Banbury Radio Station

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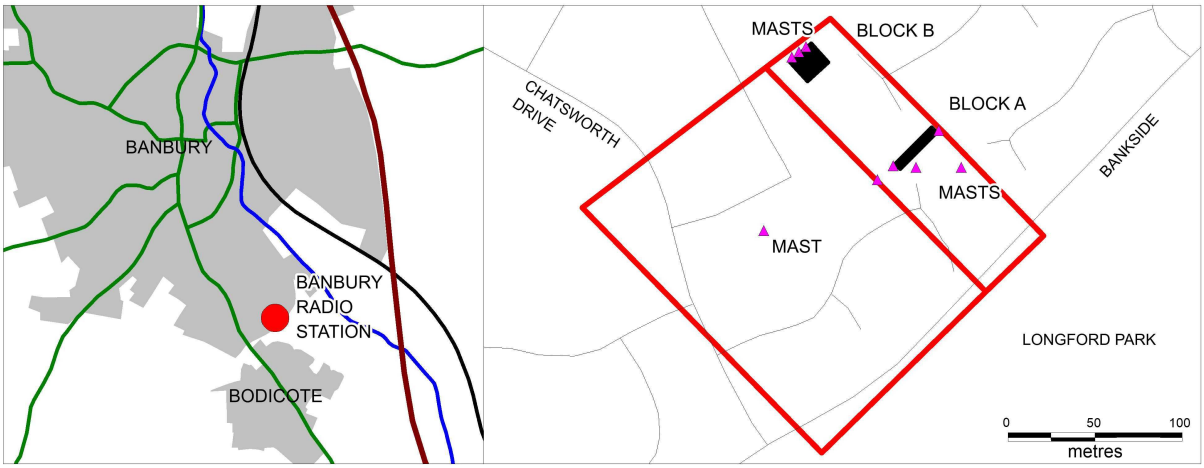
Banbury Radio Station was located at Bodicote Grounds Farm (OS NGR 446365 238875) with the site initially covering 2 acres (0.8ha) which was later extended to 8 acres (3.25ha). An access track to both the station and the farm ran north east from the Oxford Road (A4260), the station buildings being approximately 380m north east from the road and 200m south west of the farmhouse. The later 8 acre site included a small field immediately to the south west of the station buildings where there was a mast (OS NGR 446304 238802) and aerial array, several other masts were located within the curtilage of the station buildings. Prior to 1932 the site lay within the Civil Parish of Bodicote but on April 1st of that year it became part of the enlargement of Banbury and is now covered by housing constructed in the 1970s.



Location map and basic plan of Banbury Radio Station during the post-WWII period.

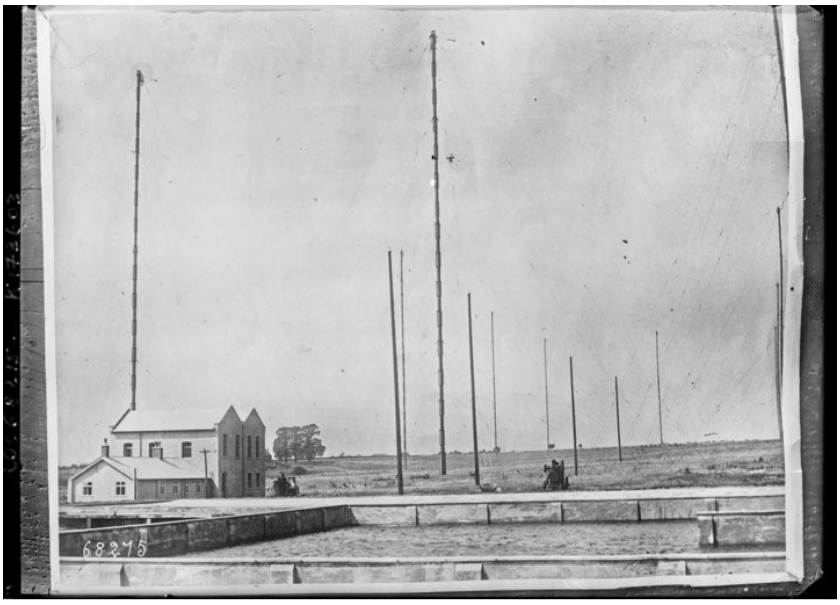
Banbury was constructed in 1921 initially as the long-wave receiving station for the first link of the post-WWI revived Imperial Wireless Chain, but was used only occasionally after the late 1920s due to technical advances that led to the closure of the long-wave link with Cairo. During the pre-WWII period it was mainly referred to as ‘Banbury Wireless Station’. Banbury and the Imperial Wireless Chain transmitter at Leafield, 4.5 miles north west of Witney, were often referred to as the ‘Oxford Station’ in the 1920s. In 1940 it was used by staff evacuated from the GPO (General Post Office) Radio Laboratories at Dollis Hill, wartime references to the site use ‘Banbury Radio Station’. After WWII the site was used for radio monitoring and by the early 1950s it became ‘Banbury Radio Measuring Station’ to assist the implementation of international radio plans.

