Conservation Management Plan
for
RAF Limavady Trainer Dome

Binevenagh and Coastal Lowlands Landscape Partnership Scheme

Hamilton Architects | August 2019

Contents

1 Executive Summary

The RAF Limavady Trainer Dome is WW2 structure located in Aghanloo, a small village north of Limavady. The structure is in private ownership and is a scheduled monument (SMR Number LDY 009:048). The Dome has been included as a Training Site in 'The Northern Ireland Defence Heritage Project Database' as an acknowledgement of its architectural and historical significance.

Trainer Domes are a particularly rare military building typology, with only six remaining in the UK. They represent a significant period in our history when sites across Northern Ireland were under threat from invasion and aerial attack. The RAF Limavady Training Dome is of particular interest as it is the only one remaining in Northern Ireland.

The structure is an unusual and noteworthy landmark in the landscape and is one of over 30 structures remaining from the now defunct RAF Limavady Airfield. The structure is now located in an agricultural field and is currently being used as a temporary stable. The structure is in a relatively poor condition and is at risk of being lost if action is not taken. The Trainer Dome's survival and unusual appearance presents an opportunity for the structure to become a focal point in telling the story of how Magilligan played a vital role in the defence of Britain during WW2.

This Conservation Management Plan forms part of a group of Conservation Management Plans for defence heritage structures prepared for Binevenagh and Coastal Lowlands Landscape Partnership Scheme in August 2019.

Figure 1 - The RAF Training Dome from the west – 31/05/2019

2 Introduction

2.1 The RAF Limavady Trainer Dome Conservation Management Plan has been compiled by Hamilton Architects on behalf of Binevenagh and Coastal Lowlands Landscape Partnership Scheme. It was written following the format of the National Lottery Heritage Fund Guidance document, *Conservation Plan Guidance* dated October 2012. The Plan was commissioned to inform the sensitive and appropriate development of the site with the aims of:

- understanding of the significance of the RAF Limavady Trainer Dome, its setting, context and links to other defence heritage structures in the region;
- understanding of the architectural importance of the structure;
- understanding of the risks and opportunities associated with the development of the site;
- developing policies and recommendations to conserve and enhance the special architectural, historical and political significance of the building;

and

- meeting the projected outcomes of the National Lottery Heritage Fund including involving a broader range of people in heritage, improving the condition and understanding of heritage assets and developing heritage skills within the local community.

2.2 A Conservation Management Plan is a document which explains why a site is significant, to whom it is significant and outlines policies to help inform decision making to ensure the significance will be retained in any future use, alteration, development or repair. The RAF Limavady Trainer Dome Conservation Management Plan illustrates this.

The plan also illustrates proposals for the interpretation of the site to help meet National Lottery Landscape Partnership Scheme Outcomes for communities, people and heritage. These proposals have been costed and are prioritised in an action plan.

2.3 The RAF Limavady Trainer Dome Conservation Management Plan sets out to:

- understand the historical and architectural context of the structure;
- to assess its significance and contribution to the heritage of Magilligan and Northern Ireland;
- to record its features and condition;
- to identify risks and threats to its significance;

and

- to explore opportunities to enhance the significance through site improvements and interpretation.

The principles and policies outlined in Section 6 provide a framework for the future management of the Trainer Dome in order to preserve and/ or enhance that significance. They should also be used to guide any future development of the site in order to mitigate against any potential adverse impact on the setting of the Trainer Dome.

2.4 The preparation of this report has followed a process of research, analysis and discussions with key stakeholders and consultants including:

- Andrew Bratton — Binevenagh and Coastal Lowlands Landscape Partnership

- Richard Donaghy — Binevenagh and Coastal Lowlands Landscape Partnership
- Gerald Millar — Owner, RAF Trainer Dome
- Gail Mahon — Blowe Studio, Artist
- James O Neill — Ulidia Heritage Services
- Causeway Coast and Glens Defence Heritage Committee
- Tiziana Meciana — ByrneLooby – Conservation Engineer
- Dimitrious Velesiotis — ByrneLooby – Conservation Engineer
- Gareth Davis — R. Davis & Co – Quantity Surveyor
- Binevenagh and Coastal Lowlands Defence and Historic Environment Advisory Group

3 Understanding the heritage

3.1 Location and context

Magilligan Point is a geographically unique site on the tip of the River Foyle estuary characterised by one of the largest sand dune systems in the UK. The site has numerous statutory designations including the following:

- Magilligan Point Nature Reserve
- Magilligan Area of Special Scientific Interest
- Magilligan Special Area of Conservation
- Lough Foyle Special Protection Area
- Binevenagh Area of Outstanding Natural Beauty

In addition to the above statutory designations, both the Magilligan Coast and Farmland Landscape Character Area and the Magilligan Village Plan have a bearing on the site.

3.2 Landscape character analysis

The Trainer Dome is located within the Western Binevenagh Slopes Landscape Character Area (LCA), one of six (LCAs) identified in the Binevengah Coastal Lowlands Landscape Character Assessment report, developed by Fiona Fyfe Associates in October 2018.

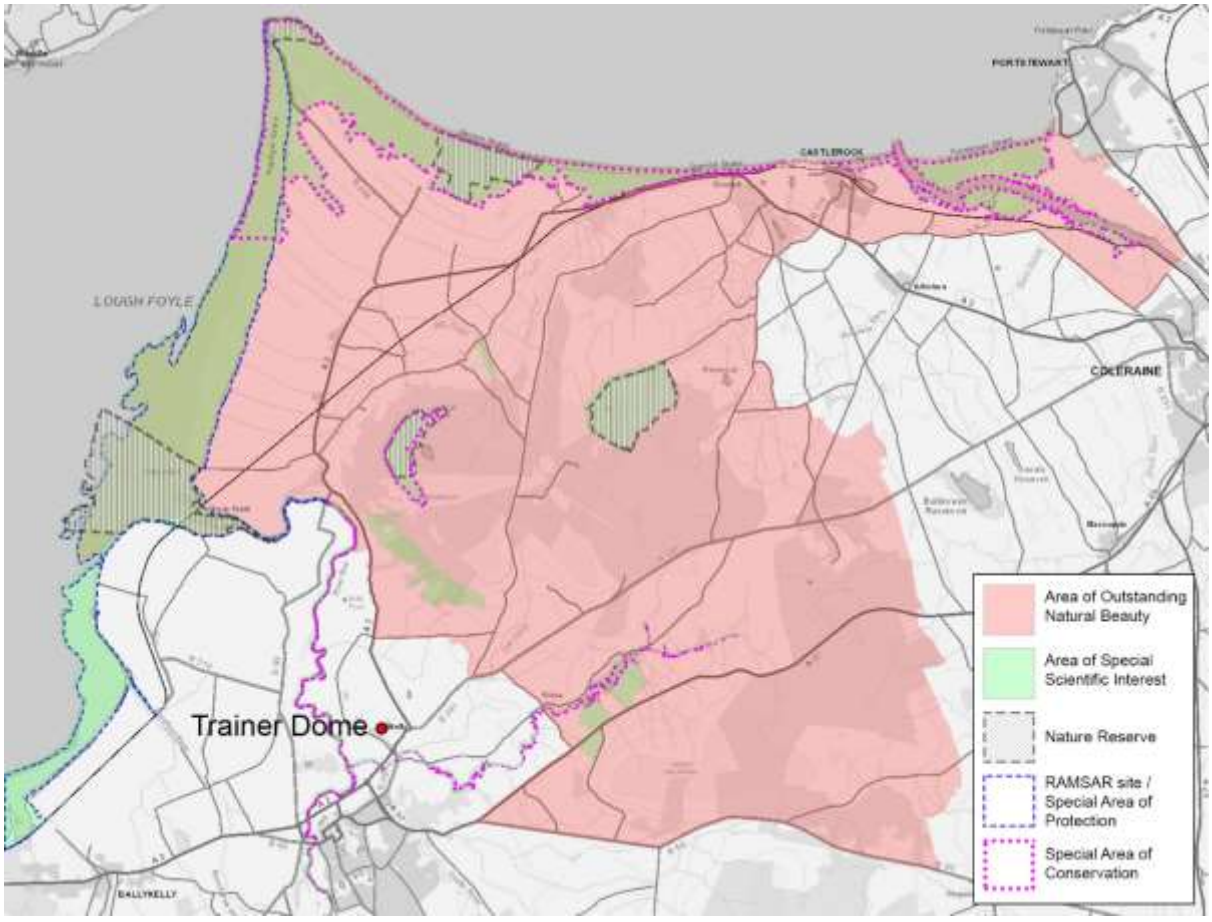

Figure 2 - Map showing site in relation to statutory designations

3.2.1 *Description*

The Landscape Character Area is largely characterised by a mix of farmland, woodland and small settlements which cover the western slopes of Binevenagh and Keady mountain. The site slopes down the west, from the Binevenagh uplands down to the complex of dune systems which comprises Magilligan Point.

The Trainer Dome is located in an agricultural field (refer to Appendix 9.1, Photograph 2) immediately north of the junction of Downland Road and Windyhill Road. The site was formerly Limavady Airfield and, while much of the site has been redeveloped, the approximate layout and location of the air strips remains legible within the landscape. There is a modest low-rise suburban housing estate to the south west and an industrial estate to the south east (refer to Figure 3). The site is accessed from the south via a small country lane (refer to Appendix 9.1, Photograph 5).

3.2.2 *Statutory Designations*

There are several Statutory Designations pertaining to the area as a natural asset. The Trainer Dome is located to the south west of the LCA in the village of Artikelly. It is located just outside the Binvenagh Area of Outstanding Natural Beauty, with the Lough Foyle Ramsar site and Area of Special Scientific Interest located to the west.

3.2.3 *The Limavady Airfield*

The Limavady RAF Trainer Dome is located within the former Limavady Airfield at Aghanloo two miles to the north of Limavady, County Londonderry. The Trainer Dome was located on the south area of the airfield, adjacent to the workshops, hangars, control building and ground signals (refer to Figures 8 and 9).

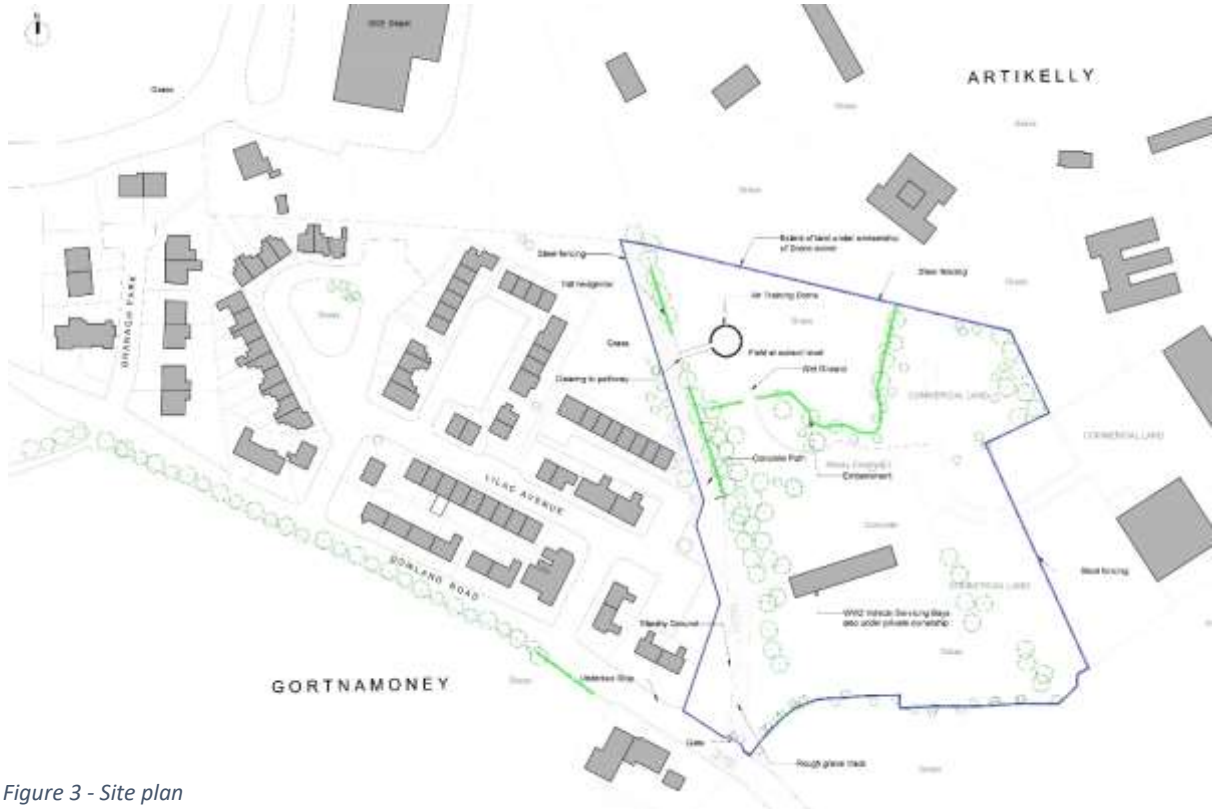

Figure 3 - Site plan

3.3 Historical development of the site

3.3.1 Prehistoric Magilligan

While there is considerable evidence of Mesolithic remains in the north-west of Northern Ireland, there is no evidence of this period to be found in the Magilligan area. This is due to the relatively young nature of the geology of the area which indicates that the area was probably submerged until the formation of the beach ridge plain, which appears to date from the mid-Holocene period. The gently curved nature of these ridge systems (which can clearly be observed in the sweeping strand of Benone Beach) has influenced the development of the field patterns in the southern section of the site. The greatest evidence of prehistoric human activity in the area broadly dates from the later Bronze Age and Iron Age, with a series of Bronze Age shell middens being uncovered in 1979, and the Iron Age Broighter hoard, discovered in 1896.

3.3.2 Medieval Magilligan

There is evidence of early Christian activity in the area including a monastery associated with St Colmcille which was founded at Duncrun of which no trace remains, however it is mentioned in the memoirs of the Ordnance Survey of 1835. Despite the evidence for several religious establishments, there is comparatively little evidence for settlement activity during this time, with just a few raths and shoreline middens scattered across the landscape.

It was probably during this time that the place name of Aird Mhic Giollagáin was applied to the area. Aird, or later Ard, denotes 'high place,' but it is not entirely clear if this refers to physical height of the Binevenagh peak or to the high-status of the monastery. The rest of the name refers to the area being the parish of the Gilligans – sometimes McGilligan or Magilligan – an Irish clan who continued to hold the area until the 'Flight of the Earls' in the early seventeenth-century, meaning that the twelfth-century Norman Conquest of Ireland had relatively little impact on the area.

3.3.3 Early military activity

From the late seventeenth-century the low-lying dunes were used as a rabbit warren, with thousands of skins being sold annually to hatters and which was reportedly one of the largest warrens in Ireland at of 1,500 acres. The construction of the Martello Tower at the tip of Magilligan point began in 1812 to protect the mouth of the Foyle from attack during the Napoleonic Wars, however it was not completed until 1817, two years after the wars had ended. While there is very little documentation of the early military history of Magilligan, a list of barracks in Ireland dated 1824-5 indicates that there was a permanent barracks located in the area at this time. It was also during this time that Lt Col Thomas Colby undertook the Foyle baseline survey, which helped

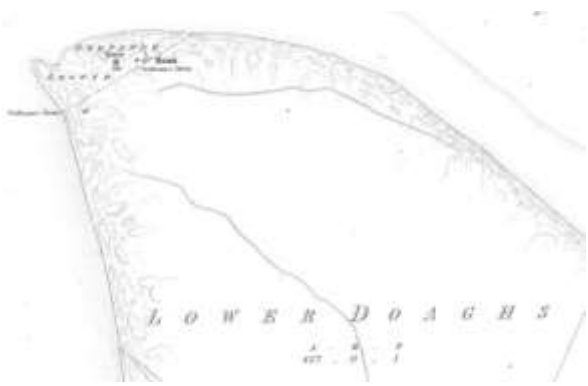

Figure 4 - Map of Magilligan Point c.1830 - Ordnance Survey 1st Edition

Figure 5 - Map of Magilligan Point c.1900 - Ordnance Survey 3rd Edition

create the most accurate map of Ireland at the time, with two of the original base towers used for the survey still surviving in the area.

