ASHBY FARM, DUCKS HILL ROAD, NORTHWOOD

PRE-REDEVELOPMENT AUDIT

PROJECT NO. 25/296   DOC NO. D015

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Notes

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1 PROJECT INTRODUCTION

1.1 INTRODUCTION

1.1.1 This Pre-Redevelopment Audit (PRA) has been prepared on behalf of Holland and Holland (the 'Applicant') in support of a full planning application for the redevelopment of Ashby Farm, Ducks Hill Road, Northwood, HA6 2SS (hereafter referred to as 'the Site'). The local planning authority is the London Borough of Hillingdon (LBH).

1.1.2 The PRA is a tool for understanding whether existing buildings, structures and materials can be retained, refurbished, or incorporated into the new development to any extent. The audit fully explores the available options for retention or refurbishment of structures, materials, and the fabric of existing buildings.

1.1.3 The findings and values contained in this report represent the best estimate of the materials and components based on the information available for the structures within the scope of the project. Estimates were made using the following information (where available):

- Site surveys; and
- Photographs.

1.2 COMPETENCY – PROJECT MANAGER

1.2.1 The project manager was Peter Hambling who is a Chartered Waste Manager working for the past 14 years within the resource and waste management industry. His background began in environmental compliance, and his experience includes contract management, waste stream analysis, collection methodologies and infrastructure development. With experience working for a construction waste contractor, commercial waste contractor and within a local authority as well as development planning, he has comprehensive understanding of the subject matter.

1.3 AIMS AND OBJECTIVES

1.3.1 This PRA report has been prepared in accordance with the Greater London Authority (GLA) Circular Economy Guidance. The report will look to understand whether elements of the existing structures on site can be retained, refurbished, or incorporated into the site.

1.4 PROJECT SCOPE

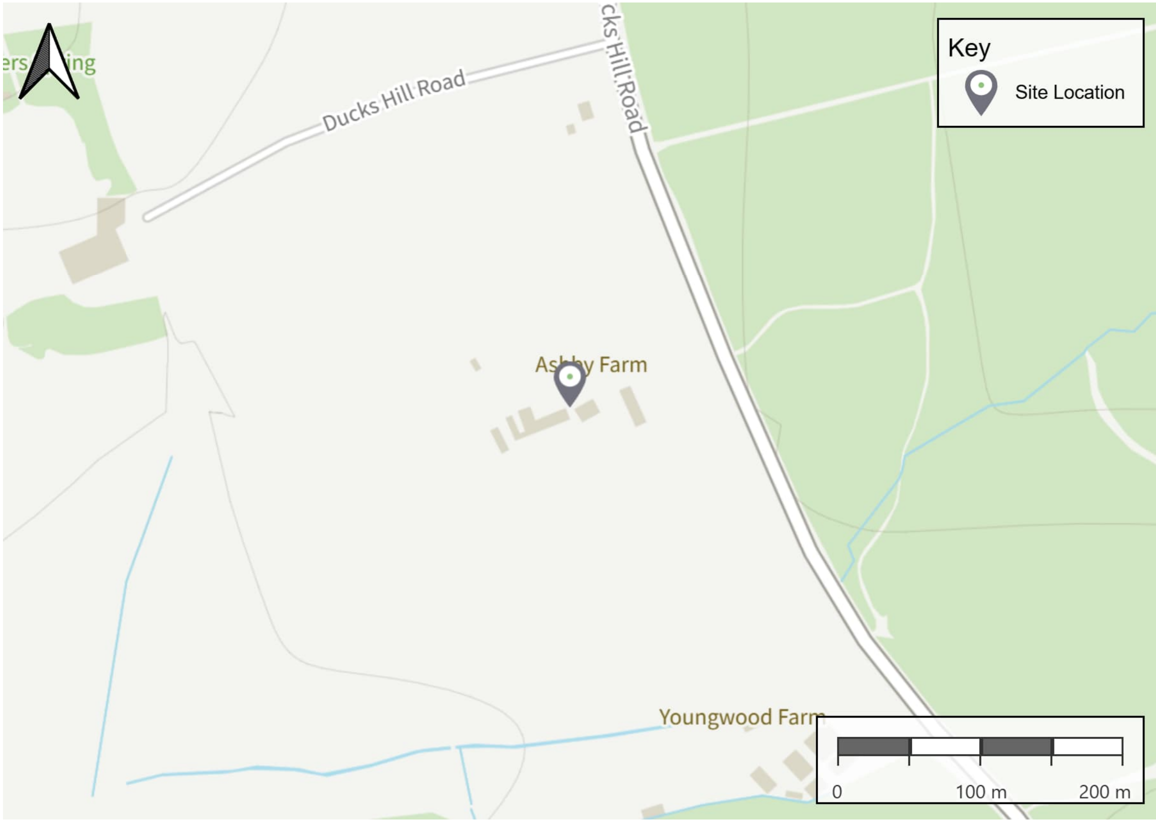
1.4.1 The scope of the PRA includes the assessment of structures making up the Site which include multiple stables varying in size, small shed-like structures and staff welfare facilities.

1.4.2 The Site includes hardstanding, lighting fixtures, and other external features.

1.4.3 One existing derelict domestic property stands to the north of the Site and will not form part of the project scope.

