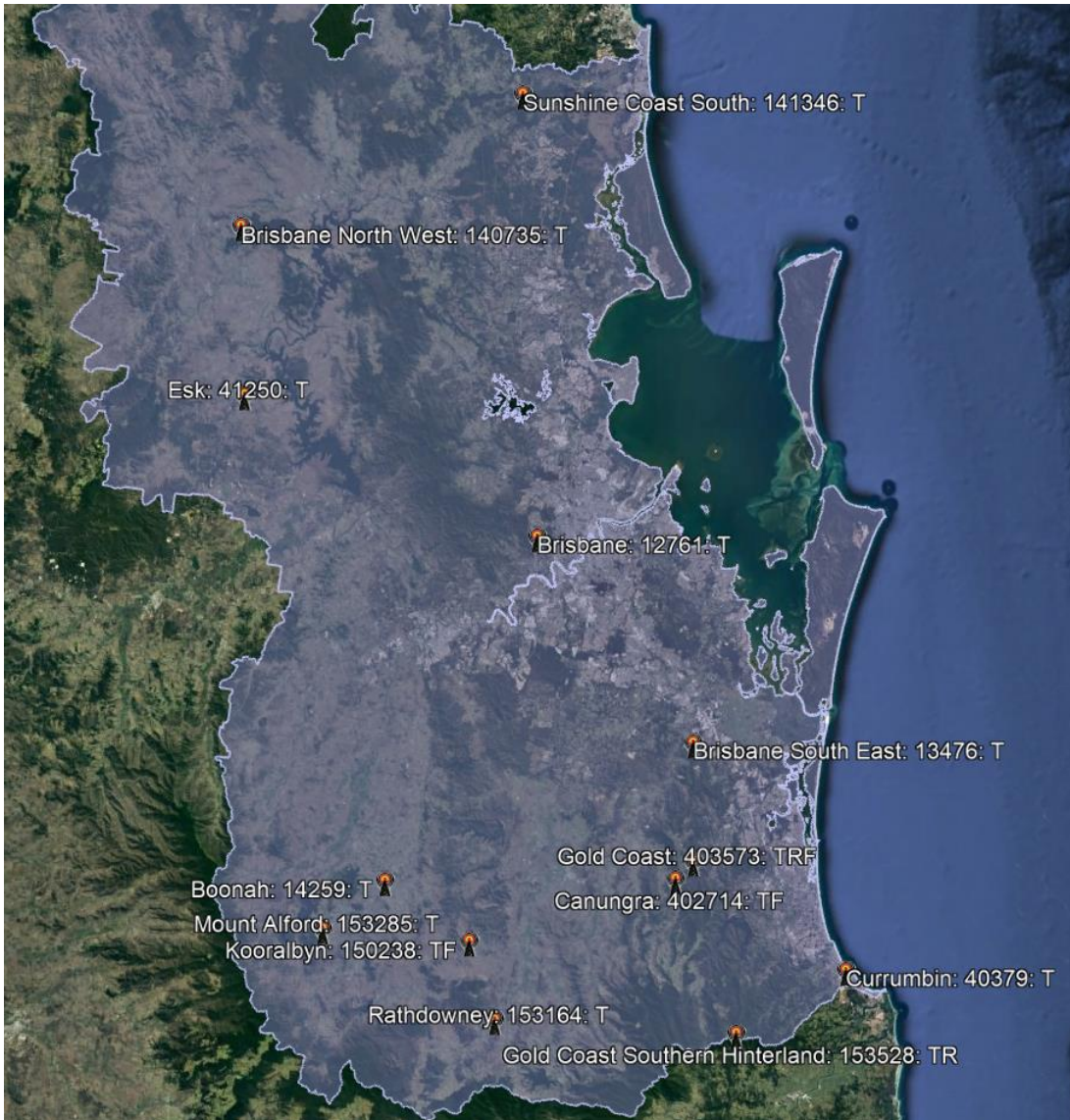


Table 1: List of survey areas in Queensland

Local transmission (repeater) site	TV Block	Surveyed areas
Brisbane South East	Block B	Victoria Point, Mount Cotton, Redland Bay, Steiglitz, Jacobs Well, Wongawallen (As per red pins in figures 2 and 3)
Currumbin	Block C and Block E (in a SFN with Gold Coast Southern Hinterland)	As in figures 6 and 7
Gold Coast Southern Hinterland (GSCH)	Block C and Block E (in a SFN with Currumbin)	
Boonah	Block D	Boonah, Dugandan, Boonah Valley, Hoya (Figure 10)
Mount Alford	Block D	Mount Alford (Figure 11)
Rathdowney	Block B	Rathdowney (Figure 12)
Kooralbyn	Block B	Kooralbyn (Figure 13)
Brisbane North West	Block D	Toogoolawah, Moore, Kilcoy (Figure 16)
Esk	Block C	Esk (including the southern part between Elm St and Aspen Dr, Mount Hallen) (Figure 17)
Canungra	Block B	Canungra, Beechmont, Witheren, Wonglepong, Boyland (Figure 20)

Methodology

Surveys were performed by the contractor visiting the identified survey areas and visually observing and collecting household antenna data. The data was obtained by counting types (that is, UHF or VHF), height and orientations of antennas across identified survey areas. Where possible the use of mast head amplifiers was also recorded. The surveys have been conducted by experienced surveyor with detailed knowledge about the survey areas.

The original sample size (of households to observe in each survey area) was generally determined based on the estimated number of dwellings in each individual survey area and using 95% confidence level⁴ and 5% confidence interval⁵.

Individual survey areas generally comprised either of individual suburbs, parts of suburbs, or several suburbs grouped together. In some cases, the sample size was adjusted by the contractor in consultation with the ACMA due to a number of factors,

⁴ This is the level of certainty with which the true population value is estimated.

⁵ This is the desired level of accuracy of the estimate.

with the most common factors being proportion estimate and visibility/accessibility of the antennas.

Proportion estimate was generally based on prior knowledge about antenna orientation in an area, either from the surveyor's experience, or general visual observation of the area (for example, driving around the suburb before the survey was conducted). MySwitch information and the ACMA-produced coverage and best server predictions were also used to inform the survey planning. In some cases where an area had a rather small number of dwellings (generally about a couple of hundred dwellings), the sample size was generally reduced to a number that, based on the surveyor's estimate, would be sufficient to represent the area.

In addition to the numerical data, descriptive information was also provided for all survey areas, including general description of the survey areas and any relevant observations, such as:

- > the size of the area surveyed
- > how representative the area is
- > the impression about the direction the antennas were generally pointing
- > the impression whether the viewers 'try hard' to get the reception based on the general antenna heights.

The surveys also provided other observations such as:

- > geography of the area (flat, hilly, valley, etc)
- > clutter (trees, type of buildings in the area, any other specifics)
- > any parts of the surveyed area with arrangements different from the rest of the area
- > a general impression about the survey.

All the survey results for each survey area as per Table 1 are presented in the corresponding sections of this report and they are compared with the best server computer-based predictions. Best server predictions are plots which show, for each transmitter, in which areas they provide the strongest signal (that is, they are the best server in that particular area, compared to all other transmitters that could potentially provide the coverage in that area).

In addition, the descriptive summaries about the general and specific observations are also provided for each area under survey results in each section of this report. It should be noted that the survey findings were based on the external observations only and therefore, no information was obtained about whether the antennas were functional and in use.

2. Brisbane South East repeater area

Overview

The main Brisbane (Mt Coot-tha) site is located about 45 km in the north-west direction from the Brisbane South East repeater and it is predicted to provide generally good coverage in the area around the repeater. Brisbane South East repeater is located at Crown Castle site on Darlington Range and its goal is to provide coverage in the surrounding areas where the coverage from the main Brisbane (Mt Coot-tha) site may be deficient, particularly due to obstructions caused by hilly terrain. The repeater operates on Block B and was planned on the basis that its coverage will be protected within higher than urban level reception (80 dBµV/m) against interference from other broadcasting services and therefore it was planned to serve a relatively small area surrounding the site. The Brisbane South East repeater is also around 20 km north of the Gold Coast (Mt Tamborine) transmitter, and some parts of the survey area were predicted to be best served by the Gold Coast (Mt Tamborine) transmitter.

The survey areas for this site are shown in Figure 2 and Figure 3. The areas were identified using the best server approach, that is, identifying areas where the local repeaters provide strongest signal compared to the main Brisbane (Mt Coot-tha) site and Gold Coast (Mt Tamborine) site. The survey areas comprised a mix of residential and rural areas, and while residential areas were generally easy to survey, the rural areas were generally more difficult to survey due to limited visibility of the antenna systems. A total of 16 suburbs/local areas were surveyed with an overall sample size of around 4,100 antennas counted.