The first edition OS map c.1830 indicates that the area of the Martello Tower was in use as Ordnance Ground with two 'Ordnance Stones' indicating the extent of an ad-hoc military encampment. The third edition OS map c.1900 indicates that, while still in use as rabbit warrens, a rifle range had been established on the dunes with a series of buildings scattered across the landscape, largely concentrated in the area that would develop into Magilligan Prison. This development corresponds with the onset of the Boer War and military activity continued to grow in the area over the early years of the twentieth century, being used primarily for training purposes throughout the First World War.

3.3.4 *WW2 and beyond*

With the use of the Irish treaty ports cut off and a considerable amount of US troops and supply convoys reaching Britain via Northern Ireland, the port of Londonderry became vital during the Battle of the Atlantic. This led to an increase in military activity in the area including the development of RAF Limavady in 1940 and RAF Ballykelly in 1941 as well as the establishment of a significant anti-aircraft battery was established at Magilligan Point.

The fall of France in June 1940 led to the fear of imminent German invasion. This led to the establishment of a 'concrete crust' of defences to beaches and shorelines along the north coast including numerous pillboxes, anti-boat landing defences, roadblocks and barbed wire entanglements.

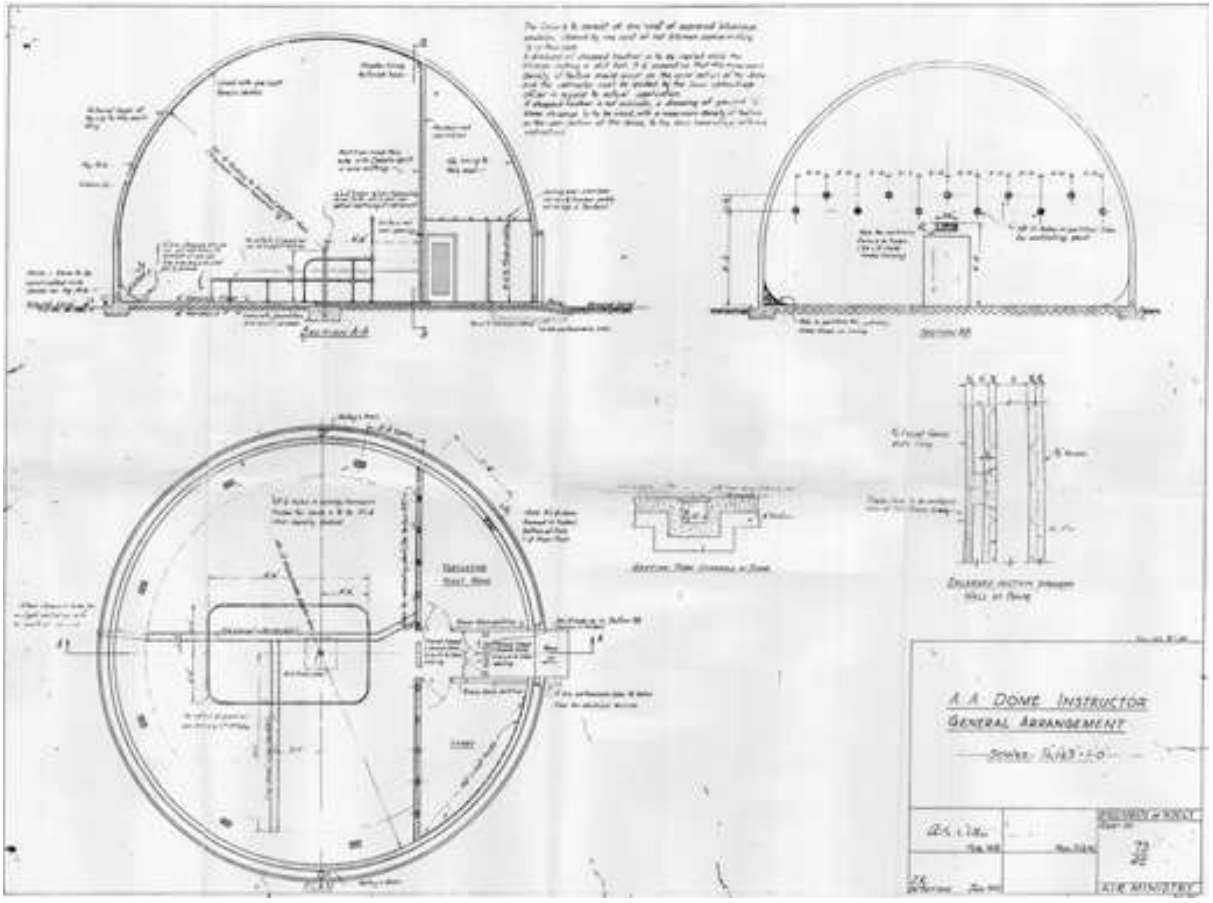

Figure 6 - Typical Trainer Dome general arrangement

Military activity in the area continued over the course of the Cold War and the period of civil unrest in Northern Ireland known as the 'Troubles.' The Magilligan army camp has since shrunk in size, with a large portion of it now part of the prison. However, it remains in use as an active training unit for the British Army.

3.3.5 Historical overview of the Trainer Dome

The design concept of the trainer dome is that images of enemy aircraft are projected onto the interior of the dome which were fired at by a replica anti-aircraft gun. An early version of the trainer dome using static images was developed by Colonel G. F. Haszard and Brigadier Vere Ronald Krohn in 1926 at the Army Anti-Aircraft School at Biggin Hill. In late 1940 a half-dome with a diameter of 25ft (7.5) was under construction at Portsmouth and a few light changes in 1941, the form of the trainer dome was conceived by Henry Christian Stephens and designed by the Trussed Concrete Steel Company and adopted by the Air Ministry. Only half of the dome's inner surface was used as a target screen as the rest was lined with sound absorbent material to limit echoes. Between 1942 and 1944 over forty concrete and steel domes were built on airfields across the country.

Henry Stephens worked with Kodak and Technicolour to develop a sophisticated simulator which projected film onto the interior walls of the dome. A 35mm camera was positioned on a pair of concrete piers in the middle of the dome. Through the use of movable mirrors and cameras the image of the aircraft from the film could be projected

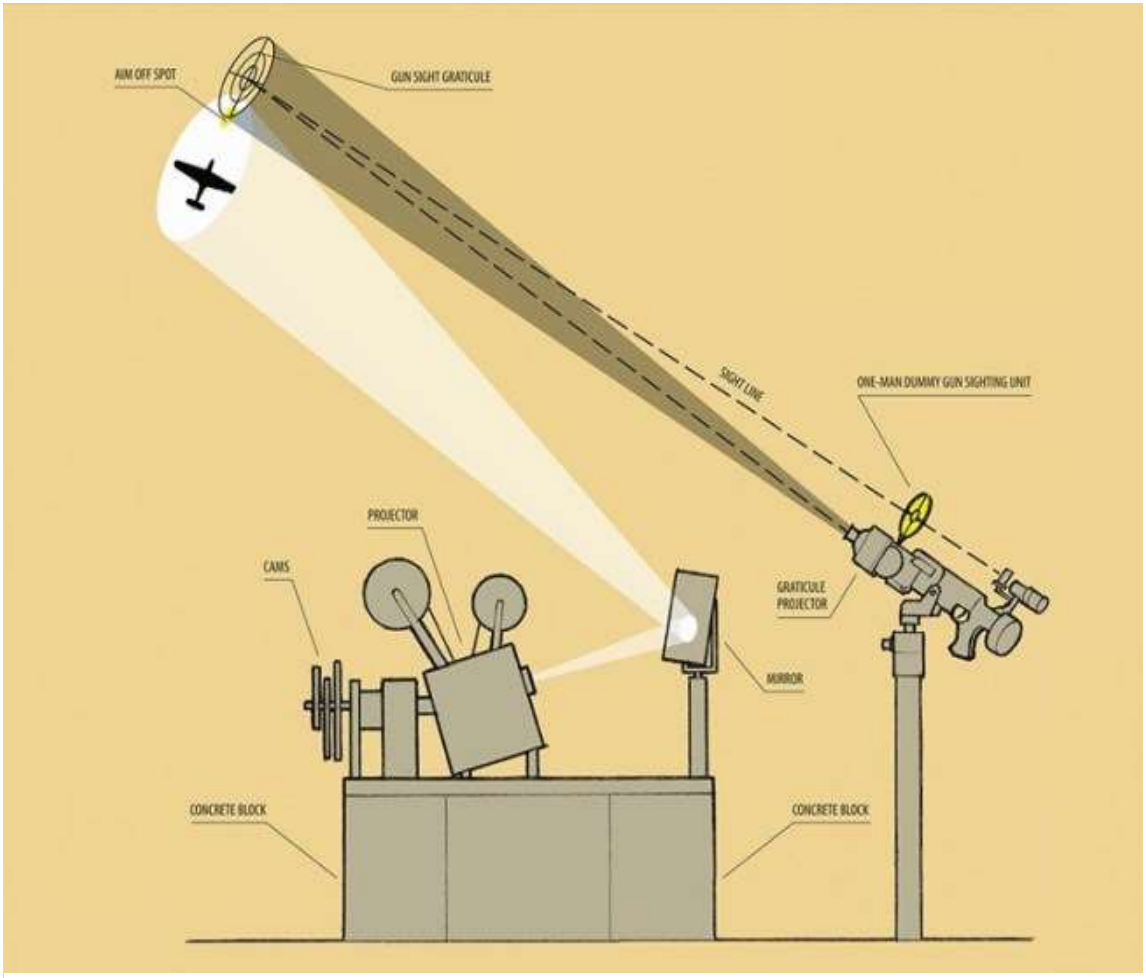

Figure 7 – Diagram illustrating how the Trainer Dome was used to train gunners. Image taken from https://langhamdome.org/, accessed 01/08/2019.

onto the wall for the dome and moved to simulate a realistic image of being dive-bombed during an enemy attack.

The trainee gunner was positioned behind the projector and mirror set-up at his replica gun (refer to Figure 7). When the gunner pulled the trigger, a soundtrack played the noise of a firing shot with a duration of approximately five seconds, which was the time it took to empty the cartridge of ammunition. The noise of the attacking aircraft was recorded on the soundtrack of the film. The sound effects presented a realistic feeling to the trainee gunner of being attacked and having to respond.

Each frame of the film incorporated a yellow dot showing the aircrafts future position and therefore where the gunner should be aiming. The yellow dot could be obscured from the trainee's vision by using yellow filter goggles. The replica guns also incorporated a small projector which shine a spot of yellow light at the exact point where the trainee gunners were firing. The instructors could then determine whether this yellow light coincided with the yellow dot on the film and thus the accuracy of the trainee gunner.

Military airfields of WW2 had a standard layout. Technical buildings including control buildings and ground signal were grouped together as well as accommodation by rank and squadron buildings. It is likely that the trainer dome was constructed after almost all the other RAF buildings and structures were completed as initially the airfield was to be used for training and coastal reconnaissance. The trainer dome was located within the technical group of buildings to the south-east of the airfield. It was accessed directly from one of the main roads leading to the control buildings.

Forty-four concrete domes are known to have been constructed but only six now remain in the UK. RAF Langham Trainer Dome has been recently restored with a National Lottery Heritage Grant and is now a visitor attraction.

3.4 Architectural description

3.4.1 The RAF Trainer Dome at Limavady is a single-storey reinforced concrete hemisphere-framed structure on circular plan and was built in 1942 to the designs of Henry Christian Stephens (refer to Appendix 9.1, Photograph 3). The framework of welded steel was fabricated off-site and used as a wire frame to support the poured concrete during

Figure 8 - Historic aerial view of RAF Limavady

construction and reinforced the shell (refer to Appendix 9.1, Photographs 13 and 14). The finished walls were 112.5mm thick. The interior had a plastered finish and the exterior was cement rendered with a camouflage of tar spray coating over. The reinforced concrete frame sits on a circular concrete projecting plinth with an integrated drip mould to capture rainwater (refer to Appendix 9.1, Photograph 6).

There is a single square-headed door opening to the east with a smooth raised rendered surround and reveal (refer to Appendix 9.1, Photograph 7). Internally there was a lobby with a cloakroom on one side and a ventilating plant on the other. The internal walls were sound-proofed with a steel-framed internal partition. Inlet and exhausts ports for the plant equipment were located to the right-hand-side of the entrance (refer to Appendix 9.1, Photographs 10 and 15). The floor is concrete with a cementitious threshold to the exterior.

Much of the historic fabric of the runways, taxiways and buildings survive throughout the airfield, but particularly around the technical group of buildings to the south, were the trainer dome is located (refer to Figure 9). The wartime setting of the trainer dome is still evident with most of the technical buildings surviving in generally good condition. The Binevenagh Defence Heritage Audit, compiled by Qaurto and Ulidia Heritage

Figure 9 – Contemporary aerial view of RAF Limavady with structures identified in the Defence Heritage Project highlighted in blue, Trainer Dome highlighted in red. Note the outline of the airstrips to the north, which remain discernible in the landscape.

Services in April 2017, describes this group of buildings as “the best-preserved group of airfield structures anywhere in Northern Ireland” which “help to create a true sense of place absent in most other airfield sites.”

These buildings make a significant contribution to the setting of the Trainer Dome and present an opportunity to enhance the broader contextual understanding of the structure. The majority of these buildings remain in reasonable condition; however, they are at risk of loss if action is not taken and several key structures have been demolished in recent years.

3.7 Condition

A Conservation Structural Engineering Report was prepared by ByrneLooby Consulting Structural Engineering. This report examined several military defence structures in the area of Magilligan Point, including the Trainer Dome. The following is a summary of the condition of the Trainer Dome. The full report is included in Appendix 9.4.

3.7.2 In general the Trainer Dome was found to be in poor condition. Common issues relate to the extensive corrosion of the reinforcement, failure of concrete and the exposure and corrosion of metal lathing, particularly to the interior of the dome (refer to Appendix 9.1, Photographs 12 to 14). Externally, the bituminous waterproof coating has largely degraded and disappeared, leading to the exposure of the concrete surface and isolated corrosion of the reinforcement (refer to Appendix 9.1, Photograph 8).

3.7.3 The building is in private ownership and is currently used as a makeshift stable. The boundary of the land has been secured by the owner to help minimise likelihood of trespassing and potential vandalism and damage to the building (refer to Appendix 9.1, Photograph 1). The owner also owns the adjacent former MT Sheds Office and Yard which are also associated with Limavady Airfield and are also lying vacant and in poor condition (refer to Appendix 9.1, Photograph 4).

3.7.4 Proposed Conservation Measures

In order to bring the structure back into use and permit safe access for the public the following is recommended:

- Repair/recast lost areas of concrete to external surface of dome before adding new waterproofing layer, ideally to the same specification as the original bituminous surface finish;
- Internal surface of dome to be repaired using shotcrete/gunite, potentially combined with a cathodic protection system to prevent further corrosion of reinforcement.

3.7.5 In addition to the above it is recommended that a full condition survey and schedule of defects, both internally and externally is undertaken along with laboratory testing of concrete to ascertain carbonation and chloride content and composition.

4 Statement of significance

4.1 This section of the Conservation Management Plan is concerned with assessing the historic and architectural value and significance of the RAF Trainer Dome, Limavady *'Any part of an historic environment with a distinctive identity perceived by people can be considered a place. The significance of a place embraces all the diverse cultural and natural heritage values that people associate with it, or which prompt them to respond to it.'* [1]

4.2 It is the cultural and natural heritage values of the RAF Trainer Dome Limavady which are outlined in this section and they are grouped under four broad headings:

4.2.1 *Evidential value*
Deriving from the potential of a place to yield evidence about past human activity through physical remains. These physical remains are the primary source of evidence about the substance and evolution of places, and of the people and cultures that made them. The ability to understand and interpret the evidence tends to be diminished in proportion to the extent of its removal or replacement.