The Post-WWI Imperial Wireless Chain Receiving Station

The Imperial Wireless Chain was conceived by Marconi’s Wireless Telegraph Company in 1910 but due to much political wrangling construction work did not commence until late 1913 into 1914. The scheme aimed to provide diplomatic and commercial communications across the British Empire by wireless. At this time communications relied on cable links that were seen as potentially vulnerable and costly, wireless offered an alternative. In January 1915 all work on the scheme was halted following the outbreak of war in November 1914; however, a number of other countries, including the United States and Germany, continued to implement similar schemes throughout the war and as hostilities ended Britain was at a disadvantage.

A conference attended by representatives of the GPO, the War Office, the Admiralty and staff from the Marconi Company was held in March 1912, with one of the main discussions relating to the

choice of a site for the British stations.[1] To avoid interference to shore stations, the Admiralty wanted the transmitter as far away as possible from the coast, the War Office did not want anything in the eastern part of the country due to defence considerations. Wales was unsuitable geographically and no land was available on Salisbury Plain, an area that had been previously suggested by the GPO. The location chosen for the receiving station for the pre-WWI scheme was at Morgan's Hill close to Devizes in Wiltshire. The site was referred to as 'Devizes Wireless Station' although it was located in the nearby parish of Bishops Cannings. The transmission side of the wireless link was at Langley near Leafield in Oxfordshire, generally referred to as the 'Leafield Wireless Station', the first link of the chain being between Britain and Egypt with similar receiving and transmitting sites under construction near Cairo (Abu Suier and Abu Zabal).[2] Transmitters and receivers were located on separate sites to allow duplex operation i.e. the ability to send and receive at the same time. Due to the cancellation of the Marconi contract after the outbreak of war Devizes, Leafield and the Cairo stations were left incomplete but were utilised for military purposes during the conflict.



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Leafield Wireless Station, transmitter site for the Imperial Wireless Chain.

The receiving site at Devizes had six 300 foot masts in place when the Royal Engineers took over the site in 1915, the linear arrangement of masts would have been capable of supporting an aerial some 2300 metres in length, plans for the Imperial Wireless Chain aerial systems exist in The National Archives and date back to May 1912.[3] The army constructed a receiving station of wooden huts clad with corrugated iron at the centre of the line of masts, a seventh 300 foot tower may also have been constructed at this time, and the site became a base for radio interception and intelligence.[4] After the war the GPO took on the site and ran a highly successful maritime communication station until 1929 when it was abandoned in favour of new locations at Highbridge and Portishead, together known as 'Portishead Radio' which closed in 2000.[5]

With the Devizes site operating as a maritime station for the GPO, and interest in the revival of the Imperial Wireless Chain soon after the war, a new location was required for the receiving part of the link with Egypt. The specific reasons why Banbury was chosen are uncertain and there are a number of factors that could have ultimately favoured the choice of a 2 acre site at Bodicote Grounds Farm. Wireless experimentation and advances in technology had continued through WWI and with it improved understanding of the technical and physical requirements of a wireless station.