Figure 2: Repeater (green dot): Brisbane South East repeater; survey areas (red pins in ovals)

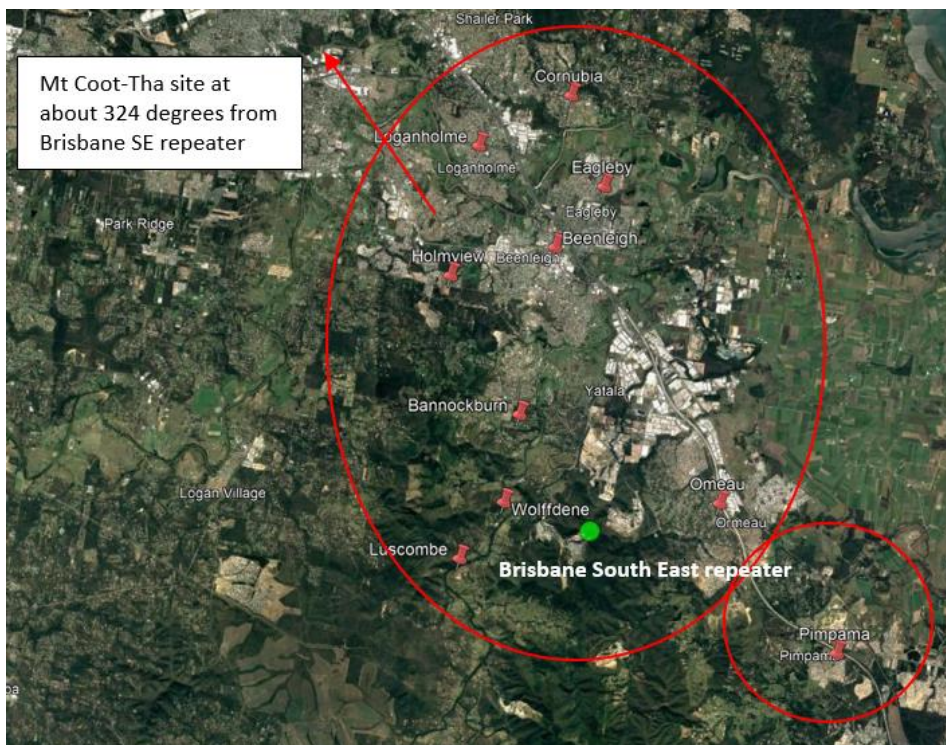
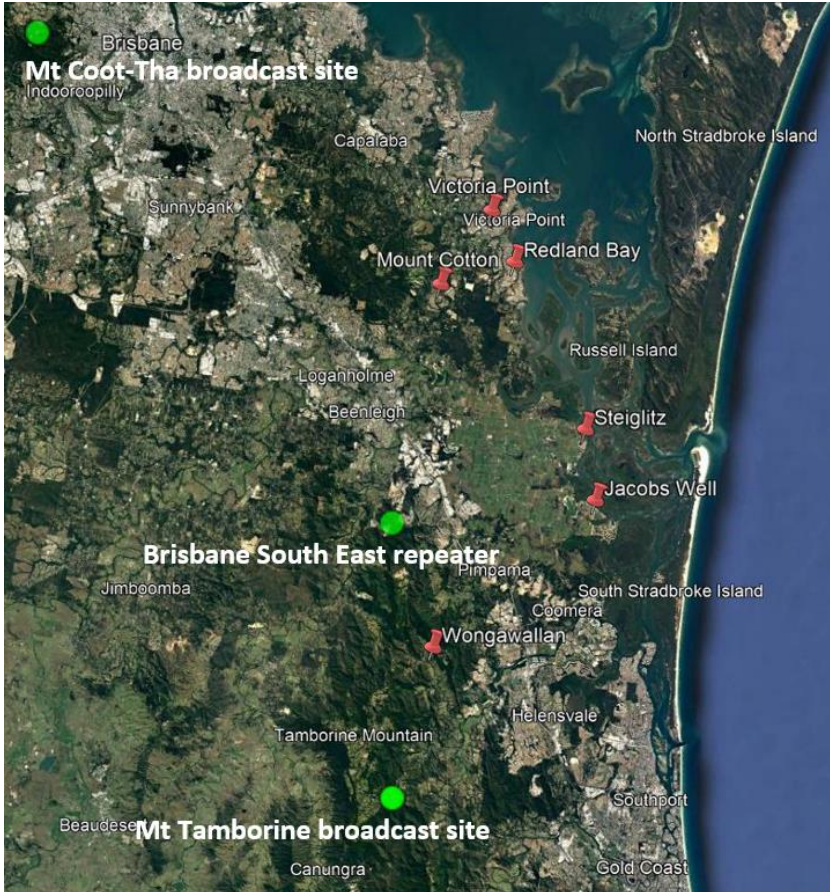


Figure 3: Repeaters/ broadcast sites (green dots): Brisbane South East repeater, Mt Tamborine and Mt Coot-Tha broadcast sites; survey areas (red pins): Victoria Point, Mount Cotton, Redland Bay, Steiglitz, Jacobs Well, Wongawallan.



Survey results

Survey results for the Brisbane South East repeater area are shown in Figure 4 and are overlaid on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 4 are presented in Figure 5.

In suburbs closer to the city (namely, Victoria Point, Thornlands and Redland Bay), households mainly receive coverage from the main Brisbane (Mt Coot-tha) site. An increase in the number of UHF antennas pointing towards the Brisbane South East repeater was observed in the areas immediately surrounding the repeater, between Pimpama and Bannockburn. However, even in these areas a majority of the antennas were pointing to the main Brisbane (Mt Coot-tha) site, with exception of Pimpama where the main antenna type was UHF antennas pointing to the Gold Coast (Mt Tamborine) site. Further north from the Brisbane South East repeater, north of Bannockburn, a majority of antennas were pointing towards the main Brisbane (Mt Coot-tha) site. Some relatively small pockets of households with antennas pointing to particular sites were noticed. However, it was observed that antennas were generally evenly distributed across survey areas, as per the results in Figure 4.

In addition to Pimpama, on the southern and south-eastern sides of the survey area in Wongawallan, Jacobs Well and Steiglitz, the antennas were predominantly of UHF type pointing to the Gold Coast (Mt Tamborine) repeater. This is consistent with the

computer predictions, showing that these areas are best served from the Gold Coast (Mt Tamborine) site.

Antenna height across this area appeared to be influenced by house height rather than any necessity to achieve a certain antenna height to obtain a signal. A higher proportion of antennas were observed to be installed at roof height (nominally at 5 m) (approximately 75%) compared to the antennas installed at 10 m above the ground level (approximately 25%).

Figure 4: Survey results overlayed on the coverage predications plot - Brisbane South East area; Coverage prediction background colour code: Yellow – Brisbane (Mt Coot-tha), Brown – Brisbane South East and Green – Gold Coast (Mt Tamborine).

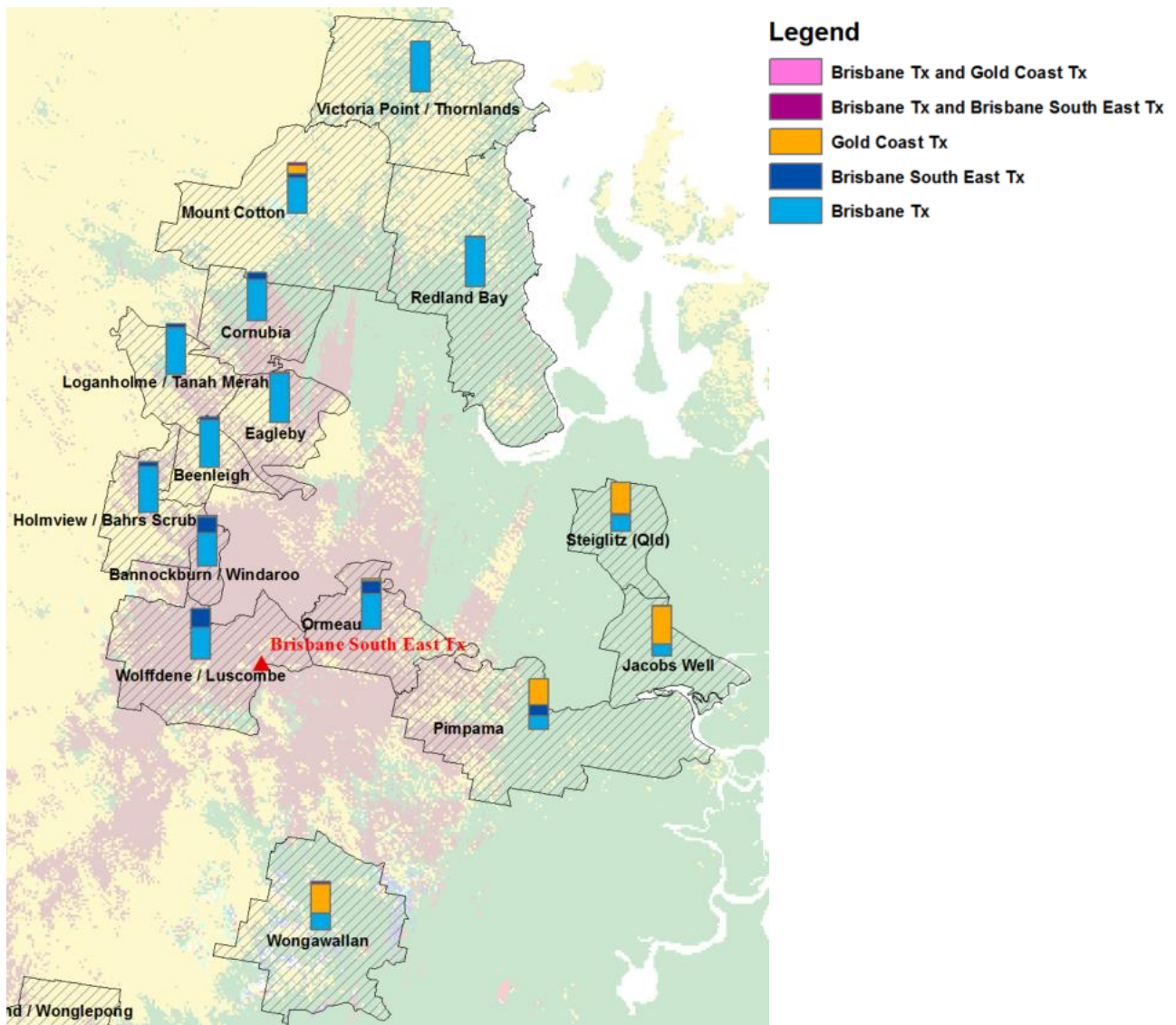
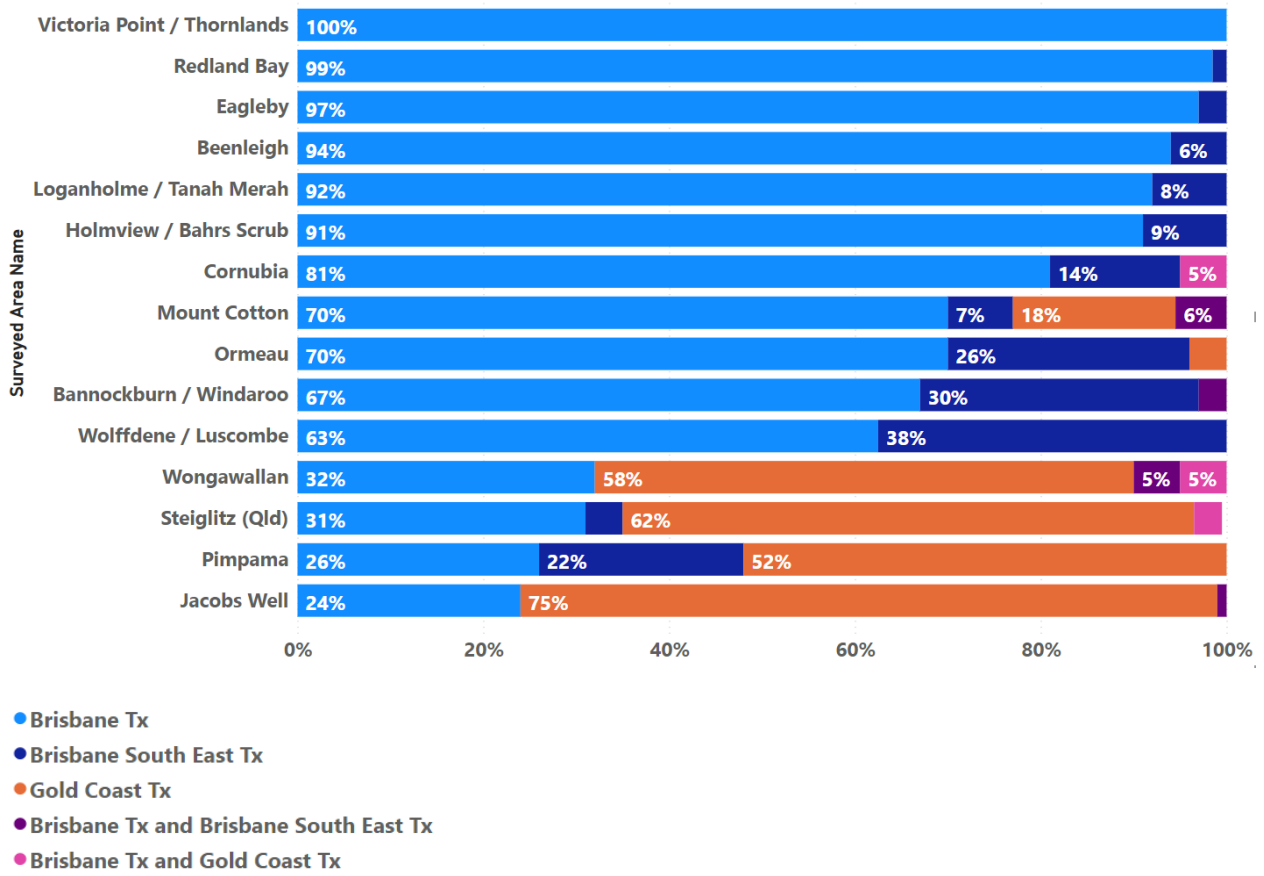