4.2.2 *Historical value*
Deriving from the ways in which past people, events and aspects of life can be connected through a place to the present. It tends to be illustrative or associative. Illustrative historic value depends on visibility in a way that evidential value does not and has the power to aid interpretation of the past through making connections with, and providing insights into, past communities and their activities through shared experience of a place, e.g. new building technique or material. Associative historic value may derive from a place where something momentous happened or where a notable family, person or event took place.

4.2.3 *Aesthetic value*
Deriving from the ways in which people draw sensory and intellectual stimulation from a place. This can be the result of the conscious design of a place or building including artistic endeavour. The design value of a building for example may embrace composition, materials or an intellectual programme governing the design and be attributed to a known architect or designer.

4.2.4 *Communal value*
Deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical and aesthetic values, however they tend to have additional value as a wider social or communal focus. Social value is associated with places that people perceive as a source of identity, distinctiveness, social interaction and coherence. They may have fulfilled a community function that has generated a deeper attachment or shaped some aspect of community behaviour or attitudes.

4.3 Assessing significance

The values outlined above form a building or place's assessment of significance, however the level of significance of each value will help determine why a building or

[1] Historic England – Conservation Principles sustainable management p. 21

place is important. The following assessment is adopted to assess the significance for the RAF Trainer Dome Limavady in this document:

Value as a heritage asset is measured by significance:

- Exceptional — National or International importance
- Considerable — More than regional significance
- Some — Local and/ or regional significance
- Little — Limited heritage value
- None — Negligible or no heritage value
- Negative — Features which distract from the heritage value of the site.

4.3.1 Evidential value assessment

The RAF Trainer Dome is of considerable evidential value.

The distinctive dome structure has retained some of its original detailing including reinforced concrete frame, plinth course with integrated drip mould, the remnants of the internal steel-framed partitions and the ventilation and ducting system. What remains is in reasonable condition, with the corroded frame reinforcement being in relatively poor condition to the interior.

The structure has some group evidential value due to the survival of other WW2 structures in the vicinity also related to RAF Limavady, although what remains is in relatively poor condition.

4.3.2 Historical value assessment

The RAF Trainer Dome is of exceptional historical value.

The Trainer Dome is of historic value due to its association with the defence of Britain in WW2 and in particular the Battle of the Atlantic. As one of six concrete domes surviving in UK and the only one in Northern Ireland, the Dome is a particularly rare building typology which is of significant technological significance due to the early and pioneering use of audio-visual equipment to train gunners.

4.3.3 Aesthetic value assessment

The RAF Trainer Dome is of some aesthetic value.

While being a functional response to a distinctly practical – albeit innovative – training technique, the unique hemispherical form of the dome is a distinctive landmark in an area otherwise characterised by modestly detailed and hastily constructed defence heritage buildings. It is a noteworthy structure which positively contributes to the character of the former airfield.

4.3.4 Communal value assessment

The RAF Trainer Dome is of Some Communal Value.

As the airfield ceased to function in the late 1950s, the Trainer Dome has only been used as a store or make-shift animal shelter in recent years. Therefore, although the buildings once had some communal significance as part of the former Limavady Airfield, this has been eroded as the buildings within the airfield are abandoned, fall into disrepair or are demolished all together. Despite this, the building still has significant cultural communal value due to its associations with WW2.

4.4 Vulnerability of significance

This section is intended to identify where structures are vulnerable to loss of significance and where there are opportunities for enhancing significance. This aims to help to prioritise future action, which will need to comply with the appropriate legislation and local planning policies in order to ensure and enhance the significance of heritage assets.

4.4.1 A framework for the assessment of vulnerability:
Heritage assets are vulnerable when they face change or neglect. Their propensity to lose some or all their heritage value can be measured by degrees of robustness, or its opposite, fragility. The index is here referred to as vulnerability.

4.4.2 It is important to note that fragility as a heritage asset is not (always) connected to fragility as a structure. Some structures, for example, may be solidly built but with fragile historic importance f, for example, their interest lies in delicate decoration on a robust structure. Others may be fragile as heritage assets because they are physically fragile as well. As with significance, it is useful to allocate a score to vulnerability so that comparisons can be made and to assist in the planning and management of the site. *Robustness* and *fragility* are measured by a score representing its *vulnerability* to change as follows:

9,10	**Highly fragile**	**Highly fragile and vulnerable to change and neglect; any interventions must be considered with very great care**
7,8	**Fragile**	**Capable of accepting limited changes of these are carefully considered to avoid compromising significance; vulnerable to neglect**
5,6	**Moderately robust**	**Capable of accepting a number of changes without affecting significance; conservation approach needed**
3,4	**Robust**	**Capable of accepting considerable changes without compromising significance**
1,2	**Extremely robust**	**Very major interventions possible without compromising significance**

4.8 The following areas of significance of the Trainer Dome have been identified using this framework:

Form and appearance *Vulnerability Rating 8* *Fragile*
The unique form of the trainer dome is highly significant to its character. Any intervention must be carefully considered to minimise its impact, particularly with

regards to external interventions and extensions. Internal interventions should be considered to retain the special acoustic quality of the space.

Fabric *Vulnerability Rating* *8* *Moderately robust*
The reinforced structure and bitumen covering are in poor condition and, if no action is taken, will continue to deteriorate. The waterproof bitumen covering is largely missing and in isolated places the concrete has spalled from the steel reinforcement. The steel reinforcement has suffered from significant corrosion. However, the fabric of the building is moderately robust and is capable of accepting changes without affecting significance. New work should secure the future of the existing fabric and should provide an additional layer of structural support for the dome. Externally, new waterproofing would consolidate the integrity of the original bitumen surface.

Setting *Vulnerability Rating* *8* *Fragile*
The trainer dome is a scheduled monument and is therefore subject to statutory protection in relation to the nature of development affecting its setting as outlined in PPS 6 Planning, Archaeology and the Built Heritage. However, the former Limavady Airfield has been designated as commercial/ light industrial in the current Local Development Plan for Limavady and so it remains at risk of becoming a store/yard for ancillary support for other industries and businesses in the Windyhill Retail Park. Numerous airfield buildings have survived, albeit in poor condition. It is the piecemeal erosion of the historic setting of the Trainer Dome which is of great risk and is thus considered fragile.

5 Risks and opportunities

This section outlines issues arising out of the need to preserve and repair the RAF Trainer Dome, improve both physical and heritage accessibility and to explore appropriate and sustainable uses for the structure. This will include the following:

- the impact of a 'do nothing' approach;
- examining the impact of inappropriate refurbishment and repairs to the structures;
- investigating potential conflict between increasing accessibility of the site and the impact on the historic fabric;

and

- exploring opportunities to improve heritage value, heritage accessibility, interpretation and learning opportunities.

5.1 Risks

5.1.1 Risk of a 'Do nothing' approach

A 'do nothing' approach has considerable risks associated with the continuing deterioration of the built fabric of the RAF Trainer Dome. While it has been left vacant for several decades and remains in reasonable condition, there is significant rusting of the internal steel frame and the steel structure of the internal partition is partially demolished. A 'do nothing' approach may lead to further deterioration of the cement render and reinforced concrete structure. The result will be the loss of historic fabric and the additional cost of refurbishment works, increasing the risk of an unviable project. It may also have significant health and safety implications, potentially condemning the building leading to its demolition.

Mitigation – A condition and structural survey will determine the condition of the trainer dome, identify sources of decay and outline repair recommendations to preserve the building.

5.1.2 Inappropriate interventions

Unsympathetic repairs will not only compromise the integrity and appearance of the structures but may lead to further loss of historic fabric if inappropriate materials are used. The circular plan form and the unique interior spatial quality of the dome should be retained and not compromised with new designs/ interventions.

Mitigation – Detailed discussions with Historic Environment Division and Historic Monuments regarding the specification of materials for the repair of the historic fabric. A thorough condition survey will be undertaken to ascertain accurately the extent of repairs required to the building fabric. All new design work should be compatible with best conservation practice in that it should be reversible, not damage historic fabric and only be as much as necessary to ensure survival of the building.

5.1.4 Further reduced accessibility

The site has potential road access from Downland Road, although this has not yet been utilised. The topsoil around the building periphery has been removed, leaving the current ground wet and soggy with poor drainage. There is a risk that the access to Downland Road will not meet current Department for Infrastructure Roads Services standards for visibility splays and kerb radius'. There is a risk that ground conditions will continue to deteriorate resulting in additional costs in relation to external works to improve accessibility which may make the project financially unviable.

Mitigation: A formal 'Pre-Application Discussion' with local planning officers including discussions with Department of Communities Historic Monuments will provide an excellent opportunity for statutory consultees to respond formally on any proposals including DFI Transport NI.

5.1.5 No compatible use found

There is a high risk that a viable use of the trainer dome will not be found, and the building continues to be used as an animal shelter and agricultural store. As the building is not listed, there is no obligation on the building owner to prevent deterioration of the building fabric and therefore there is a significant risk that the trainer dome will continue to deteriorate beyond repair.

Mitigation: The preparation of this Conservation Management Plan, including research, condition survey and stakeholder engagement and associated RIBA Stage 2 Design Proposals has provided a unique opportunity to explore potential uses, encourage statutory and community awareness and gain support for the conservation of the trainer dome. A formal PAD process will secure approval in principal from statutory consultees. A business plan or economic appraisal, including market testing may help further inform project viability.

5.1.6 Theft of historic fabric remnants

There is a risk that any extant historic fabric within the trainer dome could be removed. The site is very well secured however, and access is only permitted through a locked gate from within the Industrial estate.

5.1.7 Damage from use as animal shelter

The trainer dome has been home to livestock in recent months and this has led to the existing concrete floor being covered in animal dung/ waste. Presently there is no evidence that this has caused damage to the concrete floor, but the continued presence of animals is likely to have an increased risk of deterioration of the historic fabric.

Mitigation: A temporary door should be installed to the original opening and animals removed from the immediate setting of the trainer dome. The existing animal dung should be disposed from site safely to assess the condition of the concrete floor and prevent risk of decay.

5.1.8 Loss of understanding of the significance of the Trainer Dome

There is a strong possibility that – as the trainer dome remains inaccessible, well-concealed and remains relatively unknown outside of the locality and military heritage enthusiasts – that the significance of the trainer dome and its unique role in the success of WW2 will be forgotten.

Mitigation: This Conservation Management Plan presents an excellent opportunity to record the significance of the trainer dome and outline a framework for its future development. A community consultation and meanwhile uses proposed will increase public awareness and open the building to new audiences to experience its unique architecture and acoustic qualities.

5.2 Opportunities

5.2.1 Preservation of the historic fabric

A condition survey undertaken as part of this Conservation Management Plan identified corrosion of the steel reinforcing and excessive spalling of the internal concrete cover. The structure seems to be at a critical time in its life as the waterproof bituminous covering continues to decay leading to accelerated further corrosion, probably leading to eventual loss of the dome structure itself. This Conservation Management Plan is a real opportunity to provide a technical solution to preserve the structure in its current state as well as restore the inner fabric of the dome, thus retaining the unique and authentic space. A record of the Trainer Dome has been taken as part of this plan, including photos, measured drawings and condition survey.

5.2.2 Enhancement of the Trainer Dome

There is a real opportunity to enhance the significance of the dome through the restoration and preservation of the historic fabric, reinstatement of the plan form, improvements to accessibility and setting of the building.

5.2.3 Improved Accessibility and Setting

WW2 structures are popular sites for veterans who served during the war, and their relatives. This population demographic will require easy physical access to these sites as well as access to learning about heritage. Creating an access onto Downlands Road and improving the immediate setting of the trainer dome with paving, accessible parking will provide a unique opportunity for these people to experience one of the most architectural and technologically significant buildings in WW2.

5.2.4 Learning opportunities through Interpretation

The Trainer Dome presents an opportunity to increase community knowledge and understanding about the role of the Trainer Dome and Limavady Airfield during WW2.

5.2.6 Partnership Opportunities

The restoration of the Trainer Dome, a unique architectural structure, presents an opportunity to form partnerships with the community, voluntary, arts and commercial sectors to enhance the significance of the Trainer Dome through public awareness, physical restoration, meanwhile and end uses. The setting up of partnerships will encourage community engagement and support for the restoration project and help ensure it has a vital role both as a learning heritage space and as a multi-functional space for communities and local businesses.

5.2.6 Compatible Uses

The proposals for the Trainer Dome which form part of the RIBA Stage 2 design stage provides an opportunity to explore a wide variety of uses for the Trainer Dome and to interrogate functions and ascertain appropriate functions for the adaptive re-use of the building. There is an opportunity to find a new compatible and appropriate use for the structure which no longer has a military function. This may help gain wide support for the project from all communities in the Limavady area.

5.2.7 Heritage Training for Concrete Repairs

The conservation of the trainer dome presents an opportunity for local contractors or tradesmen to learn about the technical expertise of historic concrete repairs.

6 Conservation Policies

6.1 This section sets out the policies intended to guide any potential development of the Limavady RAF Trainer Dome in a manner designed to preserve and enhance its significance. These aims and objectives are a direct outcome of the understanding of the heritage of the Limavady RAF Trainer Dome developed through this document, and of the risks and opportunities faced now and in the future.

6.2 Specific Conservation Management Plan aims, and objectives have been developed to form a framework to advise and inform the development of detailed proposals for repair and conservation, for the design and location of any new work or alterations to the immediate setting, and for potential new uses for the Limavady RAF Trainer Dome.

All conservation works considered are guided by the principle of minimum intervention under the general aim of doing as little as possible but as much as necessary.

6.3 A Conservation Philosophy

The Policies that follow have been prepared based upon the conservation philosophy that aims to ensure the integrity of the element through an emphasis on repair of the significant historic elements. proposals for new use should lead to acceptance that there will be a certain amount of repair and conversion work. The philosophy that should guide this repair and conversion work can be summarised as follows:

- The budgetary and phasing decisions for the repair of the Limavady RAF Trainer Dome should be informed by the significance and vulnerability of the historic fabric.
- The internal wall finish and steel-framed structure be repaired rather than rebuilt where possible.
- Wholly newly designed work and alterations to the historic fabric should be discernible through inspection.
- Existing elements of considerable or exceptional significance should be retained where possible, and where necessary restored, according to best conservation practice.
- Materials traditional in the primary build and their associated construction and repair techniques should be used for repair and making good.
- Historically accurate recreations and replacements of fittings fixtures finishes, etc, should be considered where historic research fully underpins the design materials and appearance of these features. Where this is not possible for reasons or budget or due to lack of historic evidence modern interventions may be used, and these should be visible by inspection.
- Interventions, including those of repair to the historic structure, should be kept to the minimum necessary to ensure the best possible preservation of authentic historic character.
- Changes of use of each building on the site should be sought that best fit the levels of significance set out in this Plan.
- Opportunities identified in this document for restoration and interpretation should be taken where the budget allows and should be seen as an integral part of the conservation of the heritage of the site.
- Archives material and heritage interpretation of the site should be integrated as seamlessly and naturally as possible into the proposed visitor experience of the site.

6.4 Conservation Policies

6.4.1 The Setting of Limavady RAF Trainer Dome

The setting of the Limavady RAF Trainer Dome may be impacted upon by the potential for future industrial development within the former Limavady Airfield. It is beyond the scope of this study to include viewing cones of all the views that may be considered, but reference should be made to *POLICY HE10 in PPS5: Additional policy principles guiding the consideration of applications for development affecting the setting of a designated heritage asset.*

SET1. The existing special character and historic interest of the Trainer Dome must be respected when any potential development within the former Limavady Airfield or its boundary.

