

Appendix III: Definition of the Digital Preferred Service Area

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Introduction

The introduction of any new service within spectrum occupied by the six main multiplexes will result in a loss of predicted gross coverage. However, as in many areas there is significant overlap between stations if the loss of coverage was limited to these overlap areas there would not be any impact on net coverage.

Consequently, in determining the impact of new applications in interleaved spectrum on the coverage of the six main multiplexes, an understanding of what defines the coverage of a station and what needs to be protected is required.

The coverage of a station can be defined in many ways. An initial approach would be to assume that the viewer will continue watching the same station that they presently use to receive their analogue services. As such the definition for the analogue preferred service area (APSA) currently used for assessing damage to existing DTT and analogue networks could be used. However, with the reallocation and release of spectrum, coverage of stations in the digital network post DSO will differ slightly to that of the analogue network. Also, as 80 of the 1160 stations will offer three additional multiplexes it is likely that viewers, as they renew their existing aerials, will realign to the station offering the greatest number of multiplexes.

For this study, initially three methods were considered for defining the digital preferred service area (DPSA) of stations post switchover. Each of these methods assumed that with time there would be no connection to existing analogue usage.

1. A pragmatic approach based on viewers wanting to receive as many multiplexes as possible.
2. A semi-pragmatic approach aimed at providing at least a 3PSB service.
3. Providing the best possible PSB service irrespective of commercial multiplex coverage.

Of the three methods the second, the semi-pragmatic approach, has been adopted for this study. This definition of the DPSA ensures that 3PSB coverage is protected whilst recognising that viewers will attempt to watch a station that offers the greatest number of multiplexes.

Definition of the DPSA

The 'semi-pragmatic' approach, assigns a viewer to the station that provides the greatest number of multiplexes on top of a 3PSB service. It takes no account of nationality or region.

The DPSA is defined by the following rules.

Rule 1 - A pixel must have 3PSB coverage. 3PSB coverage being defined as PSB1, PSB2 and PSB3, being available at 70% of locations or better and for at least 99% of time from the same station.

Rule 2 - At any location (prediction pixel) 3PSB coverage may be predicted as being available from more than one station. In this case the pixel will be assigned to the station that offers the greatest number of multiplexes on the basis of the following steps.

1. If more than one station is available assign the service to the station providing the highest number of serving commercial multiplexes. In this case a serving commercial multiplex being one that is predicted to be available in at least 70% of locations and for at least 99% of time.
2. In the event that step 2 results in two or more stations having the same number of multiplexes available.
 - If six multiplexes are available assign the pixel to the station providing the highest availability for the worst performing PSB multiplex.
 - If fewer than six multiplexes are available assign the pixel to the station providing the highest availability for the worst performing commercial multiplex.

It should be noted that this method may result in some PSB relay stations not being assigned any coverage, Figure AIII-1.