Figure 5: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Brisbane South East



3. Currumbin and Gold Coast Southern Hinterland (GCSH) area

Overview

The area around Currumbin, including the GCSH is undulating and coverage in the area is provided from 3 sites. The main site is the Gold Coast (Mt Tamborine) site which provides coverage in the general Gold Coast areas. However, due to hilly terrain, 2 additional repeater sites also serve the area, Currumbin operating off Crest Drive and the GCSH site at Bilbrough Lookout, near Springbrook. The Gold Coast is a unique area from the TV planning perspective because it is an overlap area between metro Brisbane TV1 licence area and regional Northern NSW TV1 licence area. Consequently, all 3 sites provide eight services to this area – 3 metro commercials, 3 regional commercials, and 2 national services.

The main site in the area is the Gold Coast (Mt Tamborine) site, which is a medium-high power (25 kW ERP) site that provides services using Block D and the lower half of Block E. Currumbin and GCSH sites operate in a single frequency network (SFN) utilising Block C and upper half of Block E. Due to mountainous terrain and obstructions, the main Brisbane (Mt Coot-tha) site does not provide coverage to this area.

The survey area for these 4 sites is shown in Figure 6 and Figure 7. The area was identified using the best server approach, that is, identifying areas where the local repeaters provide the strongest signal compared to the Gold Coast (Mt Tamborine) site. Residential areas in and around Currumbin were relatively easy to survey. However, some parts of the area, which are more rural, were generally more difficult to survey due to limited visibility of the antenna systems, due to tree lines. Such areas include households in Currumbin Valley, Tallebudgera Valley, and areas in Figure 7 such as Neranwood and Austinville. A total of 9 suburbs/local areas were surveyed with an overall sample size of around 1,100 antennas counted.

Figure 6: Repeaters (green dots): Gold Coast Southern Hinterland (Springbrook) repeater, Currumbin repeater; survey areas (red pins in ovals)

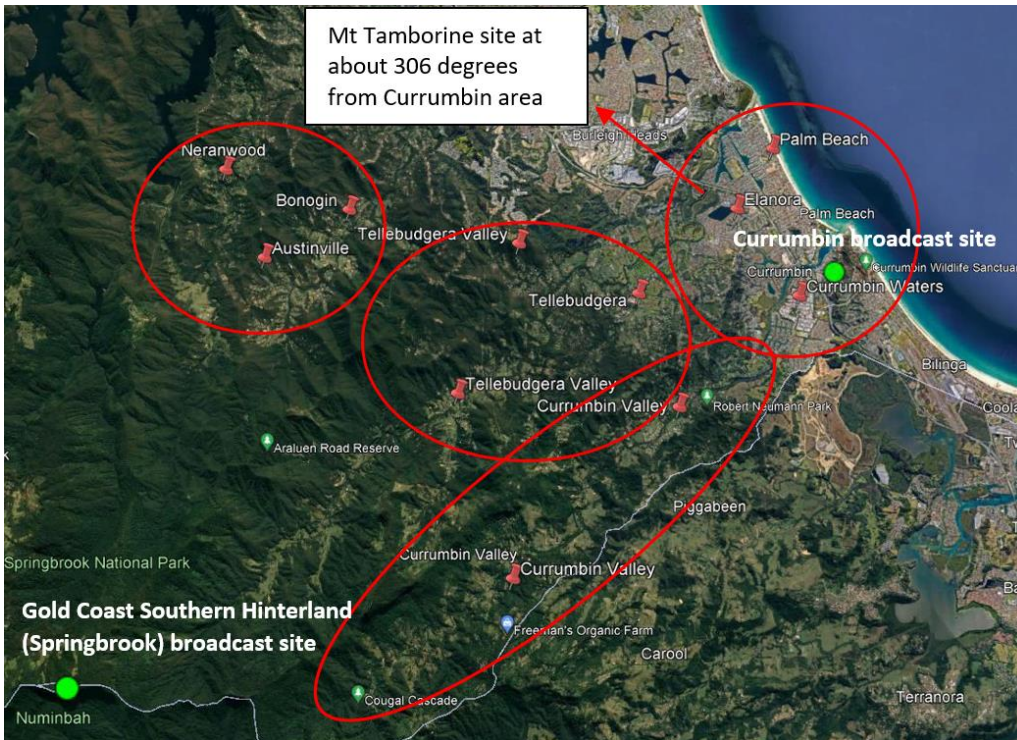
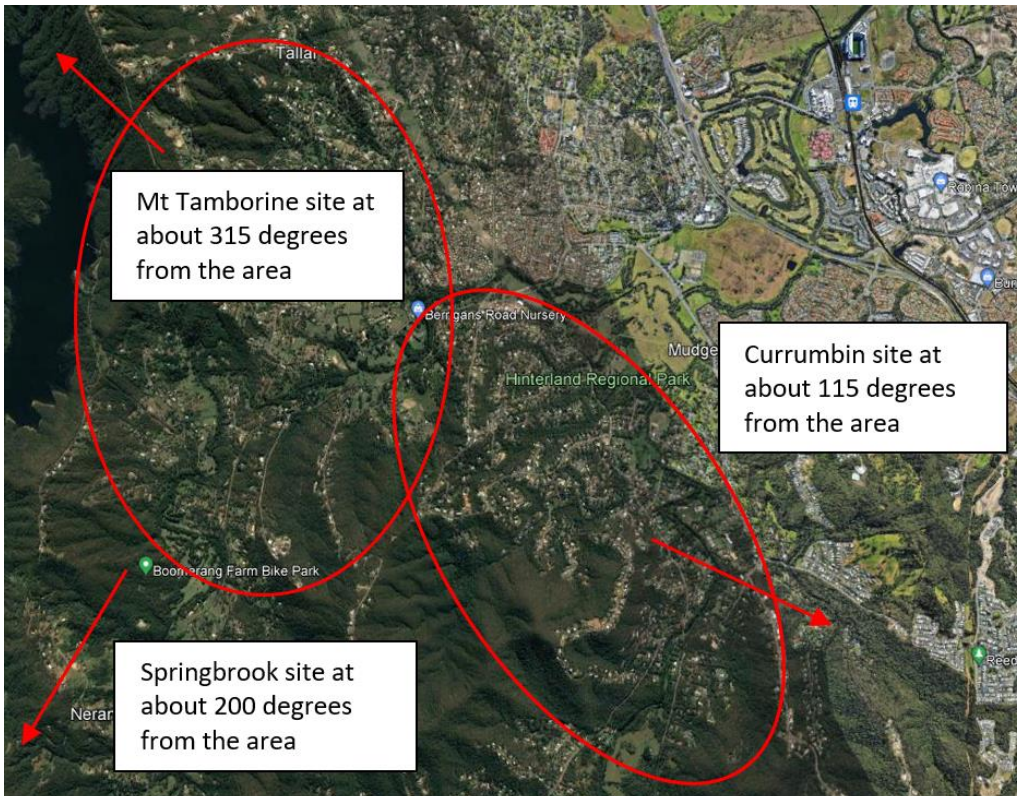