1.4.4 The location of the Site is shown in Figure 1-1 below.

Figure 1-1 Site Location



1.4.5 The scenarios that will be considered are as follows:

- Light Refurbishment;
- Refurbishment and Extension; and
- Full Redevelopment.

1.5 AUDIT METHODOLOGY

1.5.1 The audit is based on a non-intrusive survey methodology; a site visit was conducted on Tuesday 7th October 2025 by the project team.

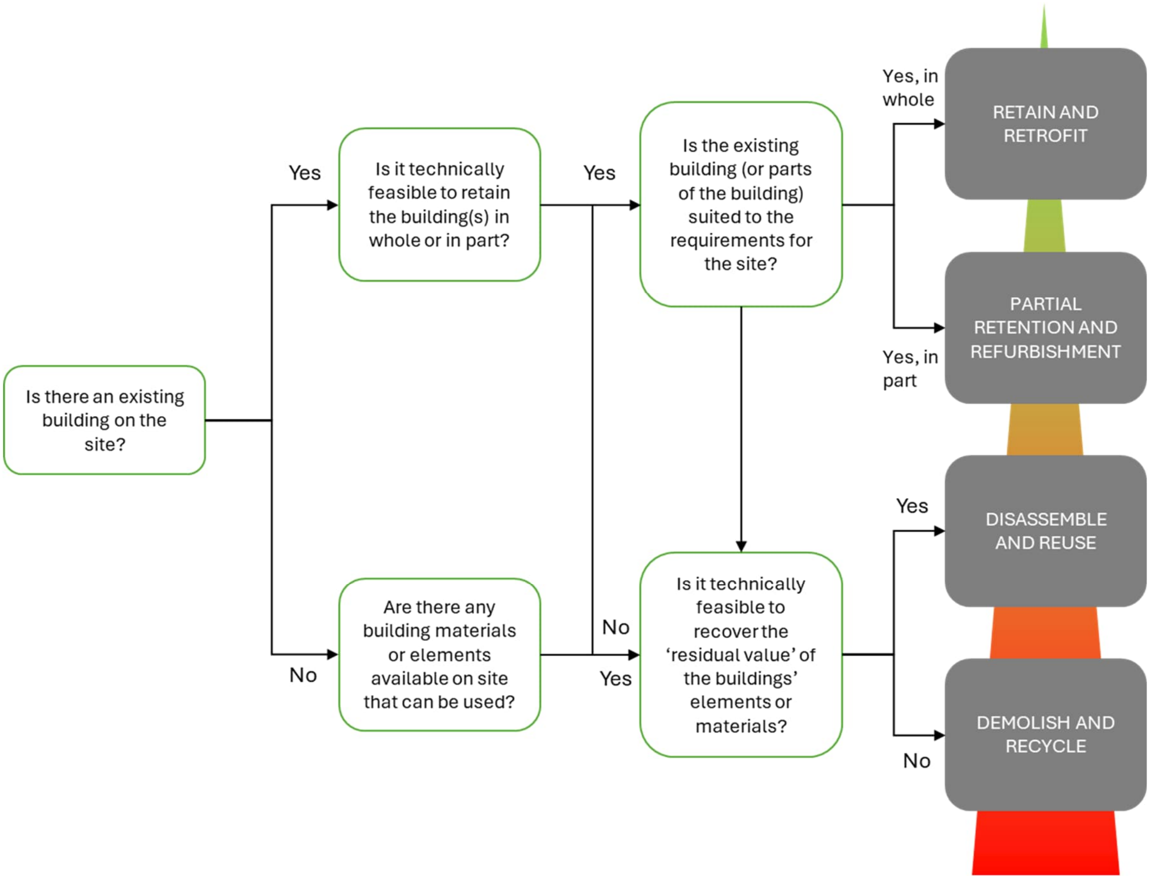
1.5.2 A thorough inspection was made of the structures and external areas where possible.

1.5.3 Where details of construction methodology were not included on the plans, appropriate assumptions have been made to facilitate the audit results, based on industry knowledge.

1.5.4 Where information is not available to inform the audit results, suitable assumptions have been made using relevant published material and extensive prior knowledge based on industry and project experience.

1.5.5 Figure 1-2 below shows the decision tree for the approaches taken for the existing structures on the site as part of the design process.

Figure 1-2 Pre-Redevelopment Decision Tree



1.6 HAZARDOUS MATERIALS

1.6.1 It is unknown when some of the main structures were completed, so it is anticipated that asbestos may be present in a number of the building components.

1.6.2 It is assumed that all Asbestos Containing Material (ACM) will be removed by an appropriately trained and licensed contractor in advance of redevelopment.

1.7 KEY DEFINITIONS

1.7.1 To inform the audit process and results, key definitions were established.

1.7.2 Reclamation is reuse of a material or product in the same form. An example of reclamation is the removal of carpet tiles from an office for reuse in another location.

1.7.3 Recycling is reprocessing of a material of product for an alternative use. An example of recycling is crushing of house bricks (on- or off-site) for use within secondary aggregate materials.

1.7.4 Closed loop recycling is the process by which a product is used, recycled, and then made into a new product again without losing any of its material properties. An example of materials suitable for closed loop recycling are aluminium cans, which can be reprocessed multiple times into the same product.