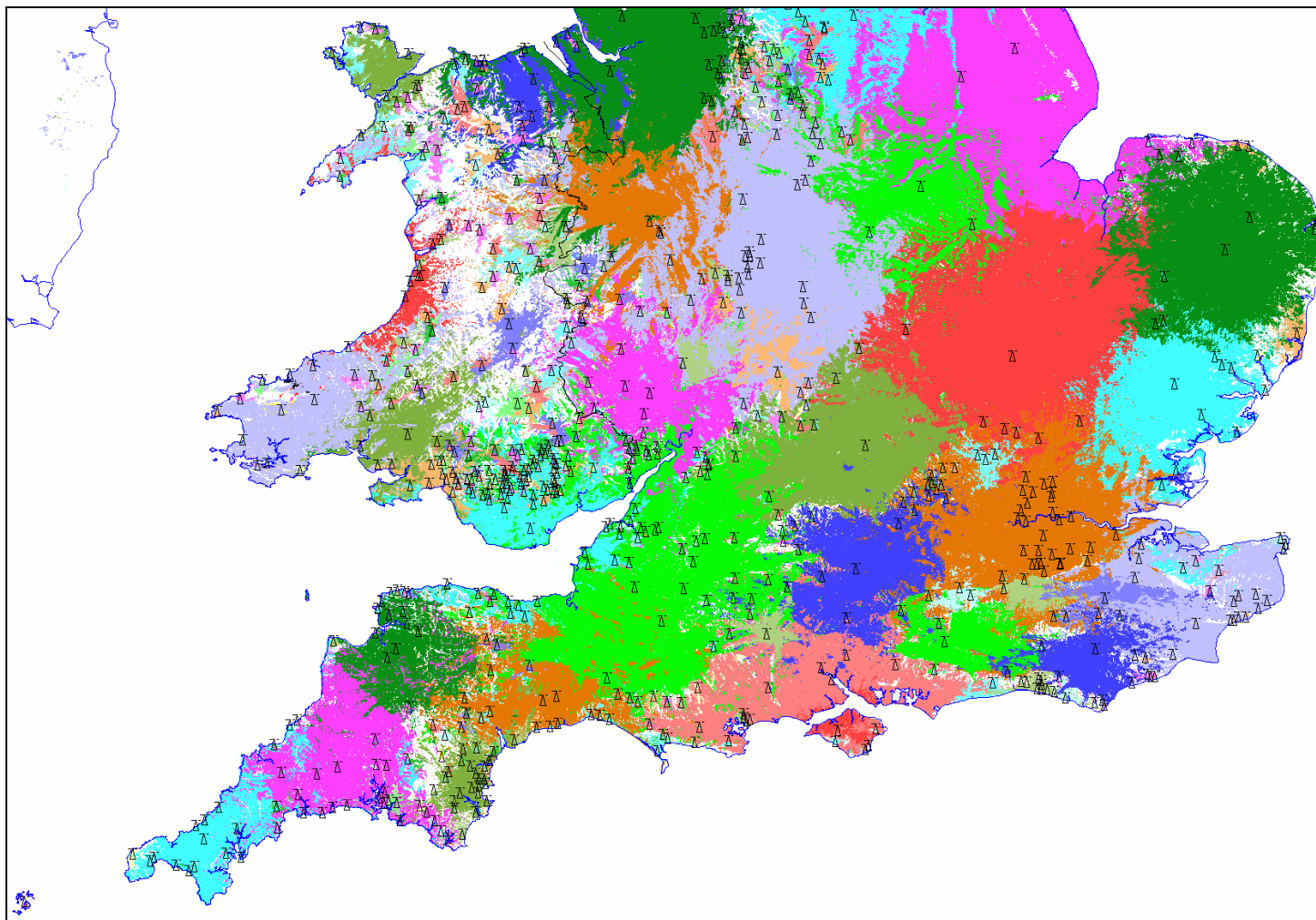


Figure AIII-1a : Overview of DSA Allocation

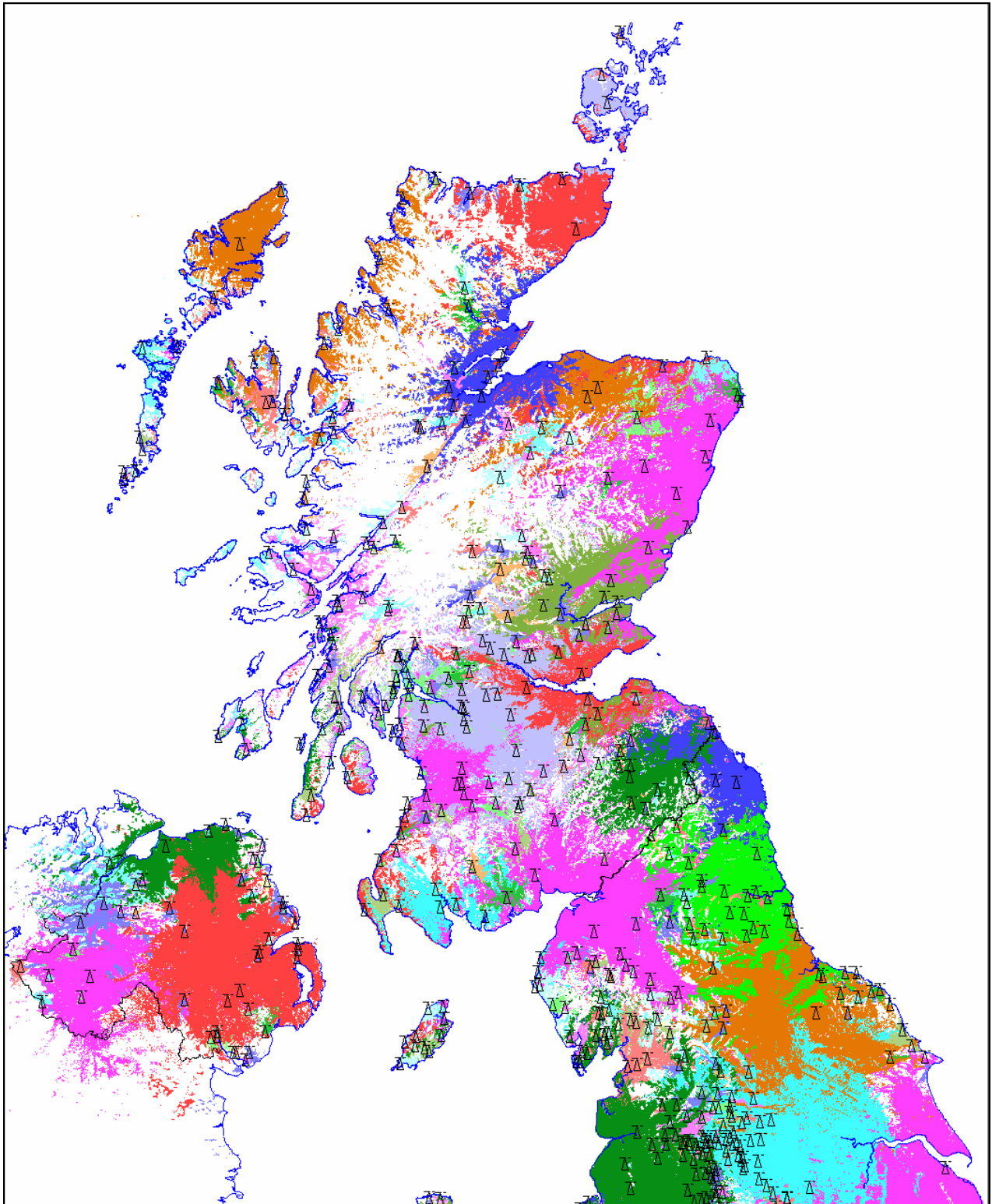


Figure AIII-1b : Overview of DSA Allocation

Discussion

The DPSA and its definition is a fundamental part of the method adopted for protecting the six main multiplexes. Analysis of the impact of the 71 interleaved channels has brought to light a number of improvements that could be made to the definition of the DPSA. Further work is required with respect to protection of coverage in the following areas.

- National boundaries
- Regional boundaries
- Duplicated coverage
- Protecting re-broadcast links

Apart from some small refinement to account for improvements in protecting coverage in the areas mentioned above, the use of the DPSA to define and hence protect coverage, coupled with the planning rules adopted, can be viewed as a success. Use of the DPSA has allowed interleaved channels to be planned at 71 stations with effectively no impact on the overall coverage of the main six multiplex network (see Appendix I).

National Boundaries

The definition of the DPSA does not recognise national or regional borders. Consequently, on a national level particularly between the Wenvoe and Mendip and the Moel-y-Parc, Storeton, The Wrekin and Winter Hill transmitters the DPSA whilst protecting the best available service may not match viewer choice, Figures AIII-2 and AIII-3.

In North Wales the DPSA assigns large areas, particularly along the coast to Winter Hill. Whereas this may well reflect viewer choice, it may not protect Welsh services.

A similar situation occurs in South Wales where large areas are assigned to Mendip. Again whereas this may reflect viewer choice it may not protect the Welsh services.