Figure 7: Repeaters: Gold Coast Southern Hinterland (Springbrook) repeater, Currumbin repeater; survey areas (red ovals)



Survey results

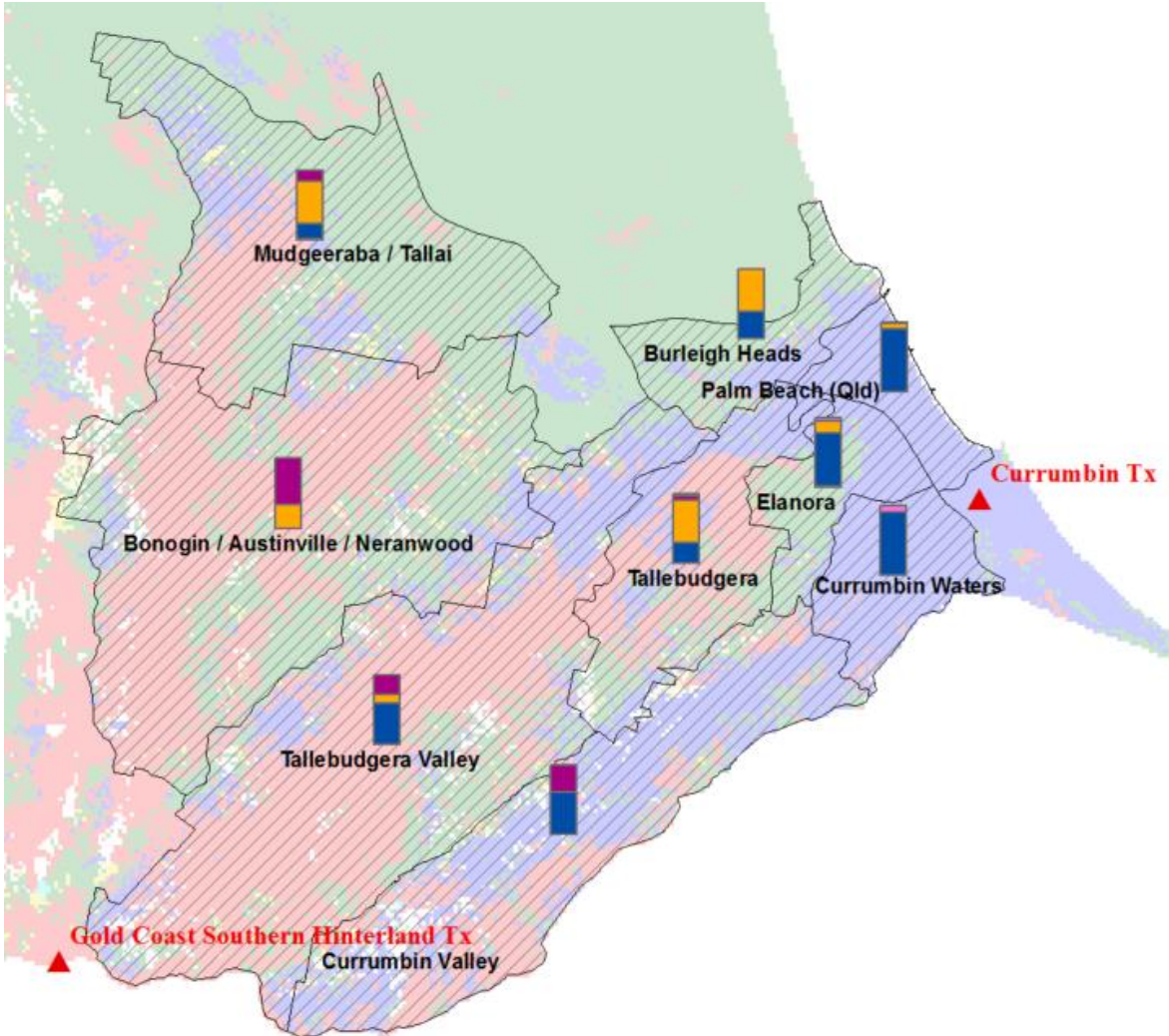
Survey results for the Currumbin and GCSH areas are shown in Figure 8 and are overlaid on the best server plot **Error! Reference source not found.** The actual percentage breakdowns corresponding to the results in Figure 8 are presented in Figure 9.

The observations were generally consistent with the coverage predictions. It can be observed that in the suburbs in the Currumbin area (Palm Beach, Currumbin Waters and Elanora), the antennas were mainly pointing to the local Currumbin site and the majority of the antennas were installed above the roof height of up to 10 m above the ground level. In Elanora, around 17% of antennas were observed to point to the Gold Coast (Mt Tamborine site). Also, in a smaller area within the suburb of Elanora, to the east of Casuarina Dr in an area around Silver Glade Dr, antennas were observed pointing to the Gold Coast (Mt Tamborine) site. This area is predicted to have poor coverage from the Currumbin site and is predicted to be better served from the Gold Coast (Mt Tamborine) site.

The observations in Currumbin Valley, Tallebudgera Valley, Bonogin, Austinville, and Neranwood revealed that a proportion of households had their antennas pointing towards the GCSH site and the majority of the antennas were installed at roof height (nominally at 5 m) and some at 10 m above the ground level. However, the sample size in these areas was relatively low due to difficulties observing the antennas in these semi-rural or rural areas. To reach some of the rural areas there is only one road in and out of that area and with very little opportunity to observe any antennas in those locations. However, the general impression in these areas was that there was no observable pattern in the antenna choice and that often the transmitter choice would be made on a very localised basis. This finding is consistent with the computer-based predictions, showing no large contiguous areas where a single transmitter would provide best coverage.

The survey was also conducted across the Burleigh Heads area, which is considered a natural boundary between the Currumbin and Gold Coast coverage areas (see Figure 8) due to elevated terrain. The survey confirmed that this is an area where a larger proportion of antennas point towards the Gold Coast (Mt Tamborine) site, mainly in parts of the area beyond the coverage of the Currumbin site.

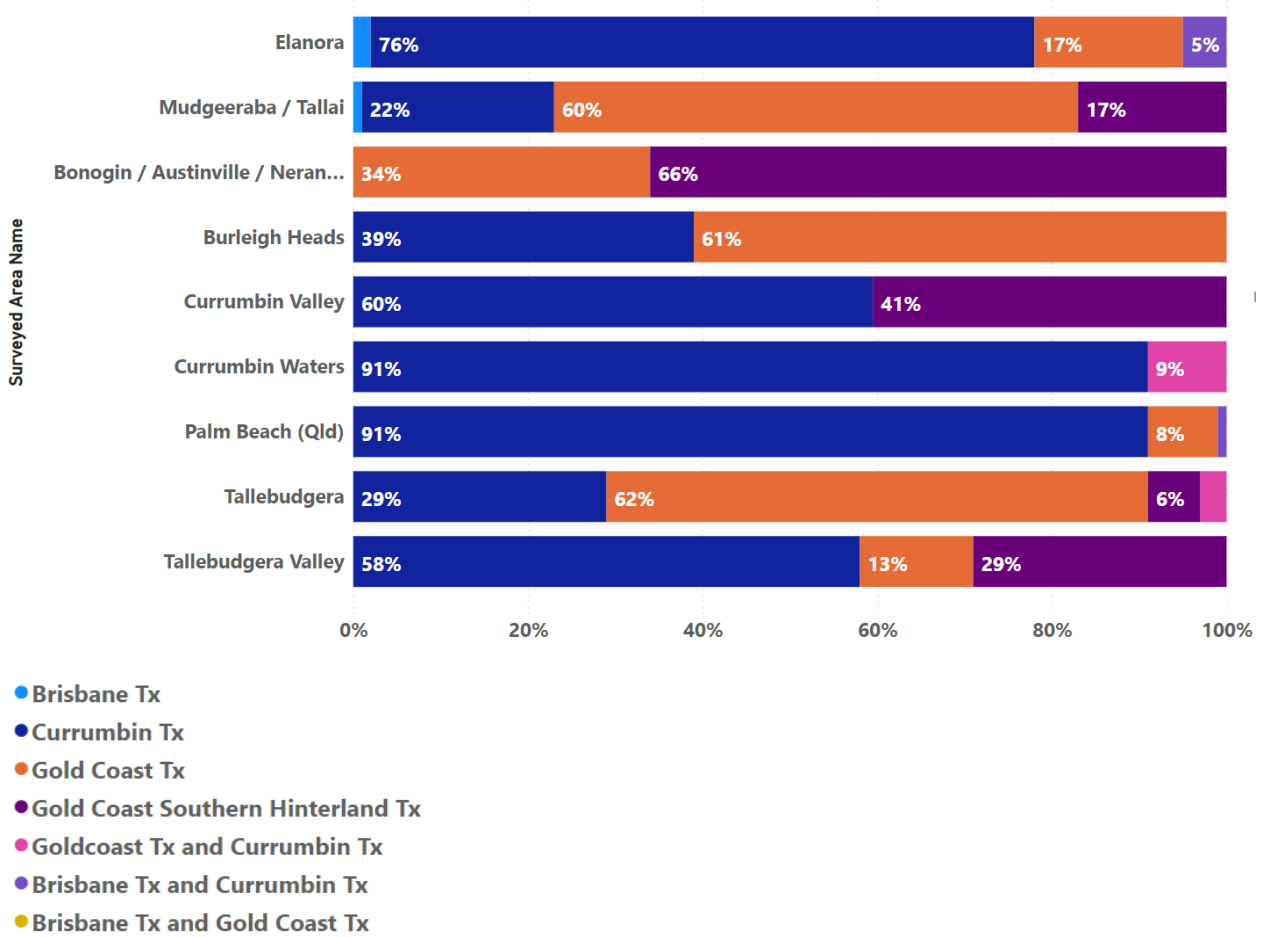
Figure 8: Survey results overlayed on the coverage prediction plot – Currumbin and Gold Coast Southern Hinterland area. Coverage prediction background colour code: **Green – Gold Coast (Mt Tamborine), **Purple** – Currumbin, **Red** – Gold Coast Sothern Hinterland.**



Legend

- Brisbane Tx and Gold Coast Tx
- Brisbane Tx and Currumbin Tx
- Goldcoast Tx and Currumbin Tx
- Gold Coast Southern Hinterland Tx
- Gold Coast Tx
- Currumbin Tx
- Brisbane Tx

Figure 9: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Currumbin and Gold Coast Southern Hinterland area.