1.7.5 Open loop recycling is where the recycled materials are converted into both new raw materials and waste product. Typically, materials recycled through open-loop recycling go on to be used for purposes different from their former purpose. This means that the input into the recycling process is converted to a new raw material, which can be used as an input into another manufacturing process. An example of open loop recycling is plastic water bottles that are reprocessed to provide material for sleeping bags or fleece jackets.

1.7.6 Circular economy is defined in the London Plan Policy SI7 'Reducing waste and supporting the Circular Economy' as one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste. The end goal is to retain the value of materials and resources indefinitely, with no residual waste at all. This is possible, requiring transformational change in the way that buildings are designed, built, operated, and deconstructed.

1.7.7 Embodied carbon means all the CO_2 emitted in producing materials and is estimated from the energy used to extract and transport raw materials, as well as emissions from manufacturing processes. The embodied carbon of a building can include all the emissions from the construction materials, the building process, all the fixtures and fittings inside and the deconstruction or demolition process at the end of life.

1.7.8 Whole Life-Cycle Carbon (WLC) emissions are the carbon emissions resulting from the materials, construction, and the use of a building over its entire life, including its demolition and disposal.

2 OVERVIEW OF EXISTING STRUCTURES

2.1 INTRODUCTION

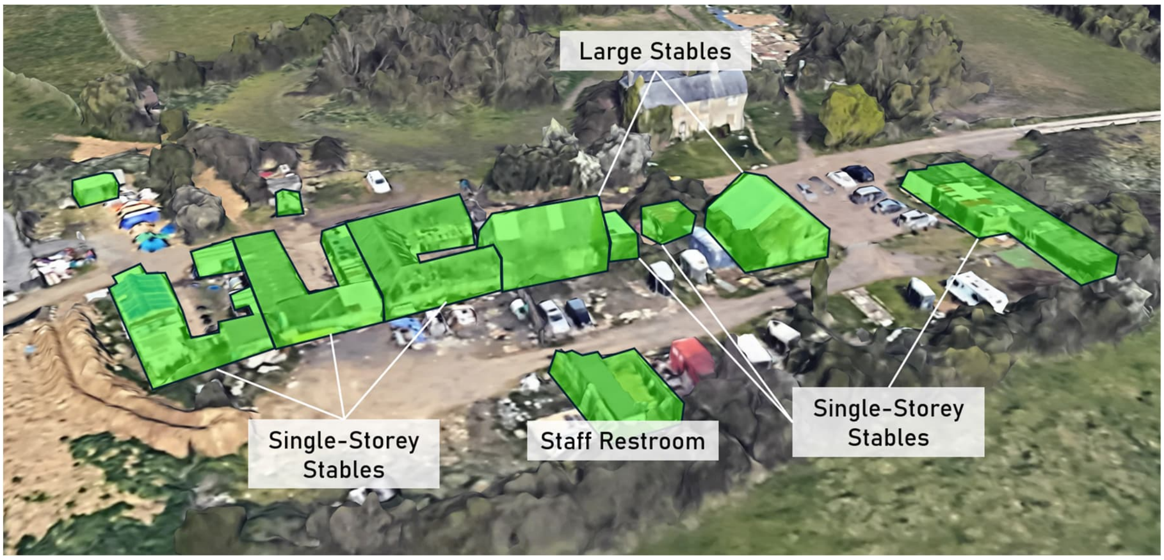
2.1.1 This section provides an overview of the existing structures on the Site.

2.2 OVERVIEW OF EXISTING STRUCTURES

2.2.1 The main portion of the Site is approached via a narrow internal road which is accessed from A4180 Ducks Hill Road.

2.2.2 Figure 2-1 below shows the existing structures within the scope of the audit at the Site.

Figure 2-1 Aerial View of Ashby Farm



2.3 EXISTING STRUCTURES

2.3.1 The following section outlines the existing structures on the Site. Several structures outlined in this section were inaccessible during the site visit, including the single-storey stables, due to their continued use as equestrian facilities.

2.3.2 The Site comprises a range of stables and associated ancillary buildings. These include two larger two-storey stable blocks, as well as several smaller stables ancillary facilities and maintenance sheds distributed across the Site.

2.3.3 For the purposes of this PRA, the structures on site have been grouped as follows:

- Large stables;
- Single-storey stables; and
- Ancillary structures including staff rest room, external areas and hardstanding.

LARGE STABLES

2.3.4 Within the scope of the audit, two structures have been identified as large stables. Both appear to be two storeys and feature timber-framed facades. Sections of the lower walls incorporate concrete blocks, painted white. In parts, corrugated steel has been used for later repairs on the facades. Corrugated steel, composite sheeting and a trussed timber framework comprise the roof space. Two small timber doors feature within one façade of the structures to allow for farm animal access. Minor lighting fixtures are installed around the perimeter of the stables.

2.3.5 Figure 2-2 to Figure 2-4 below show the external facades of the large stables and the corrugated steel which has been used for later repairs.