Reason: To comply with legislation for Scheduled Monuments as outlined in PPS6.

SET2. The relationship between Limavady RAF Trainer Dome and the other former Limavady airfield buildings should be enhanced where possible.

Reason: To preserve the original character and appearance of the Limavady Airfield and to improve the existing relationship between these WW2 buildings.

SET3. To consider reinstating the former access road leading to the Limavady RAF Trainer Dome.

Reason: To improve access to the site and improve the integrity of the building as its original setting is reinstated

SET4. To seek selective thinning of hedgerows along the former access road

Reason: To improve the setting of the Limavady RAF Trainer Dome and increase connectivity between the site and the Downlands Road.

6.4.2 Conservation approach to the historic fabric

COF1. To make any decisions on the repair, restoration and conversion of the fabric of the buildings, the historic contents and the setting with the advice of an appropriately trained and accredited conservation professionals.

Reason: The repair and alteration of historic structures requires a high degree of knowledge.

- *COF1.1. To ensure that the owner is aware of this requirement.*
- *COF1.2. To vet and only employ professionals, contractors and sub-contractors with experience of working on historic buildings or historic artefacts.*
- *COF1.3. To encourage training in the repair of historic concrete and cement, if appropriately skilled crafts people are in short supply.*

COF2. To make any decisions on the repair, restoration and conversion of the fabric of the Limavady RAF Trainer Dome and its setting with the advice of and of the relevant Statutory Bodies and with the full understanding of the historic and cultural significance of the structure

Reason: The repair and alteration of this historic structure requires a high degree of knowledge of the history and construction of the Limavady Raf Trainer Dome.

COF3. To work with the owner and future potential partners to ensure the economic sustainability of the structure including conversion and changes and layout of the site are in line with this Conservation Management Plan.
Reason: A viable use is the best likelihood of longer-term maintenance, repairs and management of the site according to this Conservation Management Plan.

COF4. To consult with non-statutory bodies in seeking a full understanding of the historic importance of the Limavady RAF Trainer Dome.

Reason: Non-statutory bodies are significant repositories of relevant information on the history and significance of the site.

6.4.3 Policies Relating to Building Fabric

BF1. The trainer Dome structure and other historic fabric should be repaired rather than rebuilt where possible.

BF2. Existing fabric and elements in good condition should be retained wherever possible, and removals informed by the significance set out in this Conservation Management Plan.

Reason: Retain authenticity of the historic fabric

BF3. Where appropriate, and where historic information is available, to restore historic features that are material to an understanding of the Limavady RAF Trainer Dome function and construction

Reason: The form and materiality of the external fabric has been identified as being of significance. The retention of extant features and the accurate and informed reintroduction of historic elements will document the past use of the structure and have a positive effect on the significance of the building.

BF4. ***Where different materials are used in restoring or replacing elements, to deploy them in such a way that the difference with the original material can be discerned by visual inspection.***

Reason: To ensure that the history of the building is better understood by visitors and users.

BF5. Mid-century building materials used in the primary building of the Trainer Dome should be used for repair and making good.

BF6. Conjectural reconstructions which are not supported by evidence should be avoided.

Reason: To protection the unique historic character and appearance of the Trainer Dome.

BF7. Interventions, including those of repair to the historic structures, should be kept to the minimum necessary.

Reason: To ensure the best possible preservation of authentic historic character.

BF8. In specifying materials for the restoration of the Limavady RAF Trainer Dome, to carefully consider the following:

- *BF8.1. To record areas of failure on the exterior on scaled elevation plans, in order to establish appropriate methodologies for conservation and to identify areas to be repaired or replaced, and of priorities for action.*
- *BF8.2. To test to establish techniques for proposed intervention on small-scale trials, either on or off the site.*
- *BF8.3. To retain the appearance of the external façade of the building as fully as possible, commensurate with new uses.*
- *BF8.4. To retain where possible the original lobby internal structure and ventilation inlets/outlets*
- *BF8.5. To undertake appropriate conservation treatment on damaged materials and exteriors, if necessary.*
- *BF8.6. To remove plant growth on buildings.*
- *BF8.7. To use original colour schemes and finishes typical to buildings of this style and age.*
- *BF8.8. To investigate sources of water ingress, and to repair the hemisphere domed roof in an appropriate manner.*

6.4.4 Policies relating to new work to the Trainer Dome

NW1. New work must not damage the authentic historic character and appearance of the Trainer Dome.

NW2. New work must use an appropriate approach to restoration without conjecture.

NW 3. To ensure sensitive and unobtrusive introduction of any new services, such as heating and ventilation, disabled access, electricity supply and wiring, hearing aid loop, water supply and sanitation

Reason: Obtrusive or insensitive installation of services could have a negative effect on the character and appearance of the Trainer Dome.

- *NW3.1. To ensure that new water meters, supplies and drainage are not visually intrusive.*
- *NW3.2. To ensure that new heating systems do not impact on the unique spatial and acoustic quality of the internal dome.*

NW4. To ensure sensitive and unobtrusive introduction of new security and safety measures.

Reason: Obtrusive or insensitive installation of safety measures and services could have a negative effect on the special character of the Trainer Dome.

- *NW4.1. To consider the use of wireless fire, security and environmental control monitors in all structures, to avoid the need for extensive cable runs within the main dome space.*
- *NW4.2. To ensure that any external lighting is suitable for the location and quality of the Trainer Dome*

Reason: An external works strategy should be considered to ensure safe access to the Trainer Dome from the main road is balanced with the potential impact on the ecology and rural character of the site.

NW5. To ensure sensitive and unobtrusive introduction of new fire detection systems.

Reason: Approved Document B on Fire Safety, of UK Building Regulations, now recommends a package of fire precaution measures to suit the individual needs of historic buildings.

- *NW5.1. To ensure that fire safety considerations are considered early in the design process in order to properly plan for full use of the buildings, to prevent accidental fire damage and arson.*
- *NW5.2. To ensure any new equipment for fire detection and management is appropriately sited and that its installation is designed to minimise damage to historic fabric.*

NW6. New works other than restoration of missing features should be designed and constructed to complement the existing, being 'of its time' without being either a slavish facsimile or a jarring contrast.

Reason: In line with conservation best practice, to ensure legibility of modern interventions, whilst designing them with sensitivity to their context.

6.4.5 Inclusive Access

IA1. Improve access to RAF Limavady Trainer Dome without damaging the heritage.

Reason: It is socially desirable to ensure that as many people as possible are able to access the buildings. The terms of the Disability Discrimination Act 1995 (DDA) applies to all public places but does not supersede or take precedence over existing legislation governing the conservation of historic buildings and structures. The following aims and objectives are written to address these issues:

IA2. Develop an access plan for both the site and the Trainer Dome

Reason: Appropriate access is vital to the preservation of sustainability of the Limavady RAF Trainer Dome and planning for accessibility will allow this to be considered. A Design and Access Statement will be required as part of any Planning Application. This plan will inform such documents. The aim should always be to reconcile the interests of conservation and access in the light of the reasonable adjustment provisions in Parts I, II and IV of the DDA. The inclusion of existing buildings within Approved Document Part M (2004) of the Buildings Regulations, and the provision of the new British Standard on Access: BS 8300 (2001) Design of Buildings and Their Approaches to Meet the Needs of Disabled People: Code of Practice. Further guidance is available from English Heritage. See also: Heritage, Easy Access to Historic Landscapes. (London: English Heritage, October 2005).

IA3. To ensure the redevelopment scheme considers any potential increase in traffic, car parking and the impact these might have on the Limavady RAF Trainer Dome and immediate settings.

Reason: Important views of and future enjoyment and appreciation of the structure may be negatively affected by access and surface parking both on and near to the site.

- *- IA3.1. To include parking arrangements, both on-site and off-site, as part of the design for the re-development.*
- *- IA3.2. To work with Causeway Coast and Glens Borough Council to improve way-finding to the Limavady RAF Trainer Dome but avoiding signage that obstructs views of the site and its significant buildings.*

IA4. Enhance public appreciation through public access and interpretation.
Reason: Limavady RAF Trainer Dome is a nationally important building. Public interpretation can be provided in a way that enhances the viability of the structure.

- *- IA4.1. To increase the information available on the internet about the history and development of the Limavady airfield as well as the Limavady RAF Trainer Dome.*
- *- IA4.2. To use the fabric of the historic buildings as an interpretive tool and explain their construction, design and function.*

6.4.6 Effects on the Environment

EE1. To consider the 'whole life' environmental impact of building material.

Reason: To minimise the environmental impact of RAF Limavady Trainer Dome conservation works whilst respecting the heritage values of the building.

EE2. Maximise the opportunity to increase the energy efficiency of equipment and any new installations.

Reason: Conserving existing buildings and efficiently operating them is an important way to reduce carbon dioxide emissions. Significant improvements to energy efficiency can be made by specifying energy-efficient lighting and other fittings. Designing, constructing and operating energy efficient buildings is the most important way that the UK's carbon dioxide emissions can be reduced. Significant improvements to energy efficiency can be made at little or no cost by specifying energy-efficient lighting and other fittings and improving insulation levels.

- *EE2.1. To ensure that energy-efficient fittings and equipment are installed as a matter of course.*
- *EE2.2. To explore as appropriate renewable energy technologies at the design stage.*
- *EE2.3. To ensure that measures to reduce energy consumption and heat loss are not visually intrusive and do not conceal significant historic interiors.*

Reason: Whereas action needs to be taken to improve energy efficiency for the needs of climate change, this should not harm the character of the building or increase the risk of long-term damage to fabric or fittings. The special interest of historic buildings can be compromised if their overall appearance is changed or significant features lost as a result of compliance with the requirements of Building Regulations. Detailed guidance on improving energy efficiency without harming the special interest of historic buildings is provided in English Heritage's publications Building Regulations and Historic Buildings and Energy Conservation in Traditional Buildings.

EE3. Check the condition of all existing roofs and the capacity of the moulded plinth and make improvements where required.

Reason: To ensure the historic fabric of the building is not subject to increased risk of water ingress due to increased stormy weather and rainfall due to climate change.

EE4. To manage soil to avoid the spread of invasive alien plants, excessive runoff and pollution of water courses.

Reason: Soils store vast quantities of carbon and buffer chemicals that might otherwise pollute water or air. The mismanagement of soil can lead to excessive runoff and pollution of water courses. Transport of topsoil is one of the main methods of spreading a number of invasive

alien species and the destruction of peat habitat in Ireland and elsewhere is a particular concern. Japanese Knotweed (Fallopia japonica) may be present on the site in view of the previous interim use by a landscape and civil engineering concern.

- *EE4.1. To ensure that peat is not used in planting.*
- *EE4.2. If additional topsoil is required, excavated subsoil should be mixed with composted material and re-used, in preference to importing topsoil.*

6.4.7 Managing information about the heritage

MI1. To enhance public appreciation through access and interpretation.

Reason: The RAF Trainer Dome is an important defence heritage asset to Northern Ireland and efforts should be made to promote its significance to the local community and within Northern Ireland.

MI2. To increase the information available on the website about the history and development of the Raf Trainer Dome. A dedicated Trainer Dome website could be constructed to increase the information available about the history and development of the Limavady Airfield and to promote events and Trainer Dome open days.

MI3. To use the fabric and unusual geometric shape of the building as an interpretive tool and explain the construction, design and function. This could include display panels and an interactive interpretative exhibition.

MI4. To make available records of completed conservation works.

Reason: It is important to have records of the works undertaken, including drawings, schedules and materials used by the Design and Construction team to inform the building user. These records to be stored in the Trainer Dome and a copy with Department of Communities Historic Monuments.

MI5. RAF Limavady Trainer Dome, in co-operation with any appointed Conservation Architect, is responsible for making sure that the Conservation Management Plan is used.

Reason: Best practice adopted by the National Lottery Heritage Fund suggests that a Conservation Management Plan is formally adopted by the relevant stakeholders in recognition of their subscription to the processes and philosophy contained therein.

MI6. The Client, in co-operation with any appointed Conservation Architect, is responsible for making sure that the Conservation Management Plan is used.

Reason: Best practice adopted by the National Lottery Heritage Fund suggests that a Conservation Management Plan is formally adopted by the relevant stakeholders in recognition of their subscription to the processes and philosophy contained herein. The following procedure would help to ensure this happens:

- *MI6.1. Appoint an appropriate specialist with the requisite/comparable skills and experience in the conservation/repair/adaptation of historic buildings and structures, as detailed above.*
- *MI6.2. Prepare a detailed Schedule of Repair and accompanying drawings and appropriate specification to detail the requirements for conservation or alteration all individual components/materials*

- *MI6.3. Ensure full integration and co-ordination of the repair work with associated new work as detailed above*
- *MI6.4. Establish costs and method of procurement to achieve the appropriate standard and quality of work*
- *MI6.5. Establish a list of appropriate contractors with the requisite/comparable skills and experience to achieve the appropriate standard and quality of work. Tender the works and appoint the preferred contractor*
- *MI6.6. Implement and monitor the works to ensure full co-ordination of the details and adherence to specification, methods of working and quality of finish*
- *MI6.7. Establish a cyclical Maintenance Strategy for the short, medium and long-term maintenance of the Trainer Dome to ensure allocation of appropriate annual budgets and a clear understanding of on-going maintenance commitments. Implement the strategy, monitor and review with time to adjust and vary to suit the changing demands and requirements of the site and building*
- *MI6.8. The Conservation Management Plan must be reviewed and reassessed by the Client at regular time intervals and updated and refined as more information comes to light from further research, analysis and evaluation. This current issue should, in any event, be fully reviewed within five years to assess whether the aims and objectives of the plan are being met; whether the conservation policies are being adopted and whether revisions, additions or amendments to the plan are required.*

7 Adoption and review

7.1 This Conservation Management Plan will be adopted by the owner of the Trainer Dome as the primary policy document to guide the redevelopment of the RAF Trainer Dome. The plan should be a living document and referred to in order to inform decisions on the conservation of the building. It is proposed that this Conservation Management Plan be reviewed annually and if new information has come to light during the course of the project, this should be reflected in an addendum to the Conservation Management Plan.

7.2 If new information brought forward during the annual review has any impact on the policies set out in this Conservation Management Plan, these should be highlighted and agreed between the stakeholders and included in the addendum.

7.3 The Conservation Management Plan should be reviewed in consultation with experienced and qualified conservation professionals.

7.4 The policies set out in this document create a framework intended to guide any potential development of the Trainer Dome. Therefore, any consultant involved in developing proposals pertaining to the structure will be made aware of this document and its policies. Any proposals will be able to demonstrate compliance with the policies set out in Section 6 of this document.

8 Bibliography

- ICOMOS, '*The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*.' 2013.
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- Historic England, '*Conservation Principles, Policies and Guidance for The Sustainable Management of The Historic Environment*.' 2008.
- Heritage Lottery Fund, '*Conservation Plan Guidance*.' https://www.heritagefund.org.uk/publications/conservation-planning-guidance, accessed 31/07/2019.
- '*Northern Ireland Defence Heritage Project*.' https://www.arcgis.com/apps/MapSeries/index.html?appid=7152cae0955248f295bac04cae31ef12, accessed 01/07/2019.
- '*DEARA/NIEA Map Viewer*.' https://appsd.daera-ni.gov.uk/nedmapviewer/, accessed 01/07/2019.
- Fiona Fyfe Associates, '*Binevenagh and Coastal Lowlands Landscape Partnership Scheme: Landscape Character Assessment*.' October 2018.
- '*Binevenagh Coast and Lowlands Defence Heritage Audit*,' Quarto and Ulidia Heritage Services, April 2017.
- *'The Second World War in Northern Ireland.'* https://www.ww2ni.webs.com, accessed on 31/07/2019.