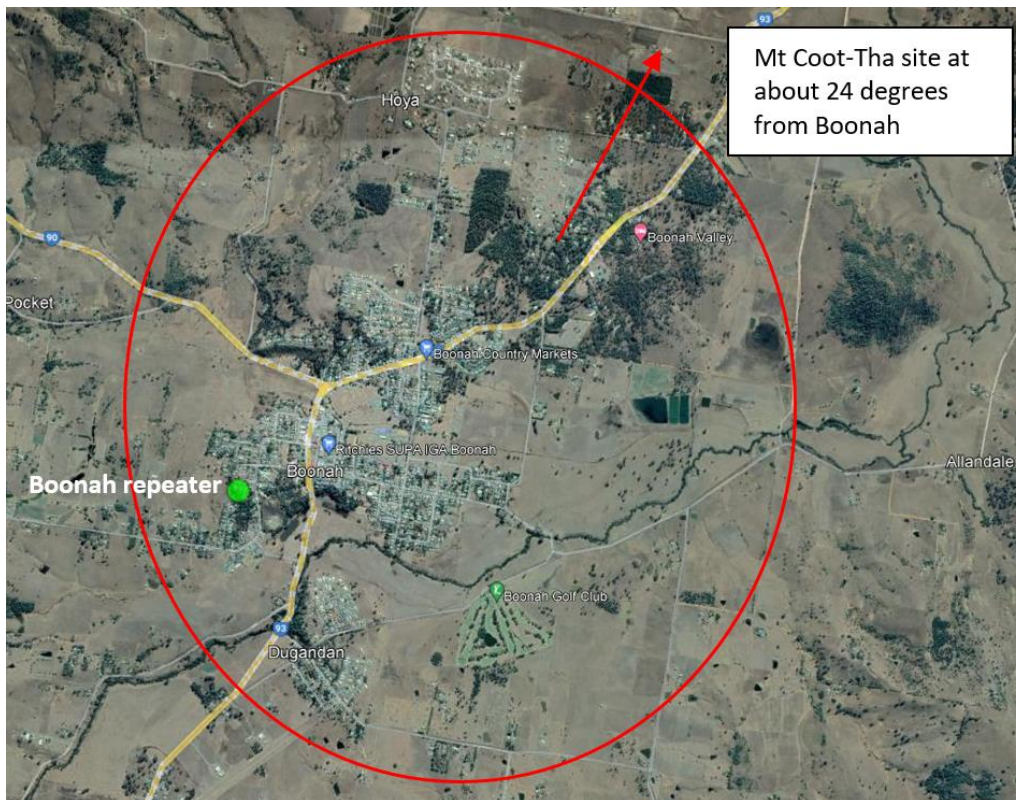


4. Boonah, Mount Alford, Kooralbyn and Rathdowney areas

Overview

The main Brisbane (Mt Coot-tha) site is located about 65 km in the north-east direction from the Boonah repeater, which is located on Reservoir Hospital Hill in Boonah. The predictions showed that coverage from the main Brisbane (Mt Coot-tha) site in Boonah is poor and therefore the Boonah repeater (operating in UHF on Block D) is expected to be the main site providing the coverage in the area. Three areas were identified by the ACMA and these are the main Boonah area, Dugandan and Hoya. All 3 areas were surveyed with an overall sample size of around 200 antennas counted. The Boonah repeater survey area is shown in Figure 10.

Figure 10: Repeater (green dot): Boonah repeater; survey areas (red oval): Boonah, Dugandan, Boonah Valley, Hoya.



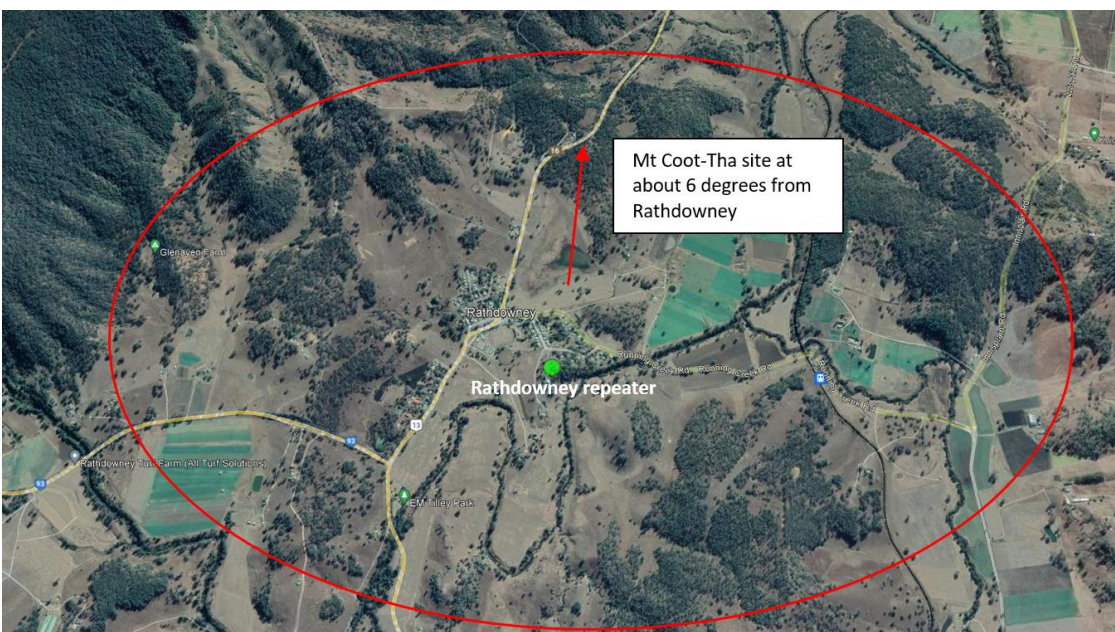
The main Brisbane (Mt Coot-tha) site is located about 77 km in the north-east direction from the Mount Alford repeater, which is located on a nearby hill. The predictions showed that coverage from the main Brisbane (Mt Coot-tha) site in Mount Alford area is generally poor and therefore the Mount Alford repeater (operating in UHF on Block D) is expected to be the main site providing the coverage in the area. The Mount Alford survey area is shown in Figure 11. The number of dwellings in the entire area is estimated to be small. The sparseness of rural properties and the geography generally made it difficult to obtain a large antenna sample and an overall sample size of 32 antennas were counted.

Figure 11: Repeater (green dot): Mount Alford repeater; survey area (red oval): Mount Alford.



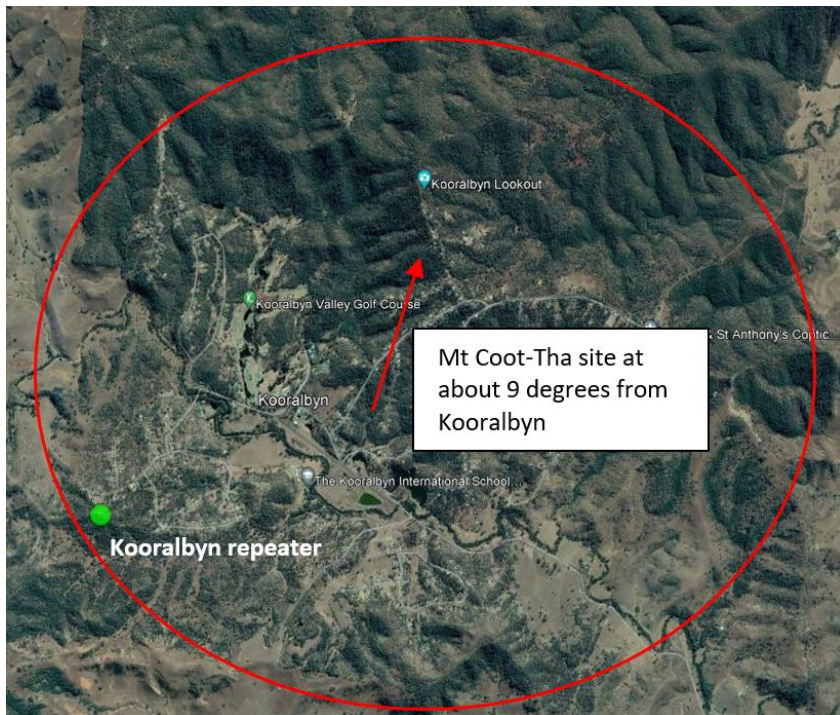
Rathdowney is a small rural town in the southwestern part of the Brisbane TV1 licence area. The main Brisbane (Mt Coot-tha) site is located about 85 km in the north-east direction from the Rathdowney repeater, which is located on John Street Reservoir, Rathdowney. The predictions showed that coverage from the main Brisbane (Mt Coot-tha) site in Rathdowney area is generally poor and therefore the Rathdowney repeater (operating in UHF on Block B) is expected to be the main site providing the coverage in the area. The Rathdowney survey area is shown in Figure 12. The number of dwellings in the entire area is estimated to be small and only the most populated part of the town provided real opportunities to observe antennas, with any dwellings further out of the town being dispersed and difficult to access or observe. The sparseness of rural properties and the geography generally made it difficult to obtain a large antenna sample and an overall sample size of 40 antennas were counted.