As with English stations being assigned coverage in Wales, Welsh stations are assigned coverage in England. Large parts of the Wirral and Liverpool are assigned to Moel-y-Parc rather than Storeton, The Wrekin or Winter Hill. Whereas this may represent the best service it probably won't reflect viewer choice and will not protect coverage of English stations.

A similar situation occurs in Somerset and North Devon where the DPSA assigns coverage to Wenvoe. In Somerset, Mendip may provide a service but in this area Wenvoe is assigned the coverage as it has a higher availability even though it is unlikely that viewers in this area would watch Wenvoe. The situation along the North Devon coast is a little different. Terrain and the fact Huntshaw Cross and Mendip COM multiplexes are co-channel means that coverage (DPSA) is

assigned to Wenvoe as either the best server or the station providing the greatest number of multiplexes. In areas where it is the station offering the greatest number of multiplexes it is possible that viewers will have receiving aerials aligned on Wenvoe.

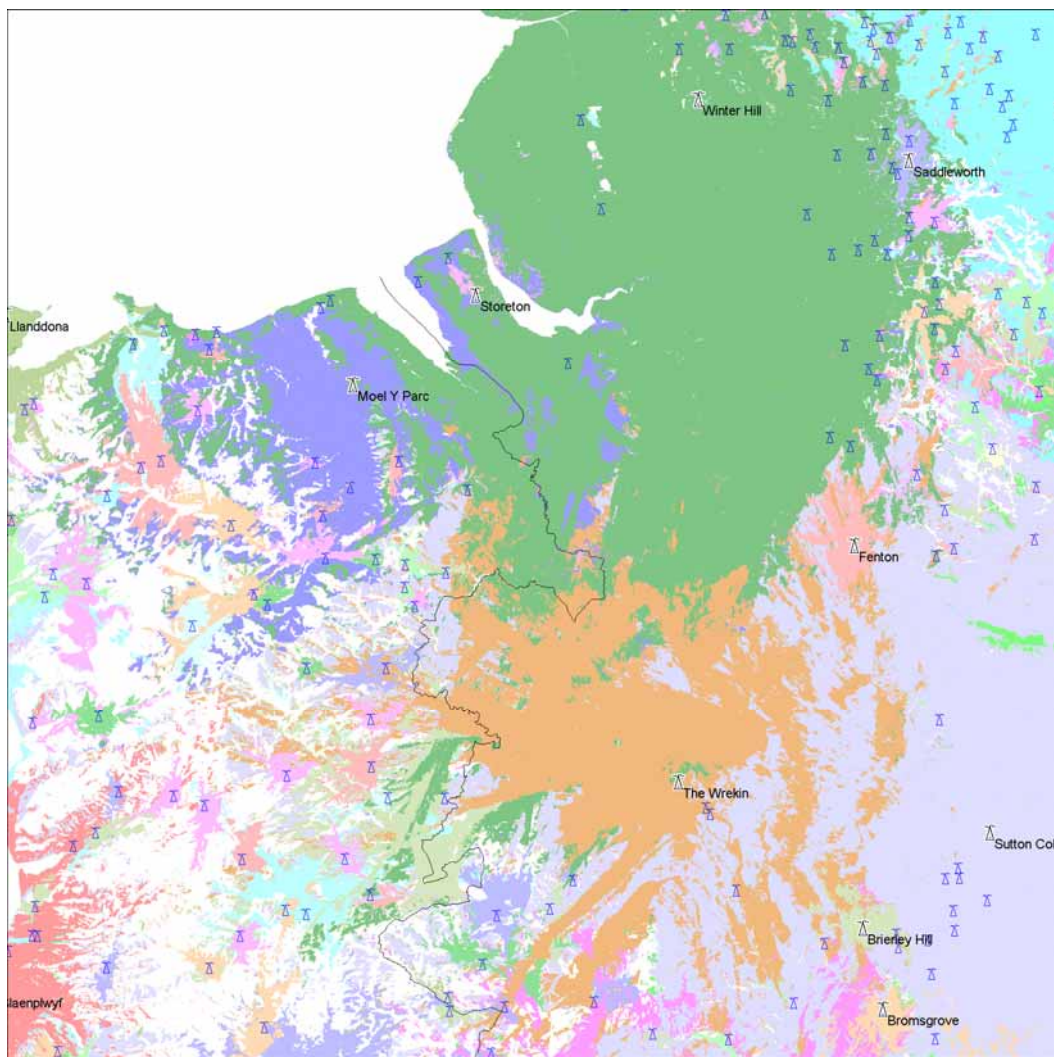


Figure AIII-2 : DPSA allocation North Wales

The DPSA definition needs to be refined to protect both the best service and the correct national service. This would ensure that English services from Winter Hill and Mendip are available in Wales, whilst protecting coverage from Welsh stations. Similarly in England it would protect Winter Hill or The Wrekin coverage in areas presently assigned to Welsh stations.

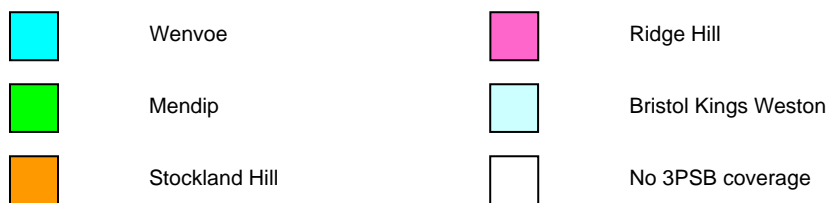


Figure AIII-3 : DPSA allocation South Wales

Regional Boundaries

A similar problem occurs on a regional level with stations having scattered coverage in areas where viewers wouldn't be expected to be watching a particular station.

Whether this scattered coverage is correctly assigned is a little more difficult to resolve and if incorrectly assigned can have a detrimental effect on the quality of an interleaved channel.

An example of possible incorrect assignment is the restriction on interleaved ch29 from Crystal Palace on a bearing of 300° ETN, Figure AIII-5 , to protect Waltham coverage in the village of Longborough (18 households), Figure AIII-4.