9 Appendices

9.1 Photographic Record

Photograph 1 - View from west - 31/05/2019

Photograph 2 - Poor setting from south - 31/05/2019

Photograph 3 - View of entrance to west - 31/05/2019

Photograph 4 - Former airfield buildings to south - 31/05/2019

Photograph 5 - Remains of access path - 31/05/2019

Photograph 6 – Vegetation to moulded plinth - 31/05/2019

Photograph 7 - Rendered entrance door surround - 31/05/2019

Photograph 8 - Spalled concrete / exposed reinforment - 31/05/2019

Photograph 9 – Vegetative growth to dome - 31/05/2019

Photograph 10 - Remnants of original machinery and plant - 31/05/2019

Photograph 11 - Steel frame / trusses - 31/05/2019

Photograph 12 - Concrete debris fallen from structure - 31/05/2019

Photograph 13 - Exposed reinforcement - 31/05/2019

Photograph 14 – Exposed reinforcement - 31/05/2019

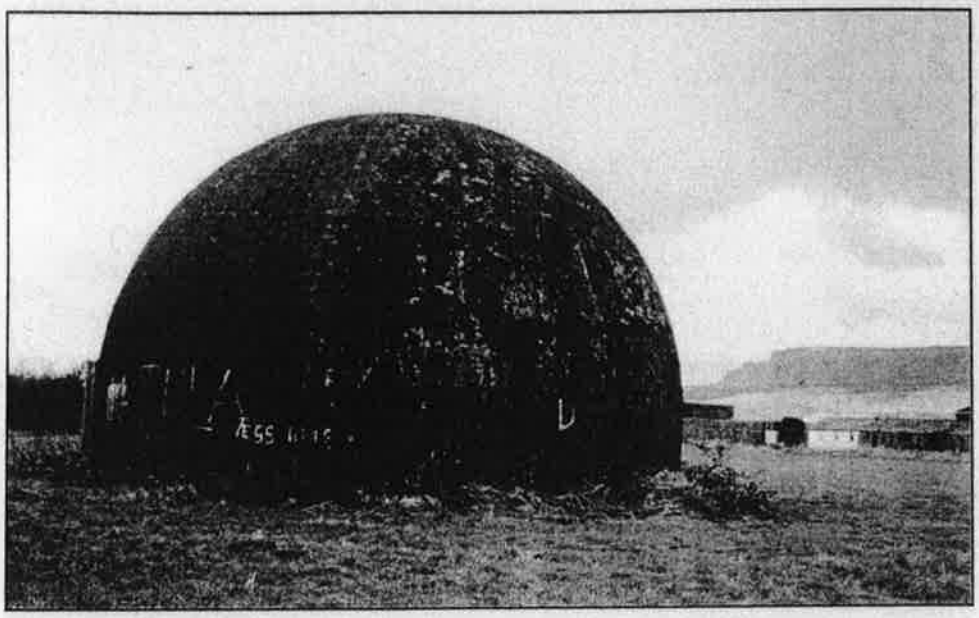
Photograph 15 – Ventilation opening to south - 31/05/2019

9.2 Scheduled Monument Description

ENVIRONMENT AND HERITAGE SERVICE

SCHEDULING OF GUNNER DOME IN THE TOWNLAND OF ARTIKELLY, CO.LONDONDERRY (LDY 9:48)

An Agency within the Department of the Environment

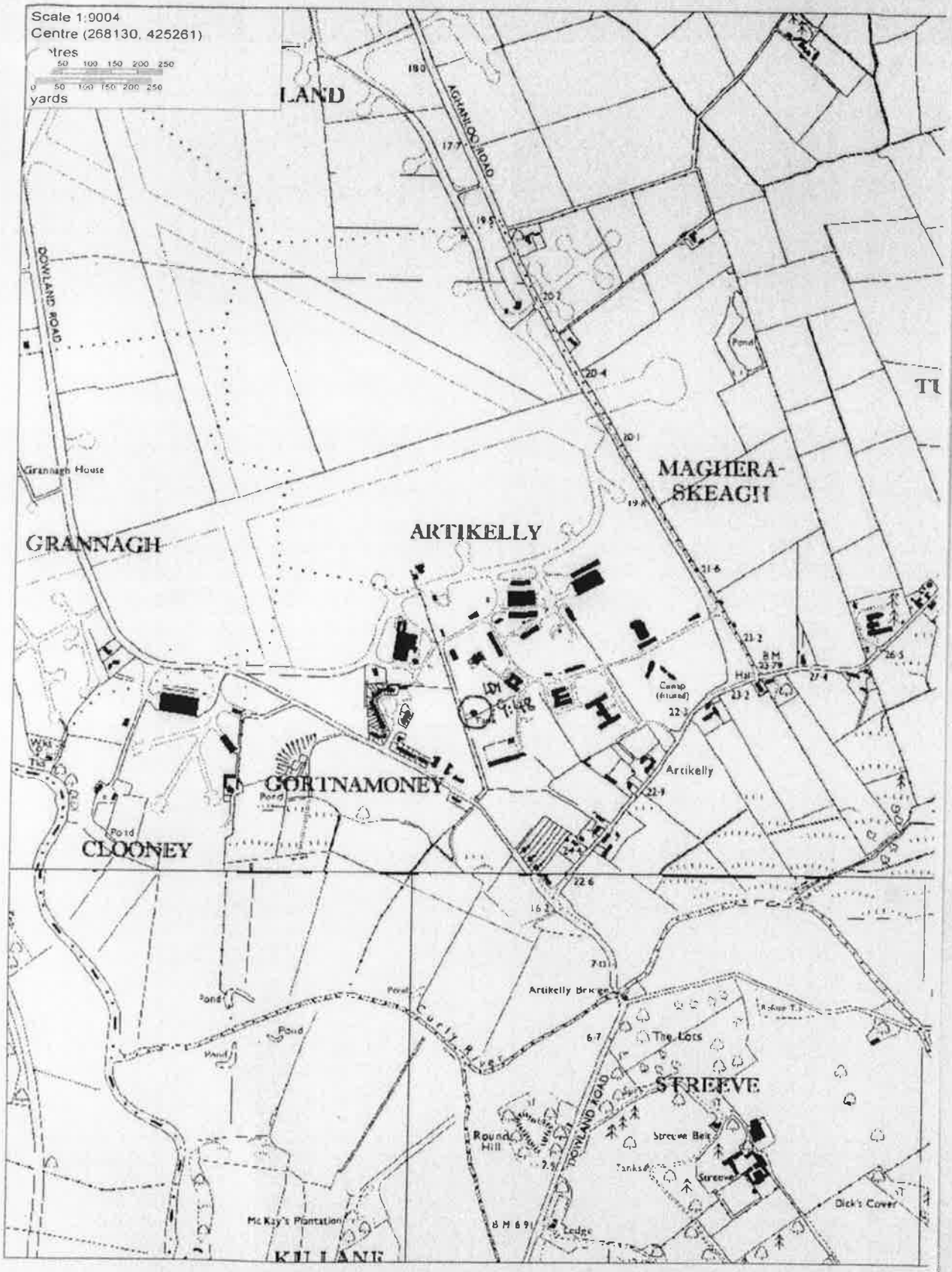


Site Description

This is a Defence Heritage site at Ahanloo Airfield, near Limivady. it is a concrete dome which was used for training flight bombers and gunners during World War 2. It used projector technology to provide simulated conditions and to test the accuracy of gunners.

The Northern Ireland Defence Heritage Project identified this as a probably unique survival in Northern Ireland, with perhaps as few as three or four in the UK as a whole.

The site is to be scheduled on the basis of its rarity.


Scale 1:9004
Centre (268130, 425261)
yards
LAND
AGHANLOO ROAD
DOWLAND ROAD
Grannagh House
GRANNAGH
ARTIKELLY
MAGHERA-
SKEAGH
GORTNAMONEY
CLOONEY
Artikelly
Pond
Camp (disused)
Curly River
Artikelly Bridge
The Lots
STREEVE
Round Hill
Streeve Belt
Tanks
Streeve
Dick's Cover
McKay's Plantation
KILLANE
Ledge

was then handed over to the infantry units of the 2nd Canadian Army Division and taken by them to the infantry training grounds above Storrington. Here the tank was used as a range target being fired upon by PIAT anti-tank weapons, amongst others, and when the troops pulled out after the war, was left sitting on the Downs. After the war, a member of the range clearing teams, who now lives in Storrington, remembers that to remove the tank it was simply rolled over into a bomb crater and buried!

On the 20th November 1993, the tank was recovered by the R.E.M.E. having been unearthed over the previous years by a number of hardy enthusiasts. Once rolled out of its grave it was placed on the edge of the field where it remains to this day.

CLAPHAM - DESTROYED VILLAGE OF COBDEN

ACCESS: By foot along the South Downs Ways, east from the A24. Map Reference: TQ 101109.

It was the emergency regulations introduced from 1939 that enabled the military to move into vast areas of the Sussex countryside. Major A.L. Shaw remembers his service with 222 Field Company, Royal Engineers, at Shoreham in 1941. On arrival his unit was faced with a massive and urgent construction programme, all needing an unlimited source of timber to be used as formwork or shuttering. Using the powers installed by the emergency regulations the military cleared and requisitioned the wooden buildings of the then so called 'bungalow town' on Shoreham Beach. In this way 222 Field Company was in one stroke able to satisfy the majority of its timber needs by dismantling these wooden structures!

SHOREHAM-BY-SEA - DOME TRAINER

LOCATION: On the north east corner of the airfield at Shoreham. Map Reference: TQ 198058.

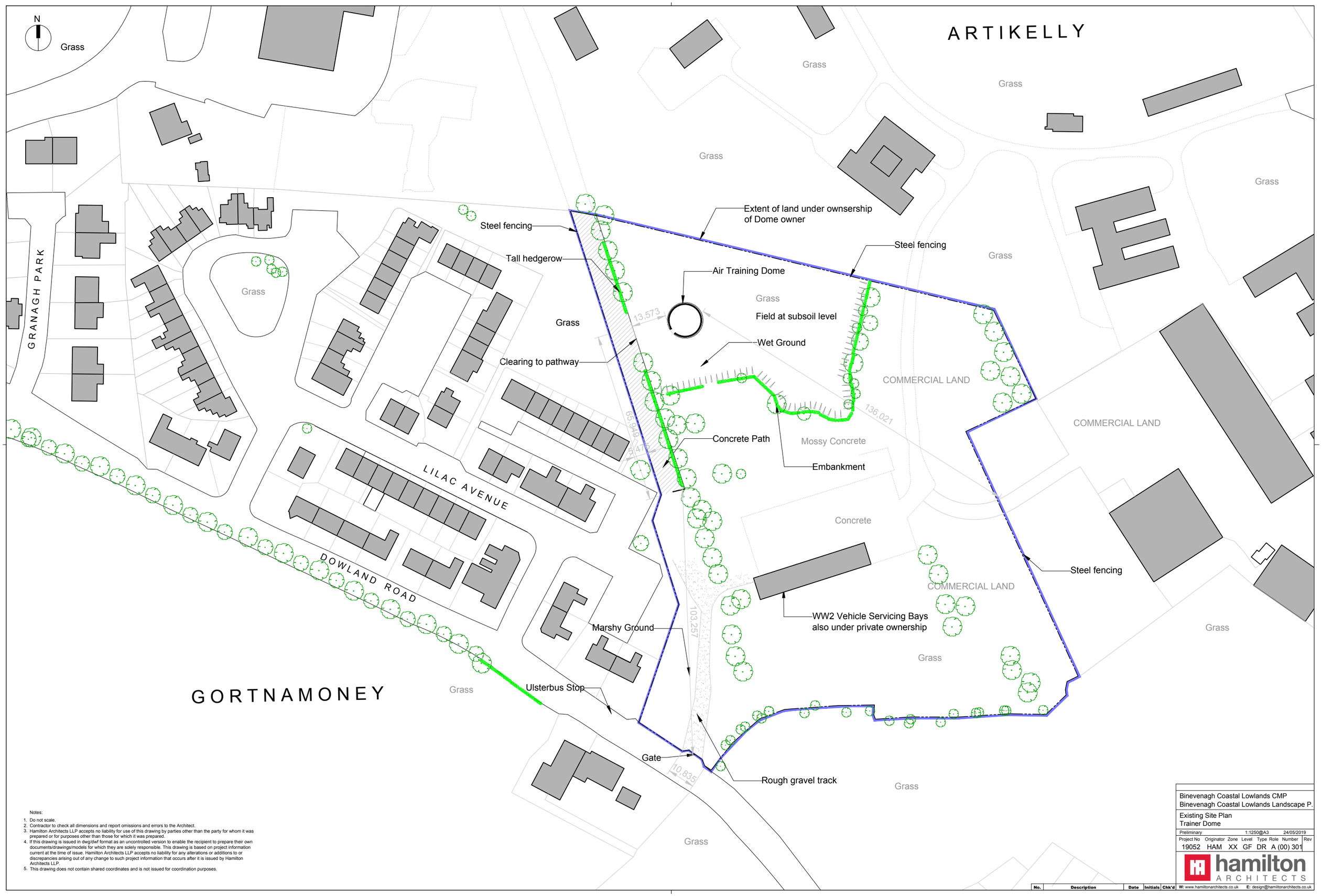
It was late 1939 that the inventor Henry Stephen came up with the idea of using films to train anti-aircraft gunners - whilst watching a newsreel in a cinema! Following further research it was decided to build these domes, from 1941 onwards, with a radius of 10 to 20 foot. The actual image of the aircraft was projected onto the projection surface by the use of a fluorescent light which flooded the whole area with blue light, creating the illusion of a cloudless sky.

The trainee gunner used dummy guns, which were fitted with a small projector which shone a spot of light at the point where the trainee was firing, and this enabled the instructor to make an estimation of accuracy. On pulling the trigger, a soundtrack produced the sound of a firing gun - but this would only last continuously for about 5 seconds, this being the time it took to empty the ammunition cartridge.

BRACKLESHAM - DERELICT BAILEY BRIDGE

ACCESS: By foot along public footpath south from the end of Ham Lane. Map Reference: SZ 834949.

9.3 Existing Drawings



Notes:

1. Do not scale.
2. Contractor to check all dimensions and report omissions and errors to the Architect.
3. Hamilton Architects LLP accepts no liability for use of this drawing by parties other than the party for whom it was prepared or for purposes other than those for which it was prepared.
4. If this drawing is issued in dwg/dwf format as an uncontrolled version to enable the recipient to prepare their own documents/drawings/models for which they are solely responsible. This drawing is based on project information current at the time of issue. Hamilton Architects LLP accepts no liability for any alterations or additions to or discrepancies arising out of any change to such project information that occurs after it is issued by Hamilton Architects LLP.
5. This drawing does not contain shared coordinates and is not issued for coordination purposes.

Binevenagh Coastal Lowlands CMP
Binevenagh Coastal Lowlands Landscape P.