Figure 12: Repeater (green dot): Rathdowney repeater; survey area (red oval): Rathdowney.



The main Brisbane (Mt Coot-tha) site is located about 70 km in the northeast direction from the Kooralbyn repeater, which is located off Walker Drive, Kooralbyn. The predictions showed that coverage from the main Brisbane (Mt Coot-tha) site in Kooralbyn area is generally poor and therefore the Kooralbyn repeater (operating in UHF on Block B) is expected to be the main site providing the coverage in the area. The Kooralbyn survey area is shown in Figure 13. An overall sample size of 201 antennas were counted.

Figure 13: Repeater (green dot): Kooralbyn repeater; survey area (red oval): Kooralbyn.



Survey results

Survey results for the Boonah, Mount Alford, Kooralbyn and Rathdowney areas are shown in **Error! Reference source not found.**¹⁴ and are overlaid on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 14 are presented in Figure 15. The observations were generally consistent with the coverage predictions.

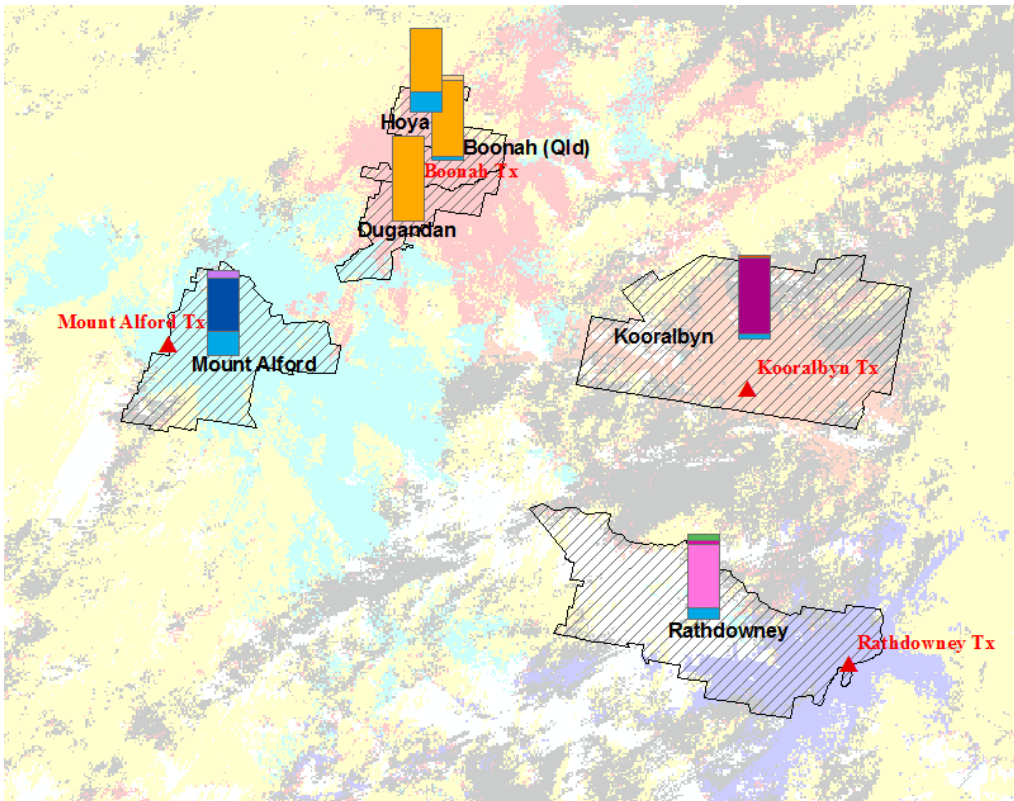
It can be observed that in the southern parts the Boonah area (Dugandan) and in Boonah Central, the antennas were mainly pointing to the local Boonah site and in the northern parts (Hoya) some antennas (25%) were observed pointing to the main Brisbane (Mt Coot-tha) site, as expected. The majority of the antennas were installed at roof height (nominally at 5m) in Dugandan. In Boonah Central and Hoya similar proportion of antennas observed were installed both at roof height (nominally at 5 m) and at 10 m above the ground level.

In the Mount Alford area most of the antennas were pointing to the local Mount Alford site with some pointing to the main Brisbane (Mt Coot-tha) site. In this area a similar proportion of antennas observed were installed both at roof height (nominally at 5 m) and at 10 m above the ground level.

In the Rathdowney area the antennas were predominantly pointing to the local Rathdowney site with most of the observed antennas installed at roof height (nominally at 5 m).

In the Kooralbyn area the antennas were mainly pointing to the local Kooralbyn site with most of the observed antennas installed at roof height (nominally at 5m) and some at 10 m above the ground level.

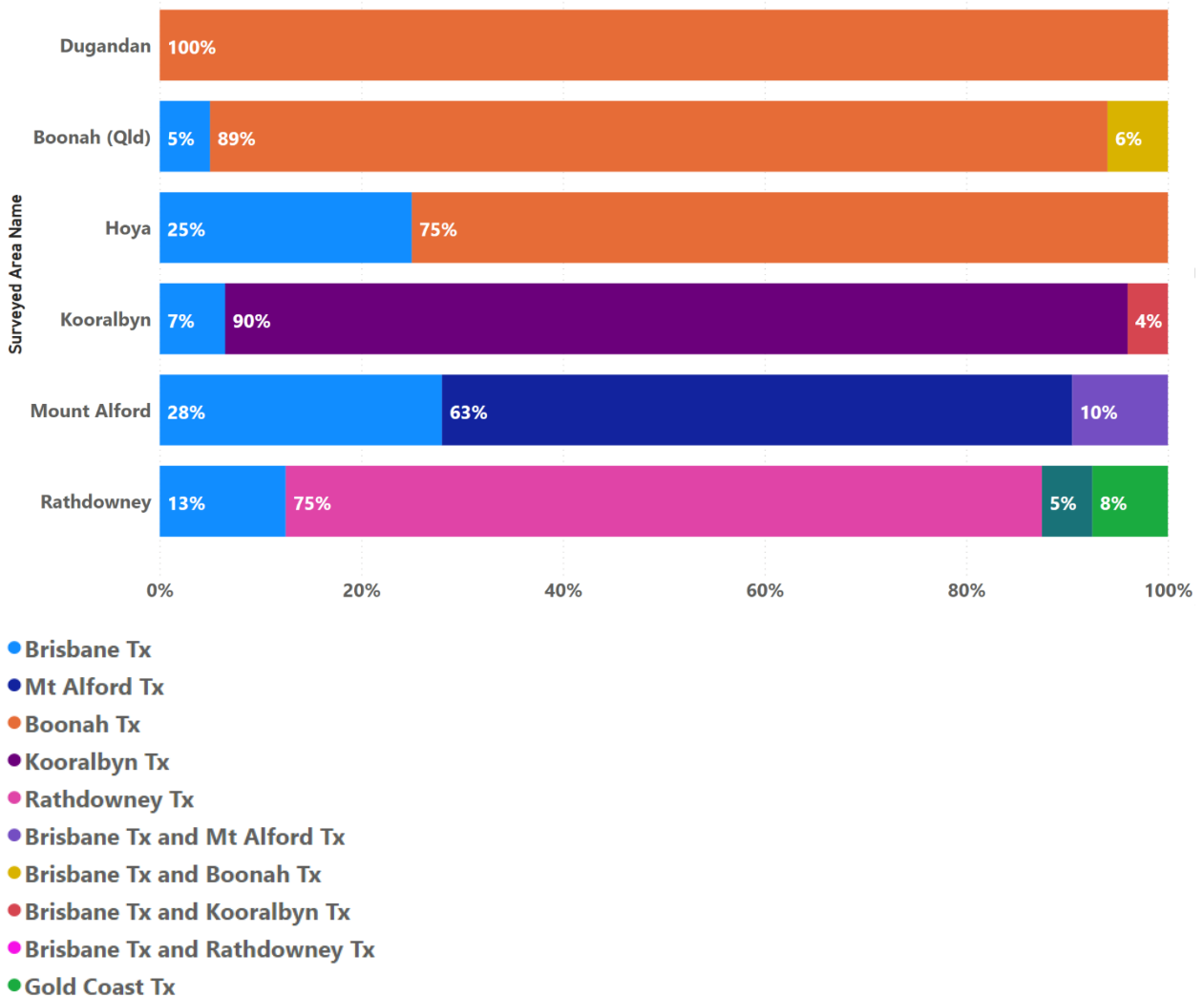
Figure 14: Survey results overlaid on the coverage prediction plot. Coverage prediction background colour code: Yellow – Brisbane (Mt Coot-tha), Grey – Gold Coast, Blue – Mount Alford, Red - Boonah, Orange - Kooralbyn and Purple - Rathdowney



Legend

- Gold Coast Tx
- Brisbane Tx and Rathdowney Tx
- Brisbane Tx and Kooralbyn Tx
- Brisbane Tx and Boonah Tx
- Brisbane Tx and Mt Alford Tx
- Rathdowney Tx
- Kooralbyn Tx
- Boonah Tx
- Mt Alford Tx
- Brisbane Tx

Figure 15: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Boonah, Mount Alford, Kooralbyn and Rathdowney areas