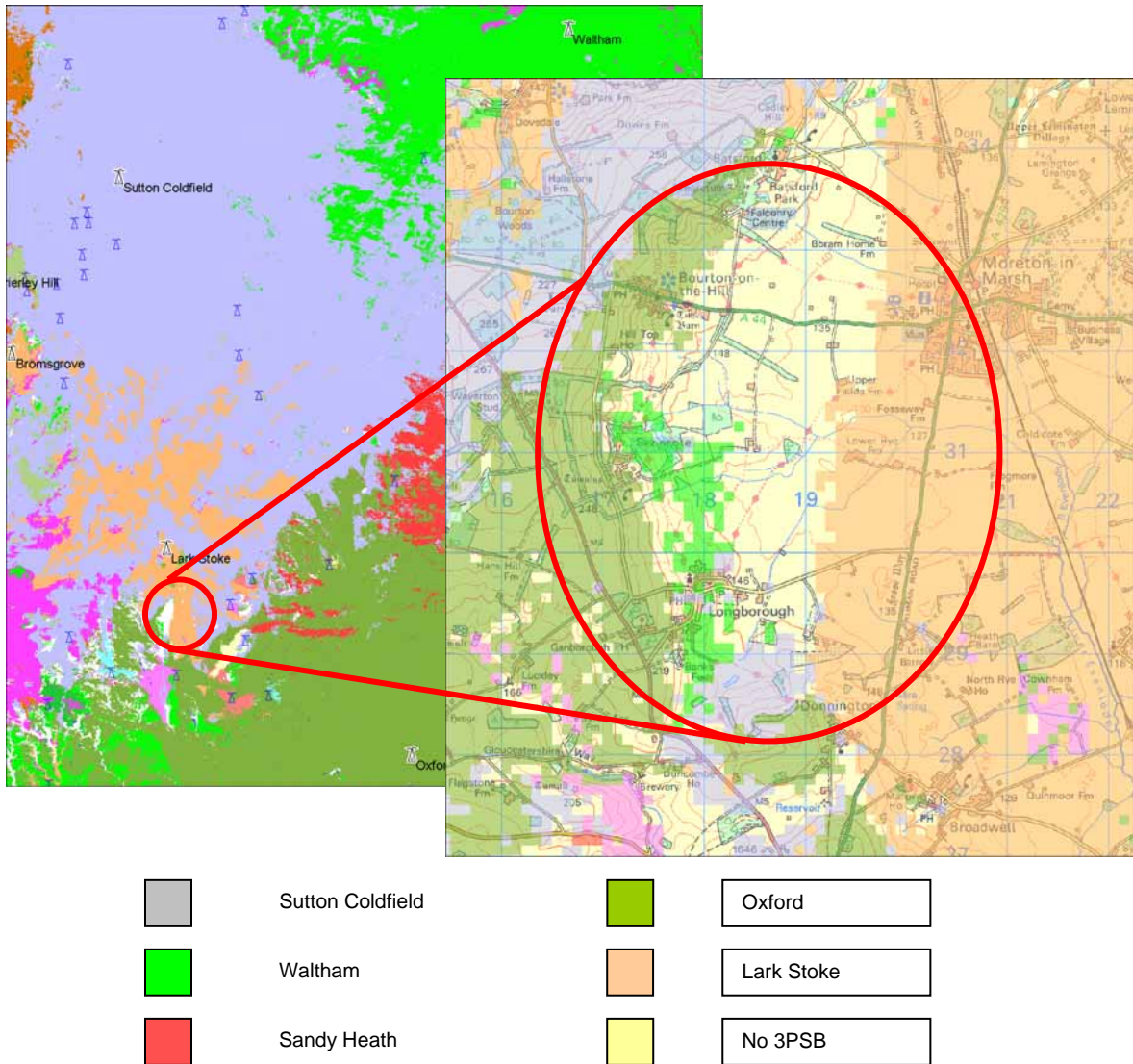


Figure AIII-4 : Waltham Coverage in Longborough

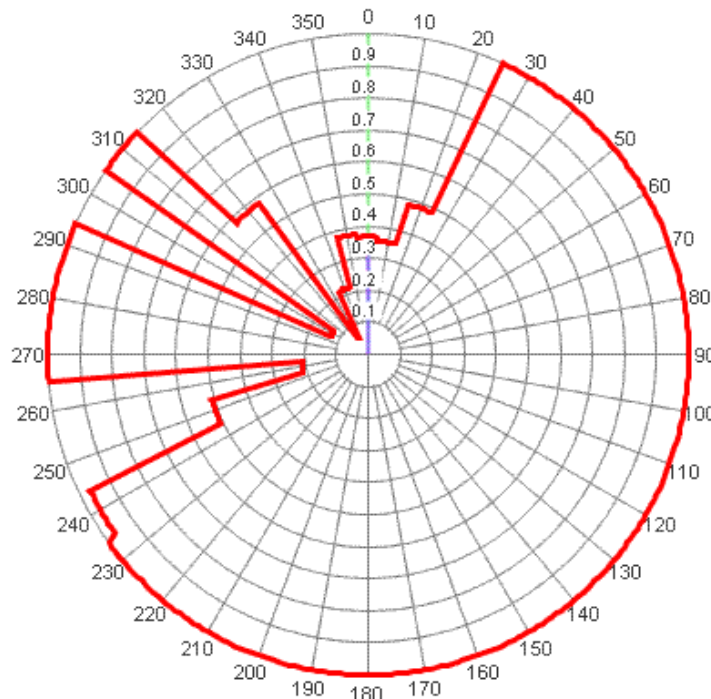


Figure AIII-5 : Crystal Palace Template ch29 @211m a.g.l. 10kW ERP

Presently, pre-DSO, the APSA assigns the area around Longborough primarily to Oxford with some coverage from Sutton Coldfield; both being stations you would associate with the area. With the re-assignment of spectrum and a change in the interference in the area, post DSO the DPSA assigns a small part of the area to Waltham as it provides a 3PSB service and the highest number of serving multiplexes. Coverage of Oxford in the area is limited by interference from the COM multiplex at Waltham on ch57 which is co-channel with a PSB multiplex at Oxford. In this case it is unlikely that the affected viewers would consider watching Waltham as Oxford and Sutton Coldfield are available in the area. Thought needs to be given as to how the DPSA definition can be refined to deal with such situations.