Existing Site Plan
Trainer Dome

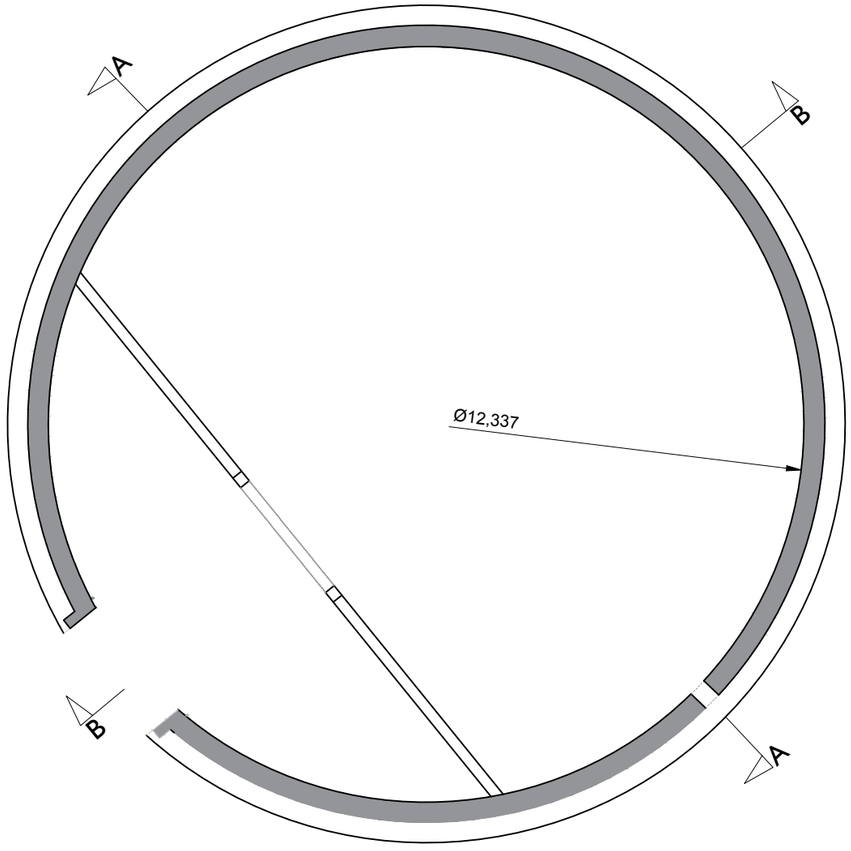
Preliminary 1:1250@A3 24/05/2019

Project No	Originator	Zone	Level	Type	Role	Number	Rev
19052	HAM	XX	GF	DR	A	(0) 301	

hamilton ARCHITECTS

No.	Description	Date	Initials	Chk'd

W: www.hamiltonarchitects.co.uk E: design@hamiltonarchitects.co.uk



Plan
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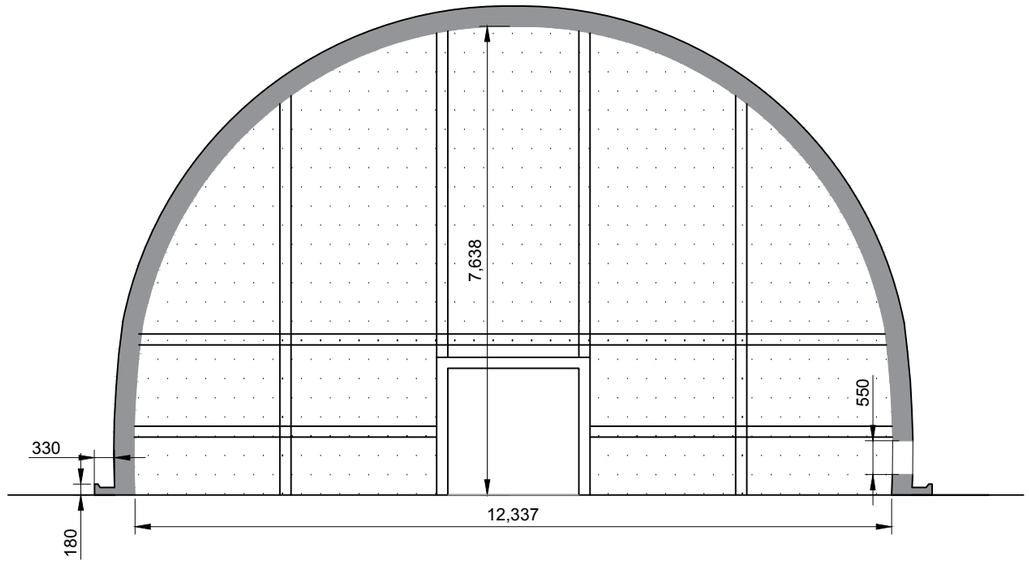

Section A-A
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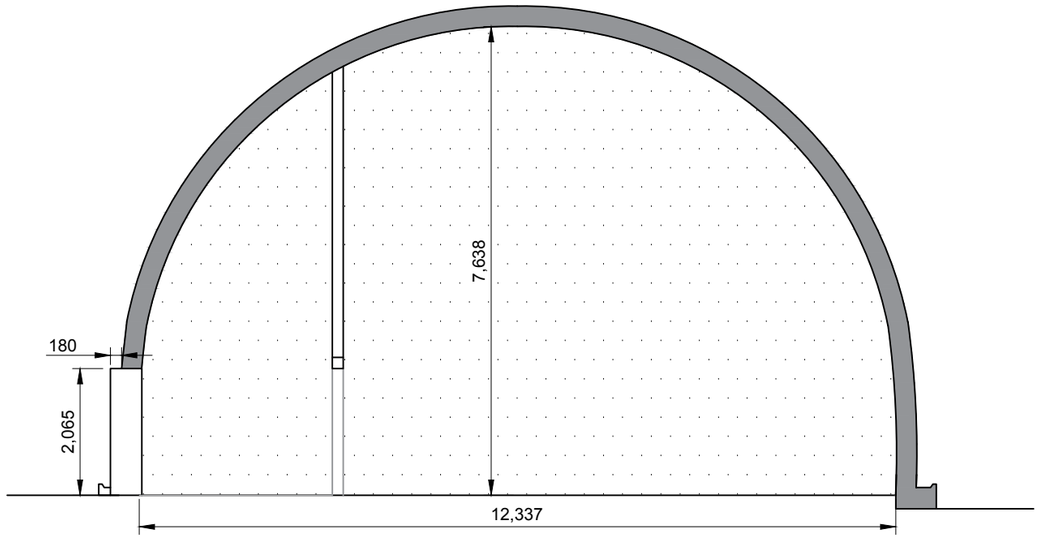

Section B-B
Scale 1:100

Notes:

1. Do not scale.
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Binevenagh Coastal Lowlands CMP
Binevenagh Coastal Lowlands Landscape P.

Existing Plan / Sections
Trainer Dome

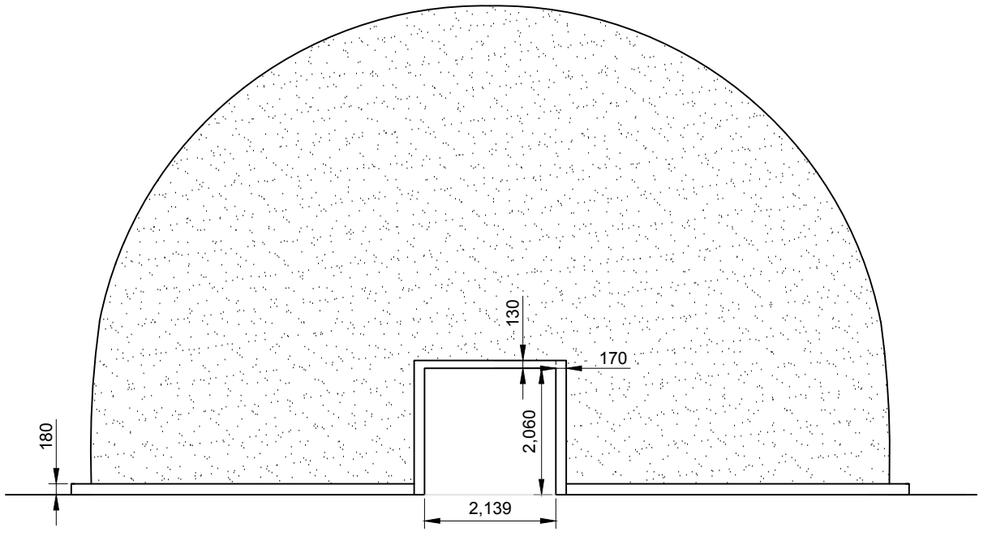
Preliminary 1:1250@A3 24/05/2019

Project No	Originator	Zone	Level	Type	Role	Number	Rev
19052	HAM	XX	GF	DR	A	(00) 302	

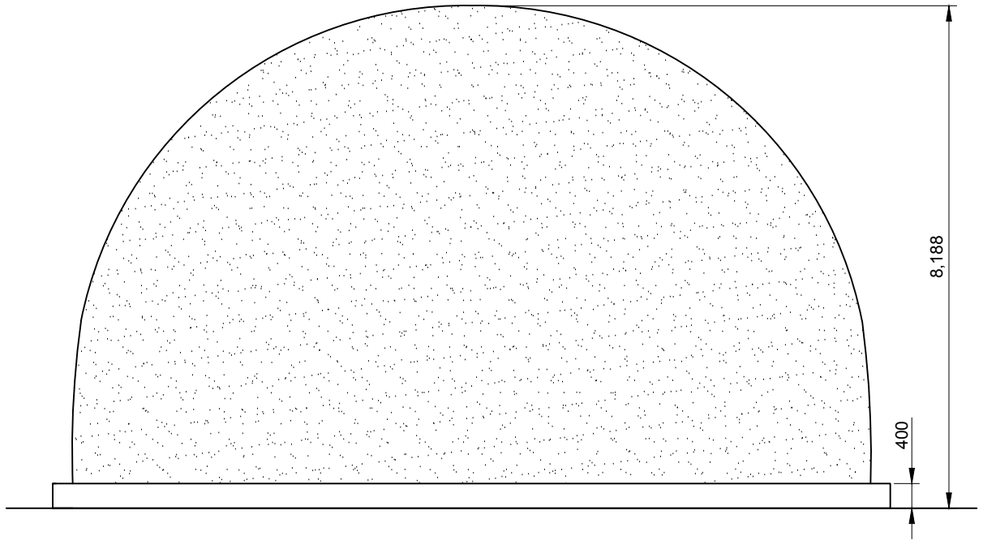
hamilton ARCHITECTS

No.	Description	Date	Initials	Chk'd

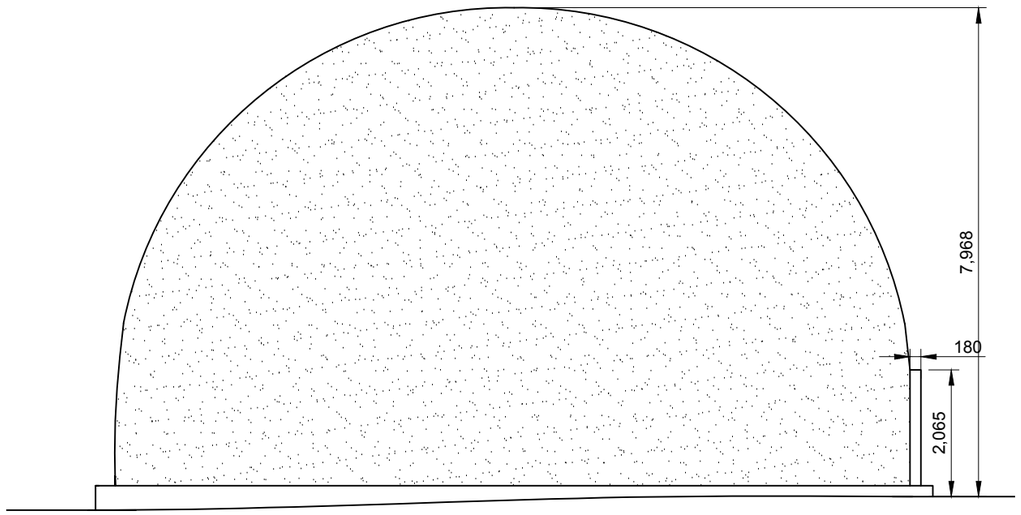
W: www.hamiltonarchitects.co.uk E: design@hamiltonarchitects.co.uk



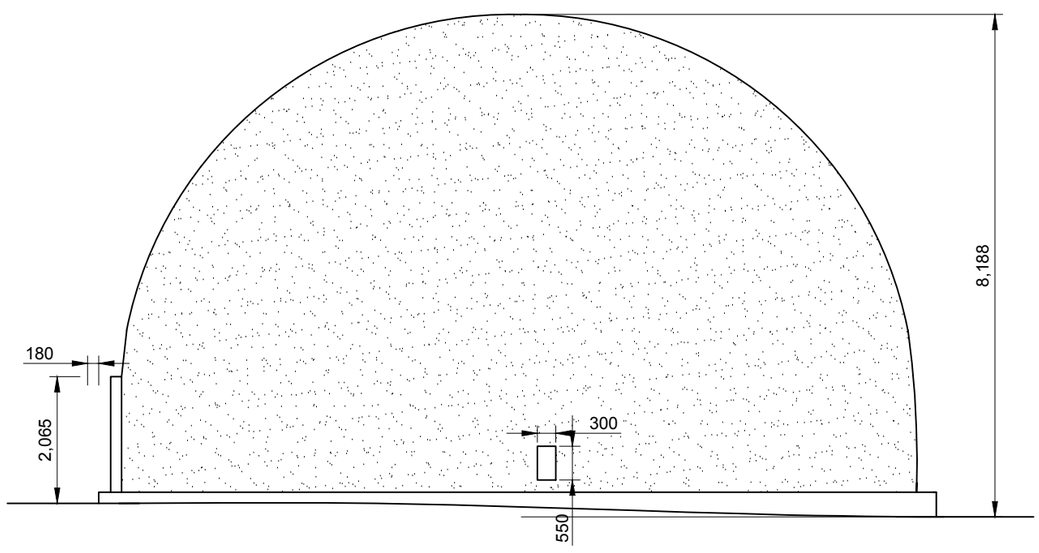
West Elevation
Scale 1:100



East Elevation
Scale 1:100



North Elevation
Scale 1:100



South Elevation
Scale 1:100

Notes:

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Binevenagh Coastal Lowlands CMP
Binevenagh Coastal Lowlands Landscape P.

Existing Elevations
Trainer Dome

Preliminary 1:1250@A3 24/05/2019

Project No	Originator	Zone	Level	Type	Role	Number	Rev
19052	HAM	XX	GF	DR	A	(00) 303	

hamilton ARCHITECTS

No.	Description	Date	Initials	Chk'd

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9.4 Accredited Conservation Structural Engineers Report

BYRNELOOBY

Hamilton Architects

Binevenagh and Coastal Lowlands Landscape Partnership Scheme

Conservation Structural Engineer's Report on: Heavy Anti-Aircraft Base at Magilligan, Pillboxes at Lower Doagh and Grange Beg, Martello Tower at Magilligan Point, RAF Trainer Dome at Former Limavady Airfield

Report No. 9090-CON-001

30 July 2019

Revision 00

BYRNELOOBY

Document Control

Document:	Conservation Structural Engineer's Report on: Heavy Anti-Aircraft Base at Magilligan, Pillboxes at Lower Doagh and Grange Beg, Martello Tower at Magilligan Point, RAF Trainer Dome at Former Limavady Airfield
Project:	Binevenagh and Coastal Lowlands Landscape Partnership Scheme
Client:	Hamilton Architects
Report Number:	9090-CON-001
File Origin:	S:\Standard Documentation\Reports\ByrneLooby\

Document Checking:

Revision	Revision/ Review Date	Details of Issue	Authorised		
			Prepared By	Checked By	Approved By
00	30 July 2019	Final issue	TM, DV	T. Meciani	T. Meciani
01	6 August 2019	Minor amendment	DV	TM	TM
Disclaimer: Please note that this report is based on specific information, instructions and information from our Client and should not be relied upon by third parties.					

BYRNELOOBY

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BYRNELOOBY

Contents

1 Introduction and Brief

1.1 Sinclair Johnston & Partners (now Byrne Looby) were instructed by the Binevenagh and Coastal Lowlands Landscape Partnership Scheme to prepare a Conservation Structural Engineering report to form part of a Conservation Management Plan for various military defence structures in Northern Ireland, dating back to the 19th and 20th centuries. In this report we are summarising our findings from desk study research of readily available material, archive sources, and our findings and observations from our site visits in May and June 2019. Advice is provided on the condition of the existing structure and any necessary repairs to be carried out in the future.

1.2 Both inspections were carried out with Nicola Donnelly of Hamilton Architects. The first visit took place on Friday 31st of May 2019. During that visit, we inspected Anti-Aircraft Battery 1 and the Command Centre at the Magilligan site, the Martello Tower at Magilligan Point and the RAF Trainer Dome at the former Limavady Airfield, in Artikelly, near Aghanloo. The visit on the 31st was carried out in wet and cloudy weather conditions, during a windy day.