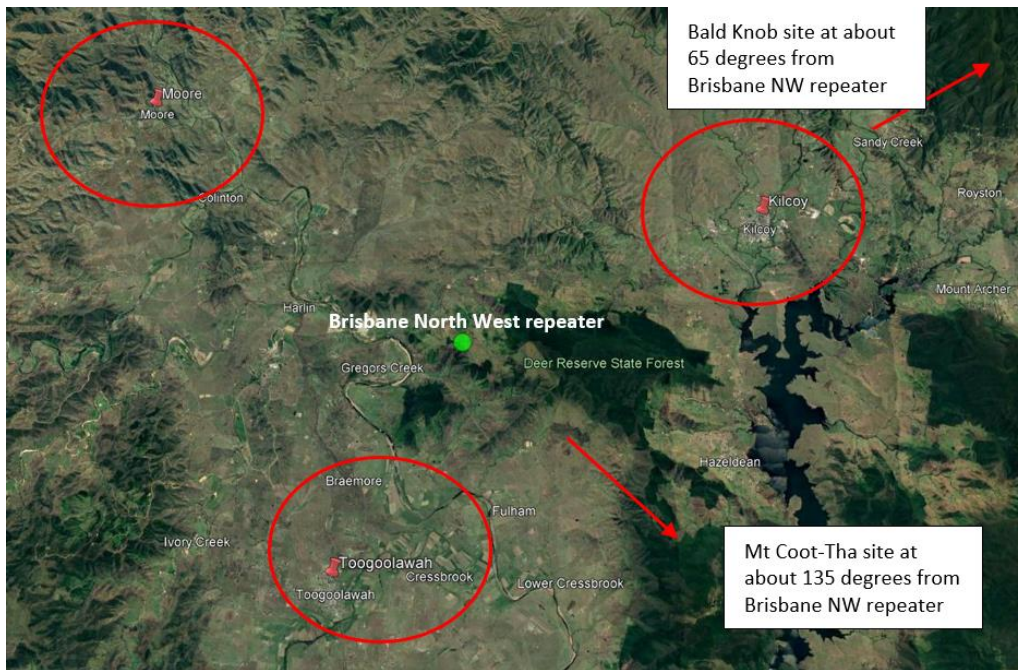


5. Brisbane North West and Esk areas

Overview

The main Brisbane (Mt Coot-tha) site is located about 73 km in the south-east direction from the Brisbane North West repeater, which is located on Pohlmans Range Rd, Gregors Creek. The predictions showed that coverage from the main Brisbane (Mt Coot-tha) site in this part of the Brisbane TV1 licence area is generally poor and therefore the Brisbane North West repeater (operating in UHF on Block D) is expected to be the main site providing the coverage in the area. The Brisbane North West survey area is shown in Figure 16. A total of 3 towns/local areas were surveyed with an overall sample size of 438 antennas counted.

Figure 16: Repeater (green dot): Brisbane Northwest repeater; survey area (red pins in ovals): Toogoolawah, Moore, Kilcoy



The main Brisbane (Mt Coot-tha) site is located about 56 km in the south-east direction from the Esk repeater, which is located on Reservoir Hill, Esk. The predictions showed that coverage from the main Brisbane (Mt Coot-tha) site in the Esk and Mount Hallen area is generally poor and therefore the Esk repeater (operating in UHF on Block C) is expected to be the main site providing the coverage in the area. The Esk survey area is shown in Figure 17. Mount Hallen is a rural area and was difficult to survey due to limited visibility of the antenna systems. A total of 2 towns/local areas were surveyed with an overall sample size of around 156 antennas counted.

Figure 17: Repeater (green dot): Esk repeater; survey area (red oval): Esk (including the southern part between Elm St and Aspen Dr, Mount Hallen)



Survey results

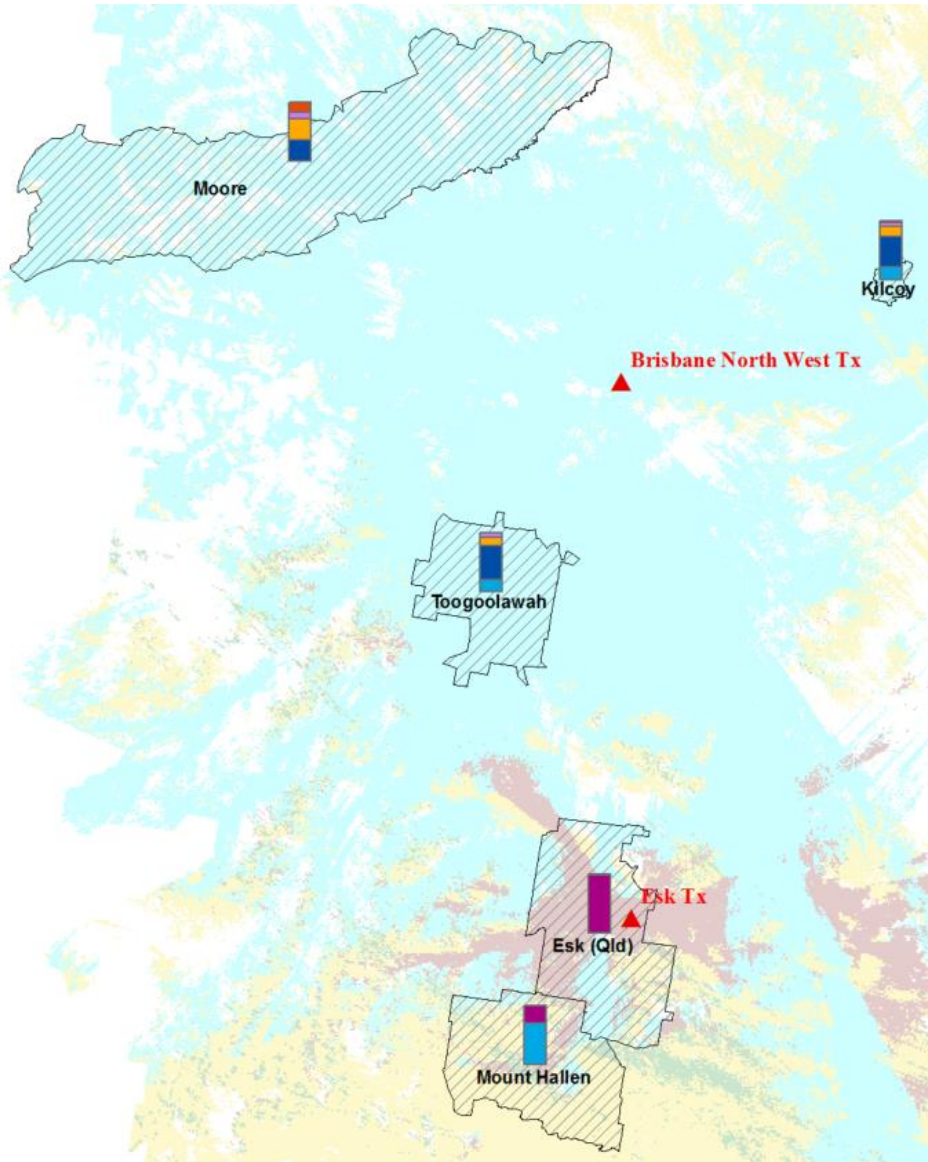
Survey results for the Brisbane North West and Esk areas are shown in Figure 18 and are overlaid on the best server plot. The actual percentage breakdowns corresponding to the results in Figure 18 are presented in Figure 19 **Error! Reference source not found..**

In Moore, the predicted coverage from the Brisbane North West site is variable. Moore is a small rural township with lots of trees, hence difficult to observe a lot of household antennas. Around 20% of observed households had no visible antenna, the remaining were either pointing to the Brisbane North West site or the Darling Downs transmitter with no specific pattern. The observed antennas were mostly installed at 10 m above the ground level.

In Kilcoy and Toogoolawah approximately 50% of the observed antennas were pointing to the Brisbane North West site and the remaining were either pointing to the main Brisbane (Mt Coot-tha) site or the Darling Downs site. In Kilcoy, the majority of observed antennas were installed at 10 m above the ground level and in Toogoolawah a similar proportion of antennas were installed at roof height (nominally at 5 m) and 10 m above the ground level.

In Esk, household antennas were predominantly UHF antennas at roof height (nominally at 5 m) pointing to the Esk site, as predicted. Mount Hallen is a rural area and only very few household antennas were visible, with most pointing to the main Brisbane (Mt Coot-tha) site and a few to the Esk site. In Mount Hallen area a number of dish antennas were also observed.

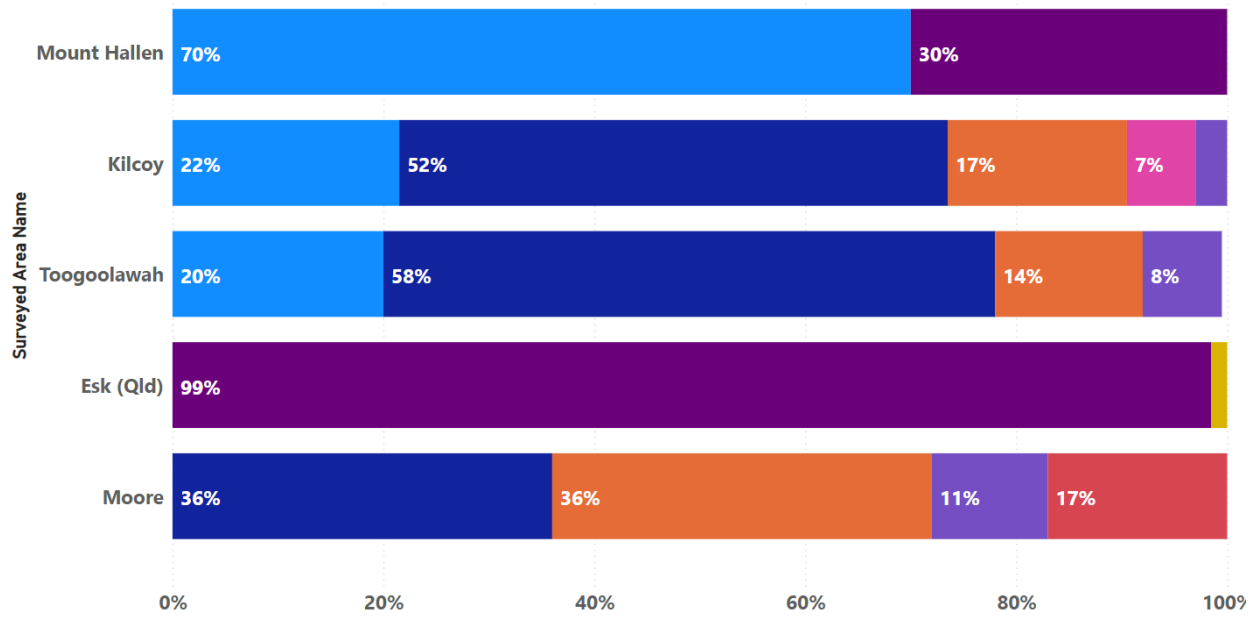
Figure 18: Survey results overlaid on the coverage prediction plot – Brisbane North West and Esk areas. Coverage prediction background colour legend: **Yellow** – Brisbane (Mt Coot-tha), **Blue** – Brisbane North West and **Red** – Esk