The transmitter and receiver sites at this time required separation due to the high power of the transmitted signal which contained spurious harmonics and other sources of ‘noise’, duplex operation required minimal interference to the receiving frequency. Interference to the receiver could potentially create significant difficulty in picking up the comparatively weak signal from the Egyptian transmitter.

The very low frequencies (VLF) transmitted tend to propagate as a ground wave following the curvature of the earth with a vertically polarised wave front that effectively dips towards the earth rather than following a straight line into space. Reflection from the lower part of the ionosphere can occur at night and the waves may travel extremely long distances due to the earth’s surface and lower ionosphere effectively creating a waveguide.

High magnitude radio waves from a high power transmitter are required to communicate reliably to the sort of distances required by the Imperial Wireless Chain (approximately 2000 miles) especially during daylight. Due to the very long wavelengths transmitted (several thousand metres), aerial systems are inefficient because they are electrically short and close to the ground, a resonant vertical aerial of high efficiency would need to be a quarter wavelength in height which is completely impractical. As a consequence, a significant amount of energy is lost in the transmitter aerial/ground system. The pre-WWI transmitter at Leafield Wireless Station was initially intended to be a 300kW Marconi spark-gap system but the post-war transmitter installed for the GPO was a 250kW Elwell-Poulsen arc system operating at 12,350 metres (24.3 kHz) in the very low frequency (VLF) radio band.[6] The spark transmitter was considered dated and inferior to the arc system at this time, although both systems had the potential to cause considerable amounts of interference. Leafield’s arc transmitter was certainly causing problems to wireless receivers within Oxfordshire, Hansard records that jamming by the transmitter was discussed in a House of Commons sitting in August 1924, alterations to the transmitter circuit at this time had apparently made a considerable improvement.[7]

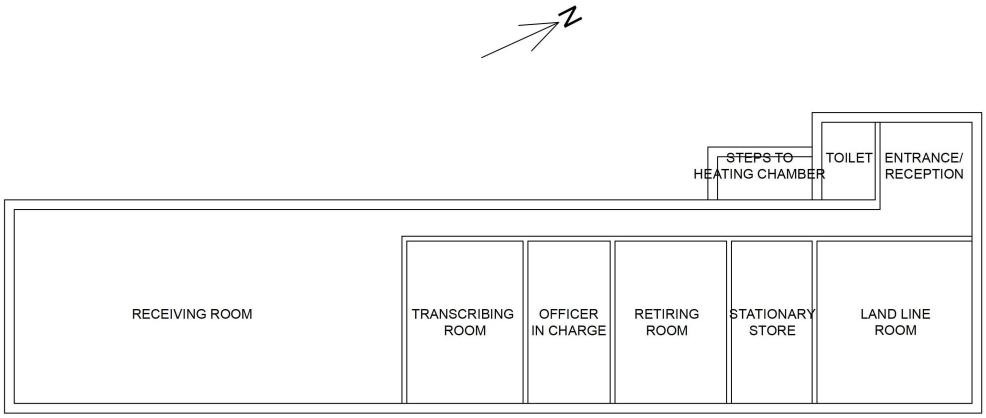
Marconi believed that certain aerials had directional properties that could be exploited to effectively create gain to the transmitted or received signal in the required direction, the orientation of the line of masts at Devizes and at Leafield was close to the great circle path to Egypt in order to exploit a small amount of gain from the long wire ‘inverted L’ type aerial. At right angles to the alignment of the aerial, the radiated power was thought to be lower and signals received from that direction weaker, a property that could be exploited where interference is a problem. An imaginary line joining the aerials at Leafield and Devizes forms a right angle with their alignment, this angle was important enough to be shown schematically on the Marconi’s Wireless Telegraph Company plan of the Devizes site which lies to the south west of Leafield.[8] The schematic Board of Trade plan[9] from 1912 also indicates this geometrical relationship between the transmitter and receiver sites. Banbury Wireless Station was also located at a right angle with Leafield, with respect to the great circle path to Egypt, but to the north east. A line joining the Devizes and Banbury sites is 52 miles in length and passes through Leafield! It is, therefore, considered highly likely that this was a very significant consideration when selecting Bodicote Grounds Farm in order to limit the potential for interference to the receiving station from the transmitter at Leafield. It does, however, appear to be a very literal interpretation of the 1912 plan at a time where technological improvements in receiver and aerial design were likely to be far more significant. The distance between transmitter and receiver sites is also important to minimising interference, the 1912 plan infers a minimum distance of 12 miles, Banbury to Leafield is approximately 17.5 miles. Other factors to consider regarding the location of the station include access to the telegraph cable network, particularly underground trunk lines linked to London, access to housing and transport links.