Figure 2-2 Large Stable Frontage

Figure 2-3 Large Stable Frontage - Concrete Blocks

Figure 2-4 Repaired Façade – Large Stable

2.3.6 Timber partitions and beams feature within the large stables, providing individual stalls for horses.

2.3.7 The majority of the floorspace of each stable consists of concrete hardstanding.

2.3.8 Figure 2-5 and Figure 2-6 below show the interior of one of the large stables, including the exposed trussed framework.

Figure 2-5 Timber Stalls - Large Stable

Figure 2-6 Trussed Timber Roof

SINGLE-STOREY STABLES

2.3.9 Several single-storey stable buildings are situated across the Site, each constructed in a similar manner. These stables are single-storey structures and feature timber-clad facades. Roof coverings comprise a mix of composite and corrugated metal sheeting and slate tiles, while the lower sections of the facades consist of a brickwork.

2.3.10 Each single-storey stable features timber stable doors, single glazed windows, and some external floodlighting fixtures.

2.3.11 All stables on site display high levels of wear and deterioration.

2.3.12 Figure 2-7 to Figure 2-9 show examples of the single-storey stables throughout the Site.

Figure 2-7 Northernmost Single-Storey Stable Frontage

Figure 2-8 Westernmost Single-Storey Stable

Figure 2-9 Brick Wall Feature - Single-Storey stable

ANCILLARY STRUCTURES, EXTERNAL AREAS AND HARDSTANDING

2.3.13 Access to the Site is gained via a galvanised steel farm gate, supported by two timber posts on either side of the entrance track. The gate is positioned along the main approach from Ducks Hill Road and serves as the primary entrance to the Site.

2.3.14 The steel gate is shown in Figure 2-10 below.

Figure 2-10 Steel Farm Gate

2.3.15 The northern boundary of the Site features two small sheds. The facades are made up of timber cladding, which show high levels of deterioration. Roofing of the sheds comprise of bitumen and corrugated metal sheeting. A standalone shed is shown in Figure 2-11 below.

Figure 2-11 Timber Shed

2.3.16 A standalone staff rest room structure is situated on the southern boundary of the Site. The main structure is predominantly timber and comprises a bitumen and timber roof, double-glazed PVC windows, glass and uPVC entrance doors and some external lighting fixtures.

2.3.17 A section of timber fencing extends from the eastern elevation, enclosing a small garden space by a timber gate.

2.3.18 The staff rest room is shown in Figure 2-12 below.

Figure 2-12 Staff Rest Room

2.3.19 Concrete hardstanding surfaces are present through the central yard spaces between stables. The hardstanding displays significant wear, surface cracking, and patch repairs.

2.3.20 Figure 2-13 below shows the concrete hardstanding on the Site.

Figure 2-13 Concrete Hardstanding

3 DEVELOPMENT SCENARIOS

3.1 INTRODUCTION

3.1.1 As part of the audit, consideration was given at a high level for the suitability of the existing structures on site to be retrofitted, or elements reused, as part of three separate scenarios for the redevelopment. Each of the scenarios will be considered in the context of the development brief to understand their suitability to meet the requirements.

3.2 DEVELOPMENT BRIEF

3.2.1 The site is to be redeveloped to provide a new state of the art gun making facility suitable for continuing the Holland & Holland brand traditions and skills throughout the 21st century. The aim is to build an exemplary facility for staff, clients and visitors that embodies the brand ethos which is driven by heritage and nature conservation. H&H wish to respond to the existing agricultural / industrial vernacular of buildings onsite with a scheme which is both modern and encompasses the traditional values of the brand. The scheme takes its inspiration from the arrangement, scale, and massing of the current farmyard buildings.

3.2.2 The proposed scheme is a net zero carbon, low energy facility with proven sustainability credentials such as BREEAM. Sustainability is a core driver for the scheme from the offset with emphasis on SUDS drainage strategies (including an attenuation pond), recycling of existing materials onsite, employee wellbeing focusing around natural daylight in workshop areas, natural ventilation, views of nature, and the incorporation of sustainable technologies such as solar panels.

3.2.3 The site will be landscaped appropriately with limited formal landscaping complemented by broader landscape remediation works. Attention will be given to existing issues with poor surface water drainage and how this may be ameliorated via incorporation of SUDs technologies.

3.3 SCENARIOS

3.3.1 The following section sets out the three different scenarios considered as part of the audit process.

3.3.2 The parameters of the scenarios have been discussed and agreed with the wider project team including architectural and sustainability consultants.

3.3.3 Three scenarios were considered to fulfil the development brief:

- Light Refurbishment: reuse of the existing structures on site in their current form with cosmetic enhancements and additional minor repairs to the fabric of the building as necessary.
- Refurbishment and Extension: reuse of the two-storey stables on site with horizontal extension to facilitate the spatial requirements for the development brief. Higher level of refurbishment to light refurbishment scenario, to facilitate modern heating systems, upgrading of retained elements with glazing and Mechanical, Electrical and Plant (MEP) systems where feasible to facilitate any proposed change of use. Improvements may include removal of existing features to facilitate addition of new elements. The remaining structures are removed to facilitate the new development.
- Full Redevelopment: full demolition of structures to ground level to facilitate construction of the gun manufacturing facilities.