1.3 A second inspection was carried out on Friday, the 14th June 2019, with the weather being sunny, dry and mild. The structures we inspected during the second visit were the Anti-Aircraft Batteries 2, 3 and 4 and the two Pillboxes (Grange Beg and Lower Doaghs).

1.4 The report is based on these visual inspections only, without any trial pits, opening-up or laboratory testing of materials or the like at this time. However, physical investigations may be advised and arranged as considered appropriate.

1.5 Marked up drawings with notes from the site visits are included in Appendix A. The drawings used are by Hamilton Architects.

1.6 Photographs taken on site are included in Appendix B and are referenced throughout the text as IMG XXXX.

5 RAF Trainer Dome, former Limavady Airfield

5.1 HISTORY AND EXISTING STRUCTURE

5.1.1 The RAF Trainer Dome (IMG 6121 and IMG 6135) is located in the former Limavady Airfield, south of Artikelly. The area is now a zone of mixed industrial and residential use. The site is privately owned and also comprises other former military buildings. Limavady Airfield opened in 1940 and stopped being used by the military in 1958. It was one of four airfields in the area, securing the city of Derry against enemy military attacks. The other three were Ballykelly, Eglington and Maydown Airfields to the W-SW. Airfields in that part of Ireland were also of great importance for planes with supplies from the United States which needed to refuel. They were also safer from attack from Germany compared to other airfields to the south and south-east. Maps with the location and the original layout of Limavady Airfield, location of other airfields in the area, and the expected ground conditions on site are included in Appendix A. The RAF Trainer Dome is a Scheduled Monument.

5.1.2 RAF trainer domes started being built in the late 1930s and early 1940s for the training of military personnel for use of anti-aircraft equipment. There were different types of domes; some built in steel and plaster, others in timber, and even inflatable 'Portobel' domes. The dome in Limavady Airfield was built with reinforced concrete. The term 'dome' for the RAF structure in Limavady is not entirely correct as although initially built as domes, these structures were later changed to having a cylindrical lower part and a dome on top. However, and for the needs of this report we will keep referring to it as a 'dome'.

5.1.3 One of the first structures of this type in concrete was designed and built by the Trussed Concrete Steel Co. Ltd. in 1942 and later adopted by the Air Ministry in 1942. The dimensions of that 'prototype' dome are given as 25ft high and 40ft internal diameter, therefore very similar with the dome in Limavady. Approximately 43 permanent domes were built in the UK, with 6 surviving now.

5.1.4 The small entrance lobby was separated from the training area by a partition of welded rods with sound insulation and wire netting (IMG 6098). The lobby originally had a plant room and a cloakroom.

5.1.5 The dome at Limavady is a reinforced concrete structure cast in situ. The reinforcement comprises a grid of ribs (vertical elements) and hoops (horizontal elements) of prewelded steel rods. The width of the ribs is approximately 150mm and the zig-zag prewelded rods are welded at 250mm pitch (IMG 6023).

5.1.6 According to Anti-Aircraft Dome Instructor General Arrangement record drawing No. 73/42 from the Directorate of Works (Appendix A), light metal lathing was wired internally and externally to the ribs and hoops on site to form a temporary shuttering for the concrete and permanent reinforcement for the entire shell (IMG 6029). This was a Hy-Rib type of steel lathing, a proprietary product used at the time. On the record drawing the external layer of lathing is shown not extending to the top of the dome. The width of the metal lath strips was measured to be approximately 100mm.

5.1.7 The rough key of the concrete through the lath was then cement rendered externally and probably internally to form a smooth finish and eventually the dome was covered externally with a tar coating with stone chippings or chopped heather for camouflage with maximum density to the top of the dome. During our visit we noticed rectangular pieces of wood still in place in small recesses in the lathing (IMG 6114). They were originally providing fixing locations for the internal plaster lining which is now lost. The external waterproof/ camouflage coating of the dome at Limavady probably comprised stone chippings.

5.1.8 According to the record drawing, the thickness of the concrete ground floor slab is 100mm with a hardcore layer of same thickness under. Channels are shown to be cast into the floor for services of the equipment. The concrete slab has a thickening around the perimeter forming a strip footing under the walls of the dome, while also accommodating a recessed gulley. The perimeter gutter for rainwater drainage is present around the dome at Limavady (IMG 6125). According to drawing 73/42, there are two diametrically opposite drains for the discharge of rainwater which we did not see on site due to vegetation.

5.1.9 From a small opening in the dome structure we measured a thickness of approximately 140mm (IMG 6009). The total thickness (including the lost cover) would have been approximately 160mm. The height of the dome in the centre is approximately 7.6m and the diameter at the base 12.3m.

5.2 CONDITION OF EXISTING STRUCTURE - NOTES FROM SITE VISIT

5.2.1 The dome at Limavady is in poor condition. The fact that the cover to the reinforcement was very limited, and the lack of maintenance and care of the structure have led to a long period of neglect and decay which have taken their toll on the fabric and structure.

5.2.2 The common issues we encountered were extensive corrosion of the reinforcement, loss of all the internal cover of the reinforced concrete dome, and weathering and loss of the external waterproofing.

5.2.3 The first observation when looking at the dome after walking through the entrance is that the entire concrete cover to the lath has collapsed and taken rusted pieces of the metal lathing to the ground. All the concrete fragments and pieces of the steel lathing have been pushed around the perimeter (IMG 6058) and a large part of the floor is covered with animal excrements as the interior was used as a stable.

5.2.4 The loss of all the internal cover due to corrosion of the steel reinforcement has exposed not just the metal lathing but also significant areas of the ribs and hoops of reinforcement (IMG 6035 and IMG 6038). All the main steel reinforcement and lathing we looked at internally were corroded.

5.2.5 Externally, the original bituminous coating on the surface of the concrete has largely weathered and disappeared. The concrete surface underneath is visible in many areas together with some areas of corroded external metal lathing (IMG 6067 and IMG 6071). The reason the external concrete cover is still in place is mainly due to this being on the extrados of the dome.

5.2.6 The perimeter concrete gutter outside the dome is in many locations covered in vegetation preventing the flow and drainage of rainwater (IMG 6074).

5.3 PROPOSED CONSERVATION MEASURES - RAF TRAINER DOME, FORMER LIMAVADY AIRFIELD

5.3.1 The dome at the former Limavady Airfield appears to be in poor condition. The internal and external metal lathing is severely corroded, all internal concrete cover to the reinforcement is lost and the external tar layer of camouflage/ waterproofing is weathered and lost in most areas. Some of the main ribs and hoops of reinforcement are exposed internally and corroded as well.

5.3.2 The approach for the repairs to the dome in comparison with repairs to the HAA site at Magilligan will be very different because of the scale of the building, the extent/ magnitude of corrosion and the type of the reinforcement.

5.3.3 The structure has been standing on the site for more than 70 years, albeit neglected and in a state of disrepair for a long period. The form of the structure has helped the building retain its external cover to the reinforcement.

5.3.4 The first and most important measure to be undertaken should be to make the structure waterproof. The existing bituminous coating is largely lost, but samples could be taken for laboratory analysis. The loose concrete sections to the external face should be cleaned and recast, and a new layer of waterproofing should be applied to encapsulate the full external surface of the dome. The material to be used and the precise specifications would be given by the architect, the compatibility and reversibility being key for the works.

5.3.5 The repair of the internal part of the reinforced concrete dome is more challenging. The cover is lost and all the lathing and main reinforcement visible are corroded. Clearly a system of patch repairs is not applicable, and the cleaning and reinstatement of all reinforcement is probably ineffective. The thickness of the RC dome minus the lost internal cover is approximately 140mm, and the lost cover was measured to be between 15 and 20mm. Probably the most feasible option, from a buildability point of view, would be to use sprayed concrete to reinstate the internal part of the dome. That can be formed by shotcrete or gunite (sand-cement mortar) and carefully treated to provide a smooth finish. Within the internal concrete layer, we could incorporate fibre reinforced polymer strips attached to the internal surface of the dome. Although trying to avoid an increased

thickness, in this case this is most likely unavoidable, although the total thickness of the new concrete/ mortar would probably not exceed 45-50mm.

5.3.6 An option that has been applied to another reinforced concrete RAF Trainer dome of very similar construction was the use of a cathodic protection system to prevent further corrosion of the reinforcement and is another way that the corrosion issue could be dealt with.

RECOMMENDED INVESTIGATIONS AND LABORATORY TESTING TO DECIDE ON REPAIR STRATEGY

5.3.7 Prior to reaching a decision on the preferred conservation approach for the Trainer Dome, further investigations and tests should be carried out to get a better understanding of the condition of the structure. These should include the following:

- Full visual survey and report to include full schedule of defects and a systematic recording of existing structural details
- Laboratory testing of concrete for carbonation and chloride content
- Laboratory testing to determine concrete composition
- Laboratory testing to confirm the composition of the original waterproofing/ camouflage layer

5.3.8 Depending on the results and findings of the investigations and testing of the materials regarding the state of decay of the structure, the project could be taken forward in two ways:

- Conservation of the fabric, painting the reinforcement with corrosion protection coatings, external waterproofing, recasting (or not) internal lost cover of concrete, or,
- In case the damage/ decay is of greater extent and the structural stability and performance have been compromised, retrofitting the existing structure would be necessary. Retrofitting could, for example, involve the use of Fibre Reinforced Polymer materials to offer the structure a 'helping hand' and prolong its life.

J.S. JOHNSTON BSc CEng FICE FIStructE FCONSE

Conservation Accredited Engineer

TIZIANA MECIANI CEng MEng PhD MICE

Conservation Accredited Engineer - Technical Director - Conservation

DIMITRIOS VELESIOTIS MEng MSc

Conservation Engineer

APPENDIX A

MARKED UP DRAWINGS WITH NOTES FROM SITE VISITS, ARCHIVE SOURCES/INFORMATION, MAPS

Image 11 - Location of the former RAF Limavady Airfield in Northern Ireland (extract from Bing maps)

Image 12 - Location of the former RAF Limavady Airfield (extract from Bing maps)

Image 13 - Location of RAF Trainer Gunner Dome in the former Limavady Airfield (extract from Bing maps)