There is no evidence that Banbury used a receiving aerial with anything like the dimensions of the 2300 metre long system intended for Devizes. Such a large aerial system would potentially have

picked up considerable amounts of electromagnetic noise, both natural and man-made, which could have resulted in difficulties in receiving the required signal from Egypt. The development and improvement of wireless technology during WWI, particularly related to thermionic valves, allowed the production of receivers with greater sensitivity and selectivity which could be used with smaller more directional aerials to improve the signal to noise ratio of the intended long-wave signal. The aerial system in use at Banbury during its operation as part of the Imperial Wireless Chain is uncertain, although a number of masts are mapped in the 1960s, these may well relate to later use of the site. The receiver type is also uncertain although it is possible that it was a bespoke GPO design.

Regardless of the factors involved in locating a suitable site, the land must be available. The pre-WWI scheme relied on the use of Crown Land at no cost to the government. In 1920 The Banbury Guardian[10] advertised the sale by auction of 'Live and Dead Farming Stock' at Bodicote Grounds Farm by Miller and Abbotts on September 27th 'by direction of Mr George Savins who is declining farming'. Presumably the land also became available around this time and was leased by the GPO. An interesting piece regarding 'Joy-Flying Over Banbury' was published in The Banbury Advertiser also in September 1920 about 10 days before the auction. A field at Bodicote Grounds Farm was used for Banbury's first 'Aviation Week' organised by the Berkshire Aviation Company, part of the temporary flying field becomes the site of Banbury Wireless Station a year or so later. Large crowds gathered and many people took up the opportunity to fly, the airmen gave a display of various stunts and 'walking on the wings'.[11]

The post-WWI Imperial Wireless Chain stations were to be constructed to building plans drawn up by the GPO. At Banbury the initial construction appears to have been a receiving building about 100 feet (30.5m) long and 20 feet (6m) wide along much of its length with an additional entrance and reception area of 15 feet (4.5m) by 9 feet (2.7m) protruding slightly towards the north west at the north eastern end of the building, forming a somewhat L shaped plan[12]. The south western part of the building contained the *Receiving Room* which was 40 feet (12.2m) in length and this could be reached by a corridor that ran along the western side of the building from the entrance and reception area. The sequence of other smaller rooms to the north east of the *Receiving Room* are as follows: *Transcribing Room, Officer In Charge, Retiring Room, Stationary Store* and *Land Line Room*. Immediately north west of the latter is the reception area, entrance and toilet. The north eastern end of the building also contained a subterranean *Heating Chamber* accessed by a stair from the corridor. Later references to the site from the 1950s refer to this structure as 'Block A' with a somewhat larger almost square building about 70m to the north west as 'Block B', which is visible on aerial images dating to March 1948.



Block A building based on GPO plan 'For Imperial Stations Receiving Buildings' 1921.

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Banbury Radio Station Block A building, north west facing side, 21st August 1954. The original early 1920s building appears to have gained an additional porch compared to the original plan.

(Photo originally reproduced in Banbury Historical Society's Journal, Cake and Cockhorse Vol 27, 2025, with permission from BT Archives. Use the URL above to see the image.)

The site would also have contained a number of ancillary buildings relating to power generation and storage as well as masts to support aerial wires. Further research may reveal more detailed plans, Ordnance Survey mapping from the 1960s does show the site in some detail but undoubtedly numerous changes had occurred since the time of the Imperial Wireless Chain.