3.4 SCENARIO REVIEW

3.4.1 The redevelopment of the Site is subject to the proposals meeting the development brief.

3.4.2 Within the development brief, aspirations are to provide a workshop and associated facilities for the manufacture of guns in connection with the adjacent shooting grounds.

3.4.3 Each of the scenarios will be considered in the context of the development brief to understand their suitability to meet the requirements. A focused approach to the scenario modelling has been employed to ensure the outcome of the audit has a meaningful impact on the development design.

3.4.4 A number of factors were considered as part of the review of the scenarios, including the following:

- Proposed Development Use;
- Spatial Capacity;
- Building Structure and Capacity; and
- Whole Life Carbon.

PROPOSED DEVELOPMENT USE

3.4.5 The development brief includes delivery of high-quality commercial and industrial facilities across the Site, meeting all relevant contemporary design standards, including:

- Accessibility
- Circulation;
- Site utilisation;
- Spatial quality;
- Aspect and outlook;
- Privacy;
- Daylight and sunlight;
- Indoor air quality and noise;
- Thermal comfort;
- Environmental sustainability; and
- Urban greening.

3.4.6 The redevelopment of the Site would seek to deliver high quality environments for the commercial occupiers to meet their needs, in accordance with all prevailing legislation and contemporary standards.

3.4.7 Consideration for retrofitting existing structures should be weighed up against the needs of future tenants and the benefits that redevelopment of the Site could bring.

SPATIAL CAPACITY

3.4.8 The existing buildings on site are single-storey, lightweight structures constructed from timber framing with a mix of breeze blocks, concrete, and brick, and finished with composite and steel roof sheeting.

3.4.9 The maximum height of the structures across the Site does not exceed two-storeys.

3.4.10 The loadbearing capacity of the structures has not been formally assessed at this stage, but it appears that the structural form would not be suitable to accommodate additional load due to the construction methodology.

3.4.11 To meet the development brief, it will be necessary to densify the quantum of commercial space on site and facilitate provision of high-quality commercial and industrial use.

WHOLE LIFE CARBON

3.4.12 The emissions attributed to a building across its lifetime are commonly split into *operational* and *embodied* carbon.

3.4.13 Operational carbon emissions are those associated with the energy required to run a building (for example lighting, power, heating, cooling, ventilation, and water services).

3.4.14 Embodied carbon emissions are those associated with all the non-operational aspects of a building including from the extraction, manufacture and assembly of materials and components, repair, maintenance, and refurbishment, as well as end of life activities

3.4.15 Strategies to reduce the whole life carbon emissions of buildings include:

- Assessing the need for the construction of new buildings versus repurposing existing ones;
- Adapting the design of a building to reduce the quantity of material used while maximising operational efficiency;
- Selecting alternative materials and construction products that have lower embodied carbon emissions; and
- Utilising materials that are durable, require minimum maintenance and can be dismantled, reused, or recycled.

WHOLE LIFE CARBON MODELLING

3.4.16 A high-level embodied carbon study was conducted to provide an appraisal of the embodied carbon impact of various retained and new build structures on site using appropriate benchmarks.

3.4.17 The model has been generated to provide a high-level quantifiable assessment of the WLC impact of each of the three scenarios, with the following assumptions:

- A building life of 60 years for assessment purposes;
- The operational energy values for major refurbishment, extension and new build scenarios assumes Net Zero Carbon (NZC) buildings, including photovoltaics (PV);
- The operational carbon factor for gas is sourced from the Standard Assessment Procedure (SAP 10)[1];

[1] https://bregroup.com/sap/

- The operational carbon factor for electricity is sourced from the *Future Energy Scenarios (FES) Guide 2023*[2] as an average value over 60-year period (2024-2084) with assumed value repeated beyond 2050;
- Operational energy values have been taken from RIBA 2030 Climate Challenge[3] for domestic and non-domestic uses;
- Embodied carbon values have been informed by the London Energy Transformation Initiative (LETI) Climate Emergency Design Guide[4];
- The embodied carbon value for the light refurbishment scenario has been pro-rated to account for internal finishes only as per the life cycle breakdown within LETI[2];
- The embodied carbon value for the major refurbishment scenario has been pro-rated to account for internal finishes, façade and MEP as per the life cycle breakdown within LETI[2];
- The maintenance period (B) for the light and major refurbishment scenarios repeats as per the maintenance cycle;
- The maintenance period (B) for new build and extension pro-rata of embodied carbon and operational carbon is as per LETI breakdown per use type;
- The disposal period (C) is as per LETI breakdown per use type for new build and extensions (low energy); and
- The embodied carbon value for demolition is sourced from the *RICS WLC Assessment for the Built Environment*[5].