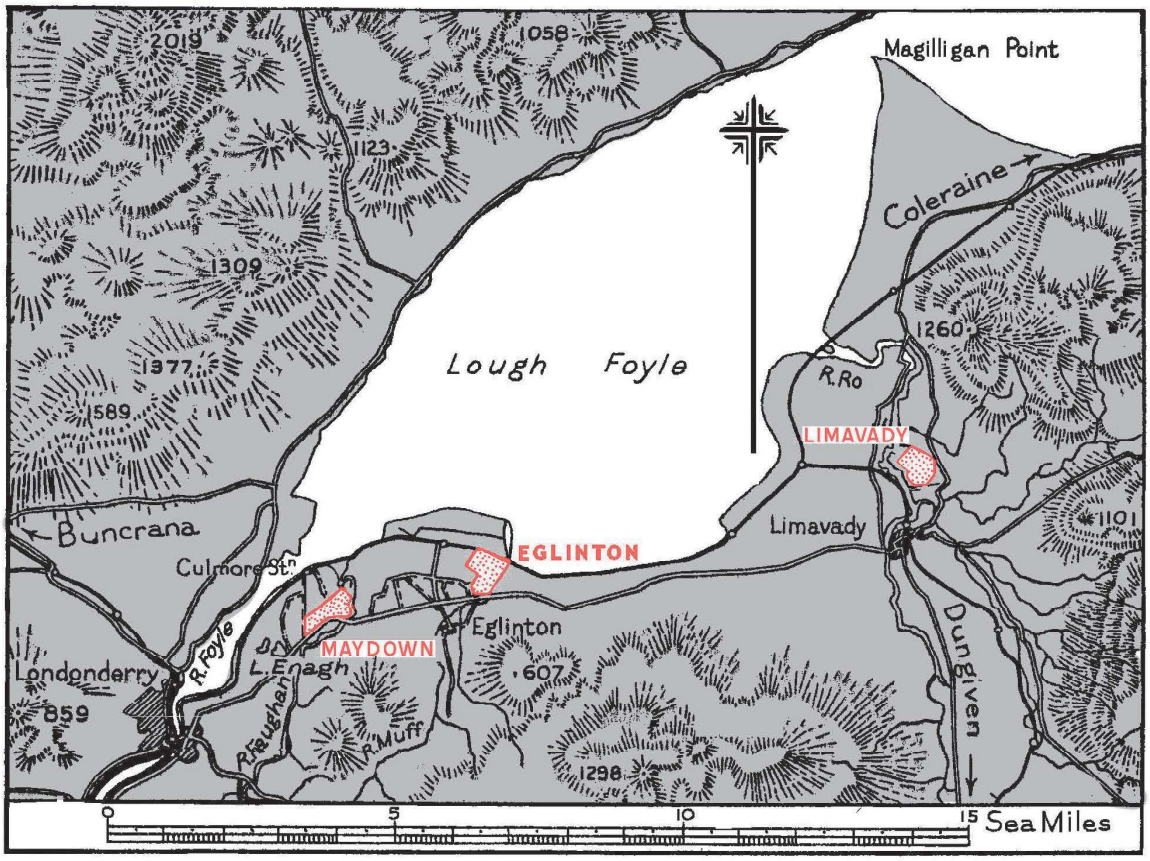


Image 14 - Map of RAF Airfields around Lough Foyle

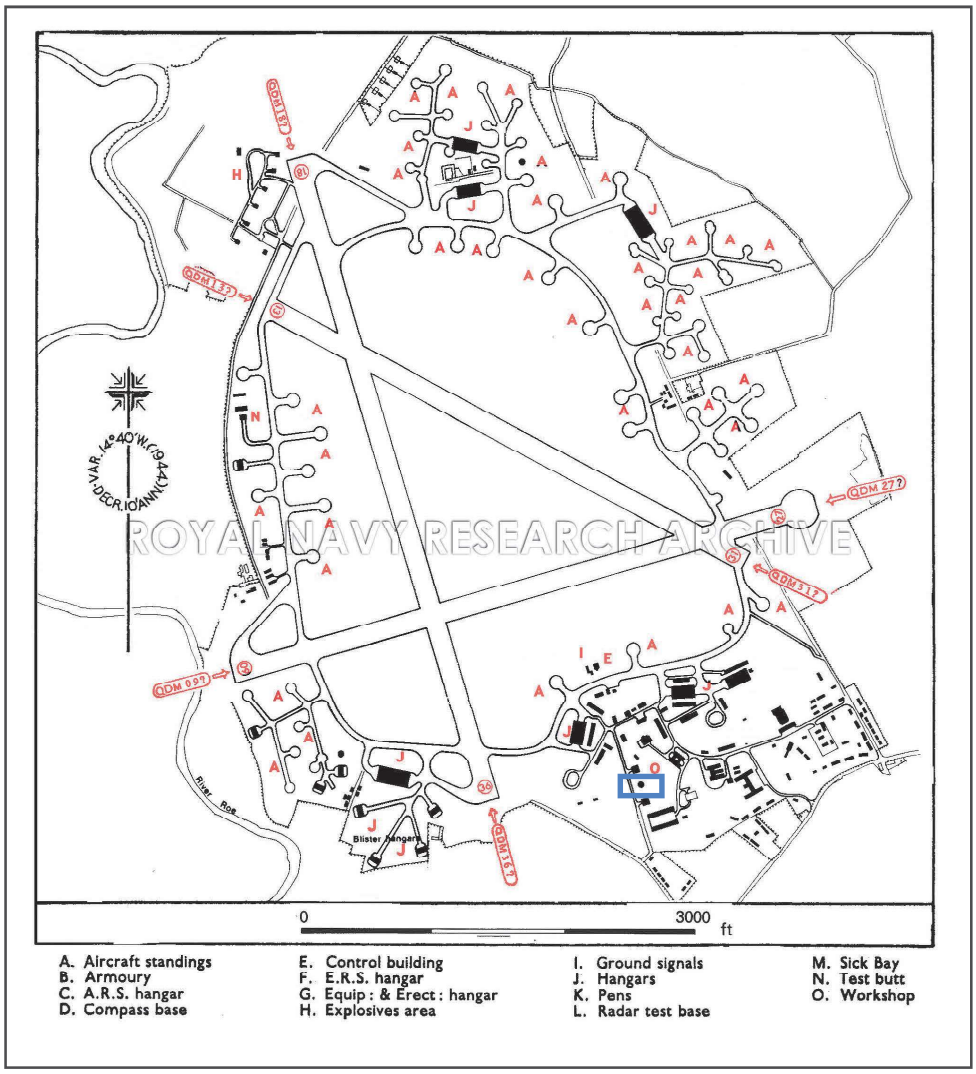
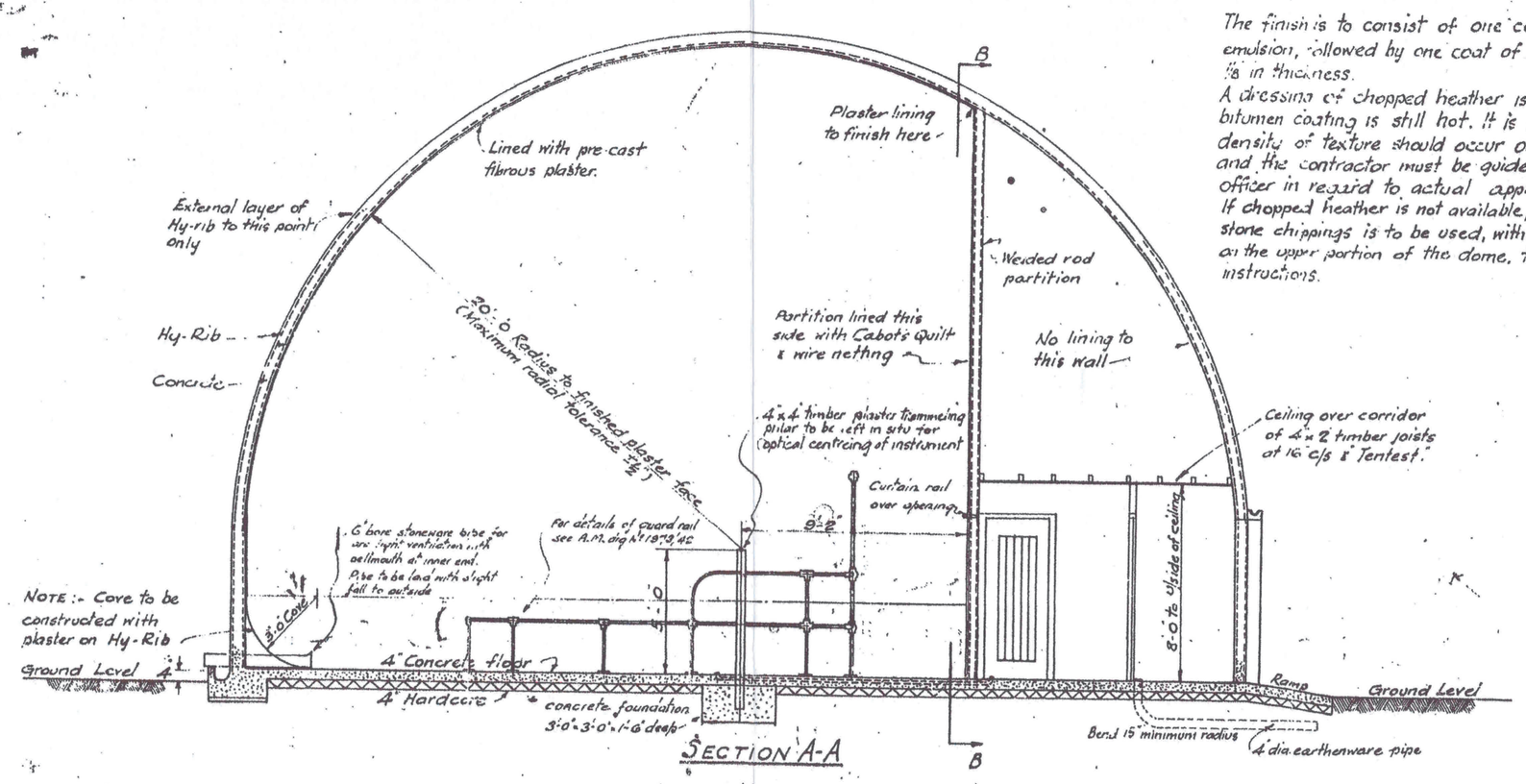


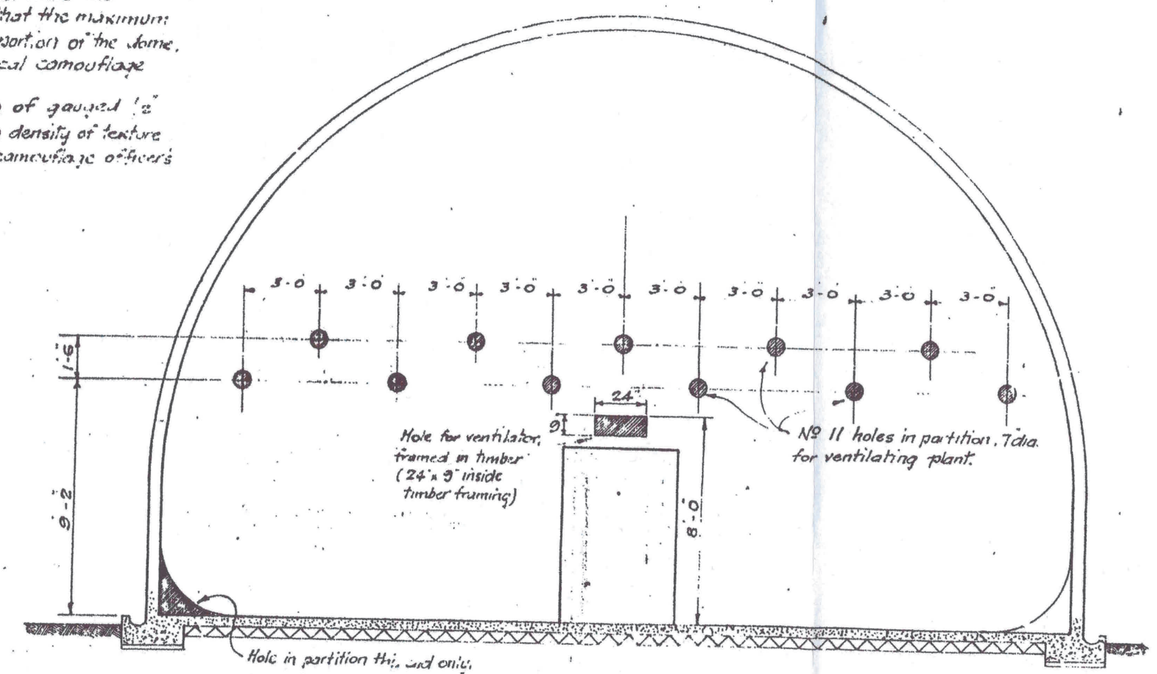
Image 15 - Map of Limavady Airfield (from the Royal Navy Archive) - the Dome shown in the blue box

Image 16 - Extract from the British Geological Survey map of the area

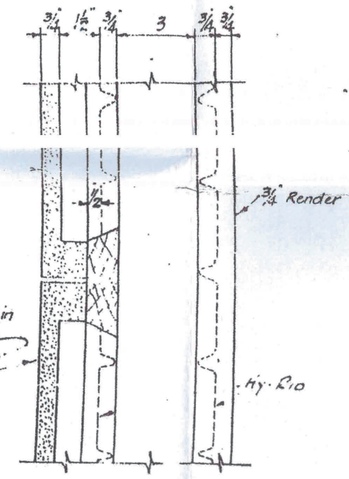
The finish is to consist of one coat approved bituminous emulsion, followed by one coat of hot ...umen, approximately ⅛" in thickness.
A dressing of chopped heather is to ...applied while the bitumen coating is still hot. It is imp...ve that the maximum density of texture should occur on th... lower portion of the dome, and the contractor must be guided b... local camouflage officer in regard to actual applicat...
If chopped heather is not available, a ...ing of gauged ¼" stone chippings is to be used, with a ...imum density of texture as the upper portion of the dome, to th... camouflage officer's instructions.



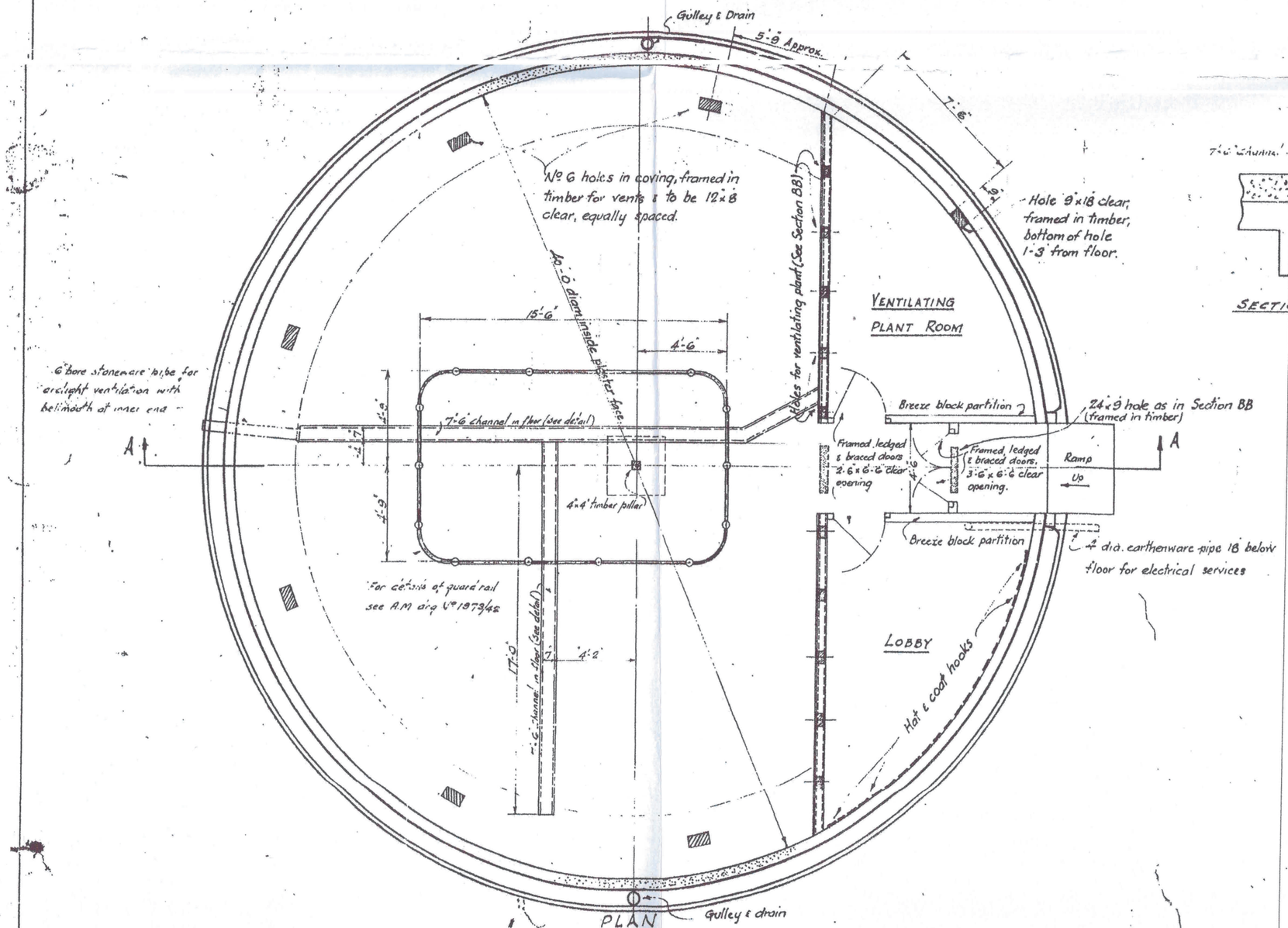
SECTION A-A



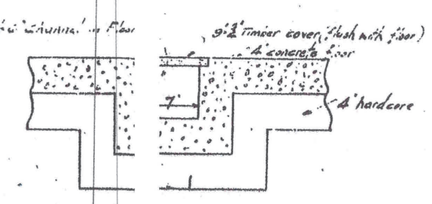
SECTION BB.



ENLARGED SECTION THROUGH WALL OF DOME



PLAN



SECTION ... CHANNELS IN FLOOR

REVISED 9'1,'42

A.A. DOME INSTRUCTOR
GENERAL ARRANGEMENT

Scales:- ¼", 1 & 3'-1'-0"

A.R. Sutton FOR W.S.	FOR D.G.W.	DIRECTORATE OF WORKS REG° № 73/42
J.R. W.SUTTON JAN. 1942		AIR MINISTRY

30 x 22

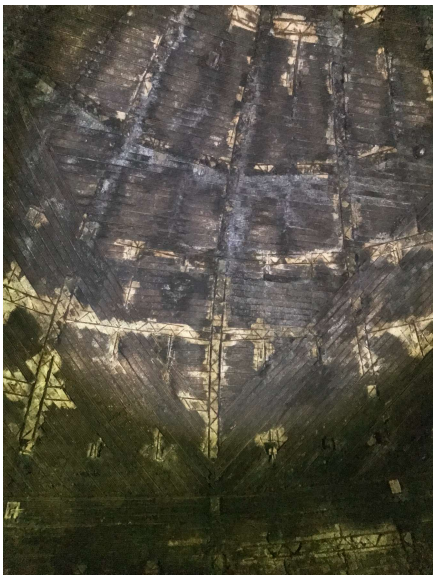
APPENDIX B

PHOTOGRAPHS

IMG_6009

IMG_6023

IMG_6029



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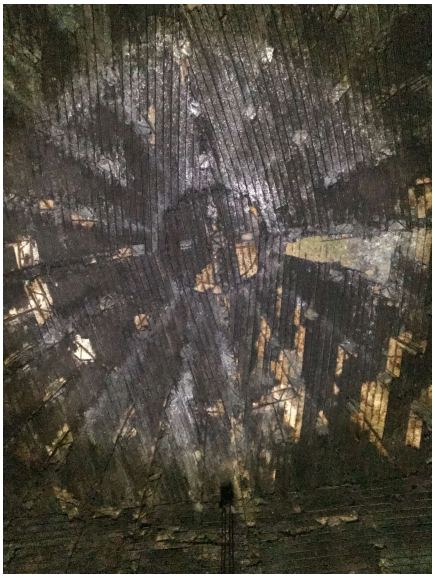


IMG_6038

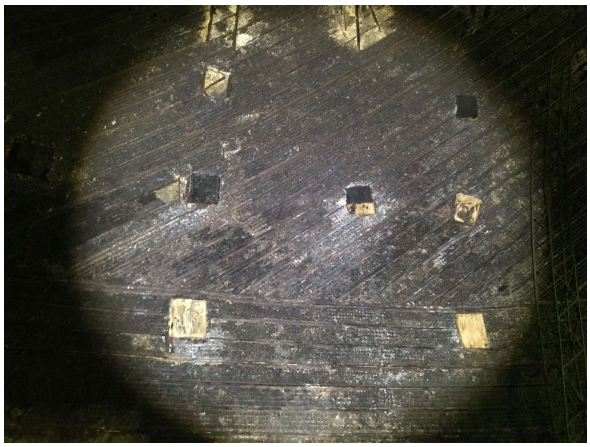
IMG_6058

IMG_6067

IMG_6071

IMG_6074

IMG_6098



IMG_6114

IMG_6121

IMG_6125

IMG_6135