During the early 1920s Marconi was experimenting with high frequency short-waves and directional aerials that had significant advantages over the low frequencies widely used at this time. Short-waves can reflect off the ionosphere allowing communication over large distances at considerably lower power levels compared to long-wave transmitters. Communication links between Britain and remote parts of the empire could, therefore, be achieved at much lower costs and in addition, direct point-to-point services became possible which for some of the Dominions was considered preferable compared to a chain of communication.[13] The government had announced in 1923 the construction of a large long-wave transmitter, at Hilmorton near Rugby, that would address some of the concerns of the Dominions by being powerful enough to communicate directly rather than through a chain. Rugby Radio Station was constructed by the GPO and became operational in 1926 as the world's most powerful thermionic valve transmitter, using proven technology the long-wave signals could be received anywhere in world. By the mid 1920s Marconi Beam Stations exploiting short-wave communication were also under construction at a number of sites. Dorchester Radio Station became operational in 1927 with services to New York and South America, later in 1928 services to Japan and Egypt came into operation. Dorchester's receiving site was located at Somerton.[14] The long-wave service from Leafield became redundant ending the role of Banbury within the Imperial Wireless Chain which, mainly due to technological advances, was never completed.

Banbury Radio Station during WWII

Banbury was only occasionally used for fieldwork from the late 1920s until November 1940 when an evacuated group from the Radio Laboratories at Dollis Hill took over the site [15, 16.] There was concern that air raids could damage the Post Office Research Station at Dollis Hill and the decision was made to move some of the staff and equipment to safer areas. Of particular concern was crystal production, at this time quartz crystals were cut and ground to resonate at a precise and stable frequency for use in radio oscillators. Banbury became one of a small number of sites where crystal production was carried out. The process requires a very precise frequency standard and at Dollis Hill, Primary Standard Frequencies were available to the laboratories but due to transmission difficulties and cost these could not be transmitted to the distant crystal production sites. Banbury was, therefore, provided with a separate frequency sub-standard initially from a Marconi Type 482-C frequency measuring set that contained a 250kHz crystal oscillator, harmonic generator and synchronous clock, but in 1944 this was replaced by a Post Office 100kHz crystal oscillator.[17]

Post-WWII

Post-WWII, Banbury took on the role of radio monitoring in order to produce information that could assist in the preparation of frequency assignment plans. In 1947, at the joint International Telecommunication Conference and International Radio Conference in Atlantic City, the International Frequency Registration Board was created to act as an administrative body to regulate the use of frequencies by various types of radio services. Tables were produced for revised frequency allocations, frequency tolerances for new and existing transmitters, tolerances for harmonics and parasitic emissions and bandwidths required by different types of radio communication. In 1951 at the Extraordinary Administrative Conference in Geneva an agreement was made that effectively implemented the Atlantic City Allocation Tables voluntarily which ultimately meant that the UK had to find replacement frequencies for many of the existing radio services.[18] As a consequence, the station becomes 'Banbury Radio Measuring Station' with its function to study radio conditions over the long-term in order to assist planning and to provide monitoring information to assess the implementation of international radio plans.

Some general details of the site in the early 1950s are set out within *The Post Office Electrical Engineers' Journal*. The site covered 8 acres (3.24 hectares) of land at Bodicote Grounds Farm approximately 1 miles south east of Banbury. There were two main single storey buildings referred to as Block A and Block B and several small buildings. Block A was the original receiving building associated with the Imperial Wireless Chain and constructed in 1921, but internally it contained receiving rooms, a frequency standards laboratory and staff offices. Block B contained working and spare laboratories, a workshop and domestic offices. In February 1948 local newspapers[19] reported on proposals to extend the site from 2 to 8 acres with the construction of further masts and aerials, the additional 6 acres was land immediately to the south west of the existing site. It is possible that Block B building was constructed at this time, although it may have been associated with the wartime use of the site.

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Banbury Radio Station Block B building, south east facing side, 21st August 1954. The building may have been constructed as part of expansion during 1948 or possibly during WWII.