3.4.18 APPENDIX A includes the detailed results of the WLC modelling exercise.

[2] https://www.nationalgrideso.com/future-energy/future-energy-scenarios

[3] https://www.architecture.com/about/policy/climate-action/2030-climate-challenge

[4] https://www.leti.uk/cedg

[5] https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/whole-life-carbon-assessment

4 LIGHT REFURBISHMENT SCENARIO

4.1 INTRODUCTION

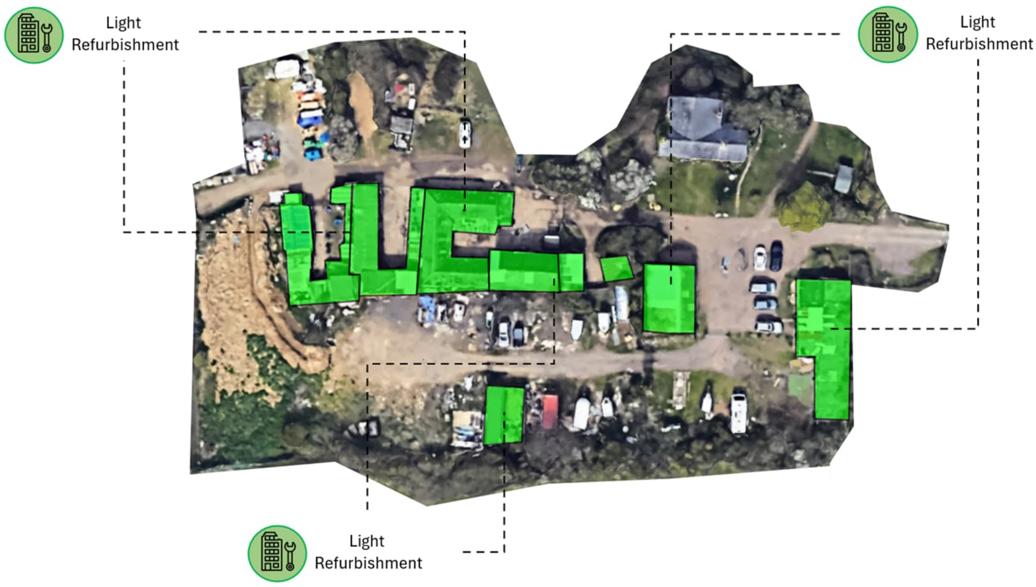
4.1.1 The first scenario considered is *light refurbishment.* It has had minimal consideration for the existing structures on site due to lack of suitability for reuse in any form.

4.2 DEVELOPMENT PROPOSALS

4.2.1 As a light refurbishment only, the development would only deliver the retained equestrian use without any other commercial or industrial provision.

4.2.2 Figure 4-1 below shows the proposals for the light refurbishment scenario.

Figure 4-1 Light Refurbishment Scenario



* Illustration purposes only

DEVELOPMENT NARRATIVE

4.2.3 Light refurbishment of the existing structures on the Site would generate the least amount of embodied carbon as part of the redevelopment. Retention of the existing buildings would prevent the need to introduce a significant volume of material as part of a new structure, with materials limited to repairs and updating the fixtures and fittings.

4.2.4 This scenario is the least impactful for embodied carbon but requires consideration alongside the development brief to understand the overall benefits long term.

4.2.5 The structures on the Site are lightweight and do not appear to have undergone any significant upgrades since construction, though there is evidence of superficial repairs to building fabric using low-quality materials.

4.2.6 Figure 4-2 and Figure 4-3 below shows the external fabric of the existing stables.

Figure 4-2 Large Stable – External Wall Section

Figure 4-3 Single-Storey Stable - External Wall Section

4.2.7 It is anticipated that there are no heating systems for the stables, so operational carbon emissions would remain negligible.

4.2.8 The existing configuration of the current stables is not considered to be optimal. A light refurbishment would retain the existing layouts and provide limited opportunity to rationalise and improve available space for the use as a gun manufacturing facility, stated in the development brief.

4.2.9 Without the opportunity to reconfigure the Site, the target commercial use stated in the development brief would not be met and the Site would fall short of the potential benefits redevelopment would bring.

4.2.10 Aesthetically the existing structures are not considered to be of any particular merit, and the light refurbishment scenario would not significantly improve the existing uses on the Site.

4.2.11 It is anticipated that little of the existing elements of existing stables could be reused from the building strip out process due to the low quality and condition of the materials.

SCENARIO OVERVIEW

4.2.12 Light refurbishment of the existing structures on site in their current form could significantly reduce the embodied carbon impact of the development compared to demolition but would significantly limit the opportunity to meet the development brief to provide a gun manufacturing facility.

4.2.13 Table 4-1 below sets out a summary of the light refurbishment scenario.

Table 4-1 Light Refurbishment Scenario

Description	Summary
Opportunities	• Limit the volume of demolition and strip-out waste generated by the redevelopment process.
Constraints	• Does not meet targets stated in development brief. • This scenario offers no increase in GIA and a limited lifespan of existing buildings. • Existing layouts unsuitable for the commercial use stated in the development brief.
Whole Life Carbon	• Embodied carbon reduced without demolition and rebuild process. • Operational carbon negligible due to use as equestrian stable facilities.

4.2.14 The high-level modelling exercise conducted estimates that the WLC value for the light refurbishment is 641 $kgCO_2e/m^2$.

5 REFURBISHMENT AND EXTENSION SCENARIO

5.1 INTRODUCTION

5.1.1 The second scenario considered is a *refurbishment and extension*, incorporating the large stables on site. This scenario assumes a heavier level of refurbishment and includes horizontal extension to provide additional area. The remaining structures would be cleared to make way for the scenario proposals.