In refining the algorithm to better reflect regional choice care needs to be taken not to eliminate viewers that are watching stations in unexpected locations. Indeed it may be better to allow an experienced planner to judge whether a restriction is required or not. The following are examples of possible problems

- During the DTT equalisation programme, Ridge Hill COM services were put co-channel with Oxford analogue. At the time, according to predictions, no problems were expected. So it was with some surprise that the planners heard about a small community in the Forest of Dean that had lost coverage of Oxford. In this case the area affected was some 120km from Oxford, actually outside the prediction area. Local terrain precluded the use of Ridge Hill, the local station, primarily due to ghosting but allowed viewers an Oxford signal through a gap in the hills.

- Another example is Waltham coverage in the village of Bishop's Itchington. This village is well outside Waltham's nominal service area but there are current analogue viewers in the area and Waltham is predicted as providing a service post switchover, Figure AIII-6.



	Sutton Coldfield (SC)		Oxford (OF)
	Waltham (WBF)		Lark Stoke (LKK)
	Sandy Heath (SDT)		No 3PSB coverage

Figure AIII-6 : Waltham scattered coverage – Bishops Itchington

It should be noted that though viewers in Bishops Itchington are presently watching Oxford analogue, as Oxford (PSB) will be co-channel with Waltham (COM) ch57 post-DSO no service (DPSA) is assigned to Oxford. Waltham will be assigned a service in the area because though Oxford and Waltham are co-channel it is a Waltham COM service that is affected so 3PSB is available and a DPSA can be assigned to the station.

Duplicated Coverage

The DPSA assigns a viewer to a single station. As stations are differentiated by station number the DPSA as with the APSA doesn't protect services from the same station which have a different station number. Examples of this inability to differentiate between services are the Ridge Hill West multiplex radiated from Ridge Hill, the Storeton Welsh service from Storeton and any station with vertically and horizontally polarised components most notably Rowridge.

Ridge Hill West is a single channel (PSB2) service from station number 14930, planned to provide a West regional service from Ridge Hill, station number 14900, towards Cheltenham and Gloucester. Ridge Hill is a six multiplex main station associated with the Central broadcasting region. As Ridge Hill West is a single channel service it does not have 3PSB coverage and as such can not be assigned a DPSA. Even if dummy PSB1 and PSB3 services were created by duplicating Ridge Hill PSB1 and PSB3 coverage and assigning them to Ridge Hill West the DPSA algorithm would assign the service to Ridge Hill as it offers the greatest number of services. A method as with English and Welsh services for protecting at least two stations needs to be introduced into the definition.

A similar problem occurs with the DPSA definition with respect to stations with both a vertical and horizontal component. Though both components are radiated from the same station they are assigned different station numbers. Consequently the component that offers the best service is assigned to the DPSA and will be protected. The weaker component will not receive direct protection and may be impacted by an interleaved channel. At Rowridge the vertical component prevails over the horizontal.

Protecting Re-broadcast Links

The main six multiplexes are broadcast from a little over 1100 sites. 80 of these sites are line fed the majority of the others receiving their programme feed off air from main stations or other stations, the parents, in the distribution chain. These off air feeds, re-broadcast links (RBLs), are an economic way of distributing programmes across the network. Interference to an RBL feed to a station will affect all of the population served by that station.

At the location of any station the present definition of the DPSA combined with the planning rules probably does not provide protection for RBLs. The DPSA at the location of the station may not be assigned to the parent and there may not be population at the location.

To protect RBLs the DPSA for the location of the station should be forced to the parent of the station and as the planning rules only protect populated location a population should be assigned (1 household) to each station¹.

¹ Population is presently based on residential addresses. In future the JPP plan to adopt both residential and business addresses – as such transmitting stations should qualify as business addresses.