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Power was supplied by a three-phase 11kVA overhead power line with a transformer feeding 400V three-phase 50Hz current to the engine room switchboard. A 57 hp diesel engine driving a 37kW three-phase generator provided a back-up power supply. In addition, float-charged batteries provided a stable power supply to equipment generating the frequency standard. A small battery-driven converter supplied 230V at 50Hz to the thermostats within the frequency standard equipment in the event of a mains failure.

The aerials in use at the time consisted of a group of six inverted-Vs that were of wire construction with their centres attached to the top of a single mast located away from the buildings in the small field to the south. The aerials sloped down to short anchor posts and were spaced around the mast in order to exploit their directional properties. There were also six omni-directional aerials of various types located close to the buildings.

The receivers were described as a number of commercial communication receivers covering 50 – 30000 kHz and also Post Office single-sideband receivers covering 10 – 30000 kHz.

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Banbury Radio Station Block A building, main measurements room, probably the south west end of the building, 16th January 1957.

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Staff and links to the local community

It is likely that a number of staff through the post-war period were those who were evacuated from Dollis Hill in 1940. A newspaper article notes the death of James O'Brien who had been a Coldstream Guardsman during WWI and had retired from Banbury Radio Measuring Station with an Imperial Service Medal.[20] He had been evacuated from Dollis Hill in 1940, after his retirement he had been involved with teaching French to children in primary schools around the Banbury area with the aid of a tape recorder, part of a ten year teaching experiment by Oxfordshire County Council. His wife, Olydd, had been evacuated with a London primary school to Middleton Cheney and later became the headmistress of Mollington school (1955-1977). Another article celebrates the presentation of the Imperial Service Medal to Jim Cordell who had also been evacuated from Dollis Hill in 1940, he stayed at the radio station until 1967 when it closed and had given 40 years service to the GPO on his retirement.[21]

Occasional newspaper articles dating to the 1920s, when the station was the receiving end for the Imperial Wireless Chain, reveal several staff names and their association with events away from the site. A report with regard to the Grimsbury Brotherhood, records 'Mr Millett, of the Banbury Wireless Station, gave a most instructive address on the work, referring to its development and the difficulties that still needed to be overcome, and illustrating his remarks from his own experiences as a wireless operator in France during the war, Mr Gibbs, also of Banbury Wireless Station, supported Mr Millett.'[22] An article from 1923, reports on 'Post Office Officials at Dinner', this social gathering at the White Horse Hotel included a 'Mr J. A. Gallagher (in charge of the Banbury Wireless Station)'.[23]

Through the Bodicote History and Memories social media group local memories of the site relate mainly to the period after its closure up until its demolition in 1971. A staff photograph dating to the post-WWII period is reproduced with permission from Mark Bletchly who's father worked at the station. On the far right is Lionel Bletchly, immediately to his right is Ron Brain, back row 2nd from the left Jim Cordell and 5th from the left Bill Hitchman. Mr Hitchman was clearly well known to the Bodicote community as a 'Jack of All Trades', his activities included being the cook and gardener at Banbury Radio Measuring Station, he gave talks on fuschias, free shaves to old patients at Horton General Hospital, he was the chairman of Bodicote British Legion and had been secretary of Bodicote cricket and football clubs.[10]

Post-WWII staff at Banbury Radio Measuring Station (Block A building in the background).

Site Closure

The station closed in 1967 ahead of the expiry of the lease on the site in March 1968. However, in 1965 plans for a new station at Hornton were being prepared although this was never constructed, at the time there were 20 engineers working at the Banbury station.[25]

There is no physical trace of anything related to the station, the site was demolished and built over for housing only a few years after its closure. Historical information is patchy and as an Imperial Wireless Chain receiving site it has been largely overlooked, lying in the shadow of the transmitter at Leafield. There has been little interest in the protection of early wireless sites as heritage assets, yet they represent an incredible advancement in technology that forms the basis of the high-tech world we live in today. The sites often contained the most cutting-edge technology of the day and heralded profound changes to society often to remote or very rural parts of the country.

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