5.2 DEVELOPMENT PROPOSALS

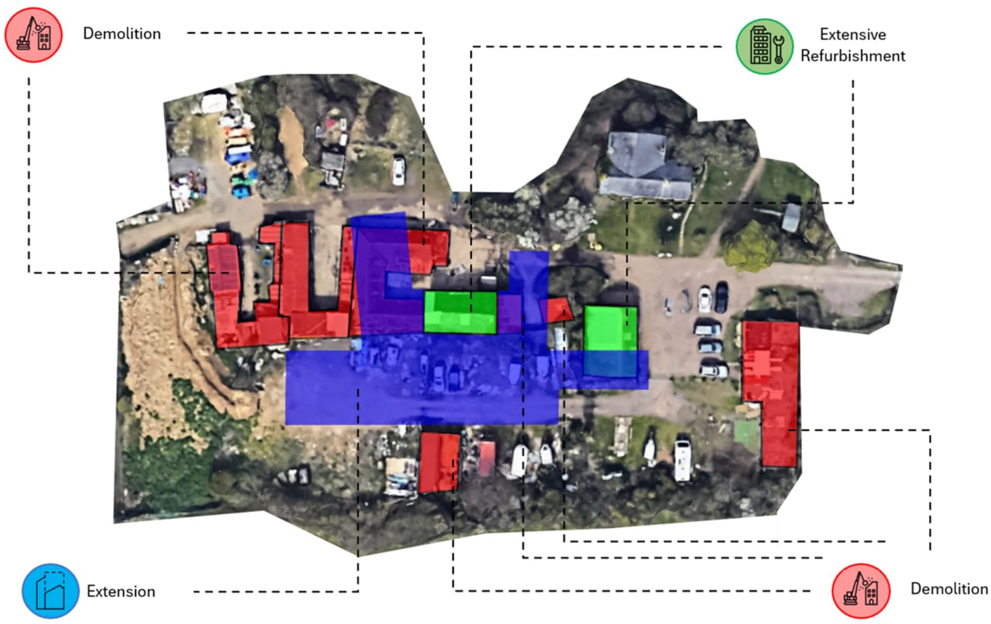
5.2.1 In this scenario, there are significant limitations to refurbish and extend on the Site due to the poor quality of the existing structures.

5.2.2 It is assumed that the existing large stables would be used for commercial use and be refurbished to contemporary standards. Horizontal extensions would be constructed to link the stables and provide the desired use to meet the needs of the development brief.

5.2.3 The remaining structures on the Site would be demolished to make way for the scenario proposals.

5.2.4 Figure 5-1 below shows the proposals for the refurbishment and extension scenario.

Figure 5-1 Refurbishment and Extension Scenario



* Illustration purposes only

DEVELOPMENT NARRATIVE

5.2.5 A major refurbishment of the large stables would be highly constrained, as the current structures are not designed for the commercial use stated in the development brief.

5.2.6 While a deep retrofit could reduce embodied carbon relative to a new build, it would still require substantial structural intervention over the building's lifespan. The level of work needed to bring the large stables up to current standards for a commercial workshop and associated facilities is anticipated to be significant.

5.2.7 Retaining the configuration of the large stables would constrain the ability to meet these requirements through limiting the design flexibility and compromise the overall quality and longevity of the scheme compared to a new build solution designed from the outset to modern standards.

5.2.8 The suitability of the existing structures for use as a gun making facility poses a substantial challenge, potentially undermining the viability of the scenario.

5.2.9 The large stables are anticipated to have uninsulated walls, roofs and floors, resulting in poor thermal performance. The original building fabric of the structures are also not compatible for integrating MEP, including modern HVAC, ventilation and lighting. Airtightness would also be a significant issue and would require significant structural intervention, potentially undermining the circular benefits of retention.

SCENARIO OVERVIEW

5.2.10 Overall, most of the development brief targets are not achievable in this scenario.

5.2.11 Refurbishment of the existing large stables would be highly constrained, as the structures were not designed for modern commercial or industrial use. While a deep retrofit could offer some embodied carbon savings compared with a new build, it would require substantial intervention to structure and fabric of the buildings to meet current standards.

5.2.12 The retained layout would restrict design flexibility and operational efficiency, while adapting the buildings for a gun-making facility would present significant functional challenges. Poor thermal performance, lack of insulation, and incompatibility with modern MEP systems would further limit feasibility. Achieving adequate energy efficiency and airtightness would demand extensive alterations, reducing the circular benefits of retention.

5.2.13 Table 5-1 below sets out a summary of the refurbishment and extension scenario.

Table 5-1 Refurbishment and Extension Scenario

Description	Summary
Opportunities	• Reduced demolition compared with full redevelopment, preserving some embodied carbon in existing structures. • Potential to enhance thermal and operational performance through selective upgrades. • Opportunity to demonstrate partial circular economy principles through adaptive reuse.
Constraints	• Existing large stable structures were not designed for modern commercial or industrial use. • Significant structural intervention required to meet current building and safety standards. • Retained layout limits flexibility for efficient operations and future adaptability. • Structural condition may restrict integration of modern MEP and sustainability systems. • High refurbishment costs may outweigh operational and carbon benefits.
Whole Life Carbon	• Embodied carbon reduced relative to full demolition and rebuild. • Operational carbon improvements possible but limited by original fabric performance. • Extensive interventions could offset some embodied carbon savings. • Overall carbon performance unlikely to meet the efficiency of a purpose-built facility.