Legend

- No visible antenna
- Brisbane Tx and Esk Tx
- Brisbane Tx and Darling Downs Tx
- Brisbane Tx and Brisbane North West Tx
- Esk Tx
- Darling Downs Tx
- Brisbane North West Tx
- Brisbane Tx

Figure 19: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area – Brisbane North West and Esk areas



- Brisbane Tx
- Brisbane North West Tx
- Darling Downs Tx
- Esk Tx
- Brisbane Tx and Brisbane North West Tx
- Brisbane Tx and Darling Downs Tx
- Brisbane Tx and Esk Tx
- No visible antenna

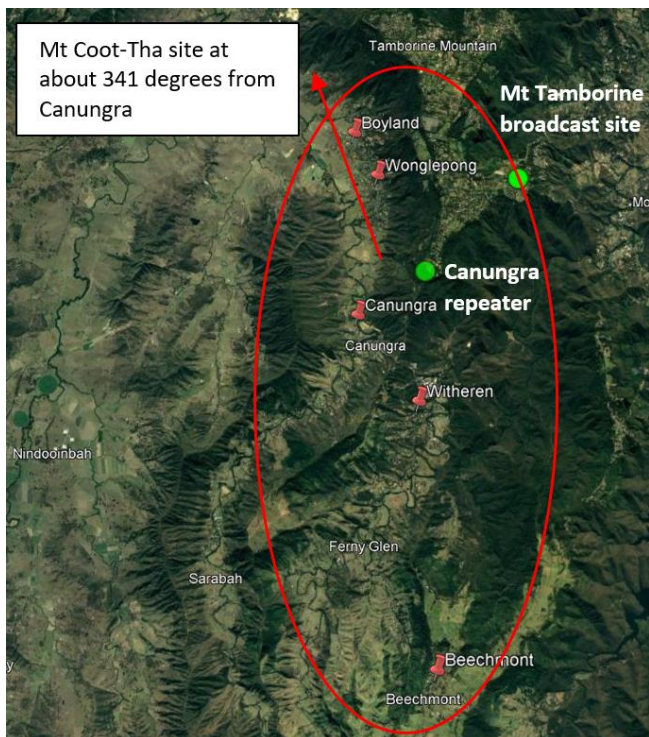
6. Canungra area

Overview

The main Brisbane (Mt Coot-tha) site is located about 64 km in the north-west direction from the Canungra repeater and it is predicted to provide generally variable coverage in the area around the repeater. It is also located around 4 km from the Gold Coast (Mt Tamborine) site. The Canungra repeater (operating in UHF on Block B) is located on Laheys Lookout, Mount Tamborine, and its goal is to provide coverage in the surrounding areas where the reception from the main Brisbane (Mt Coot-tha) and Gold Coast (Mt Tamborine) sites may be deficient particularly due to obstructions caused by hilly terrain. The repeater operates on Block B and the services were planned on the basis that they would be protected to within suburban level reception against interference from other broadcasting services

The survey area for this site is shown in Figure 20. The area was identified using the best server approach, that is, identifying areas where the local repeater provides strongest signal compared to the main Brisbane (Mt Coot-tha) site and Gold Coast (Mt Tamborine) site. The survey areas comprised a mix of residential and rural areas, and while residential areas were generally easy to survey, the rural areas were generally more difficult to survey due to limited visibility of the antenna systems. A total of 5 suburbs/local areas were surveyed with an overall sample size of around 295 antennas counted.

Figure 20: Repeaters (green dots): Gold Coast Southern Hinterland (Springbrook) repeater, Currumbin repeater; survey areas (red pins in ovals)



Survey results

Survey results for the Canungra areas are shown in **Error! Reference source not found.** and are overlaid on the best server plot. The actual percentage breakdowns

corresponding to the results in Figure 21 are presented in Figure 22 **Error! Reference source not found.**

In Boyland and Wonglepong, more antennas were VHF antennas installed at roof height (nominally at 5 m) pointing towards the main Brisbane (Mt Coot-tha) site. In Canungra and Witheren majority of the antennas were UHF antennas installed at roof height (nominally at 5 m) pointing towards the Canungra site. Beechmont is a small rural area, due to the rural setting and trees only few antennas were visible. The observed antennas were UHF antennas installed at 10 m above ground level either pointing to the Canungra site or the Gold Coast site. From Beechmont, the Gold Coast site and the main Brisbane (Mt Coot-tha) site are in similar direction and some VHF/UHF combination antennas were observed pointing in that direction.

Figure 21: Survey results overlayed on the coverage prediction plot - Healesville, Marysville and Warburton. Coverage prediction background colour code: Yellow – Brisbane (Mt Coot-tha), Green – Gold Coast (Mt Tamborine), Red - Canungra, Purple – Gold Coast Southern Hinterland

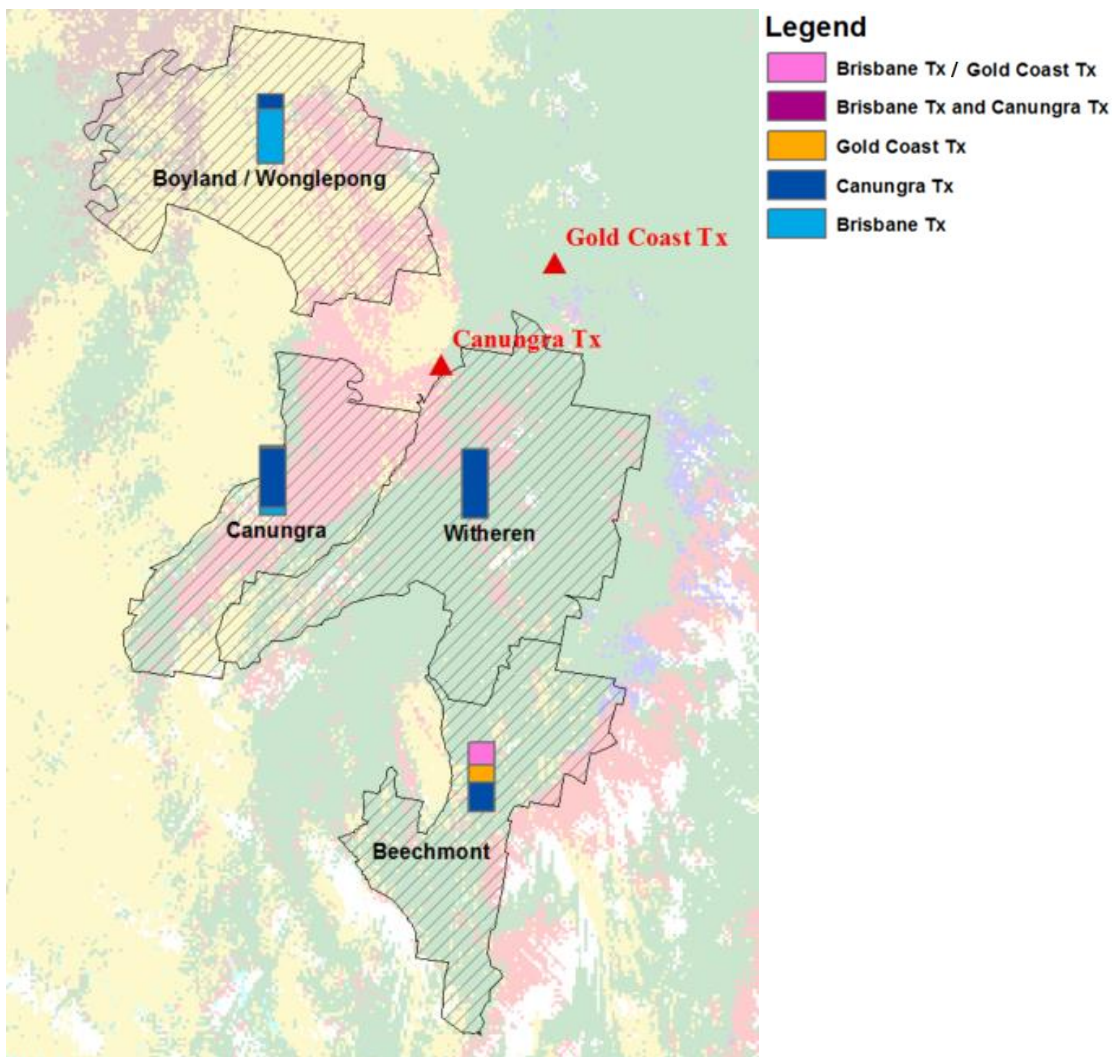


Figure 22: Percentage breakdown (rounded to the nearest percent) for each suburb in the survey area - Canungra area