5.2.14 The high-level modelling exercise conducted estimates that the WLC value for the refurbishment and extension scenario is 786 $kgCO_2e/m^2$.

6 FULL REDEVELOPMENT SCENARIO

6.1 INTRODUCTION

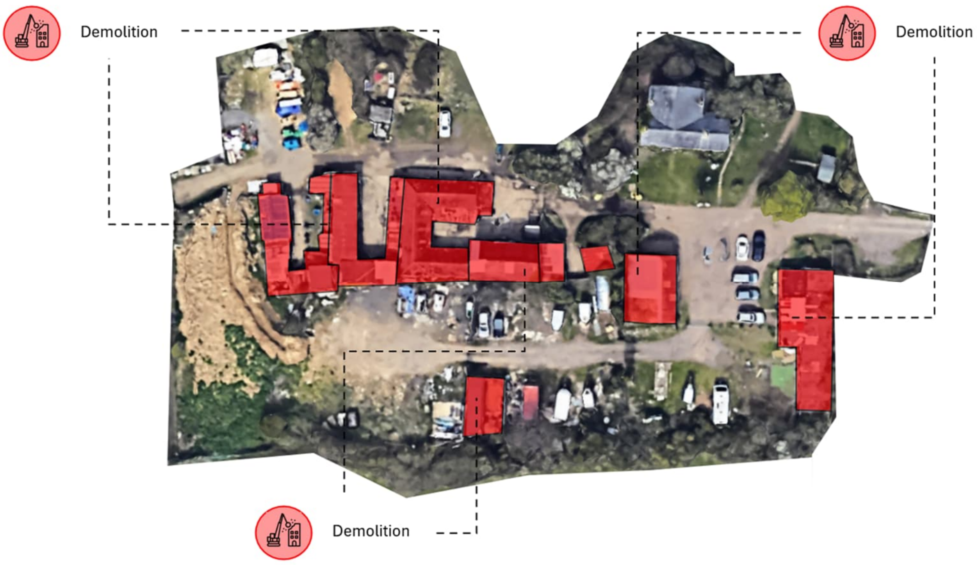
6.1.1 The third scenario considered is a *full redevelopment* of the Site without any retention or refurbishment.

6.2 DEVELOPMENT PROPOSALS

6.2.1 In this scenario, all structures would be demolished, and new replacements designed in accordance with the development brief.

6.2.2 Figure 6-1 below shows the proposals for the full redevelopment scenario.

Figure 6-1 Full Redevelopment Scenario



* Illustration purposes only

DEVELOPMENT NARRATIVE

6.2.3 Full redevelopment of the Site would provide an opportunity to design without the constraint of the existing structures on the Site. The new structures could meet the precise targets stated within the development brief.

6.2.4 It is estimated that full demolition of all the structures on the Site would result in approximately 335.5 tonnes of demolition waste.

6.2.5 Demolishing the existing structures would allow for the replacement buildings to be designed to meet all the needs of the occupants, with adaptability built in for future changes of use.

6.2.6 The building performance would be optimal and the operational carbon emissions would be the lowest value of all the scenarios for kgCO2e/m^2.

6.2.7 The development density could be optimised through a well-configured floor plate, while achieving sufficient the required floorspace in the development brief.

6.2.8 The demolition process would generate the highest level of embodied carbon by the redevelopment but allows for the additional height required to deliver to the development brief, increasing efficiency per square metre.

SCENARIO OVERVIEW

6.2.9 Full redevelopment requires demolition of all the existing structures on site which generates the most demolition waste of all the scenarios but delivers the most density of development and operational efficiency of all three scenarios.

6.2.10 Overall, this scenario could be considered the most appropriate option for the Site, given the existing constraints.

6.2.11 Table 6-1 below sets out a summary of the full redevelopment scenario.

Table 6-1 Full Redevelopment Scenario

Description	Summary
Opportunities	• No risk associated with retention of existing structural elements. • Enables more comprehensive design, unconstrained by existing structure. • Allows for a purpose-built facility tailored to meet all development brief targets. • Optimises operational performance through modern construction and systems.
Constraints	• Highest volumes of demolition waste.
Whole Life Carbon	• Embodied carbon highest generated. • Operational carbon emissions reduced compared to Scenario 2 due to optimal building performance.

6.2.12 The high-level modelling exercise conducted estimates that the WLC value for the full redevelopment scenario is 737 $kgCO_2e/m^2$.

7 WHOLE LIFE CARBON MODELLING

7.1 WHOLE LIFE CARBON (WLC)

7.1.1 This section will summarise the findings of this Pre-Redevelopment Audit regarding WLC.

7.1.2 The purpose of this study is to provide a comparable benchmark for each scenario to provide high level insight into their overall impact from a WLC perspective and they may therefore differ from results or values delivered within the WLC assessment.

WHOLE LIFE CARBON MODELLING

7.1.3 A high-level embodied carbon study was conducted to provide an appraisal of the impact of various retained and new build elements on the Site using appropriate benchmarks.

7.1.4 The model has been generated to calculate WLC per square metre for the commercial and industrial uses across the three scenarios.

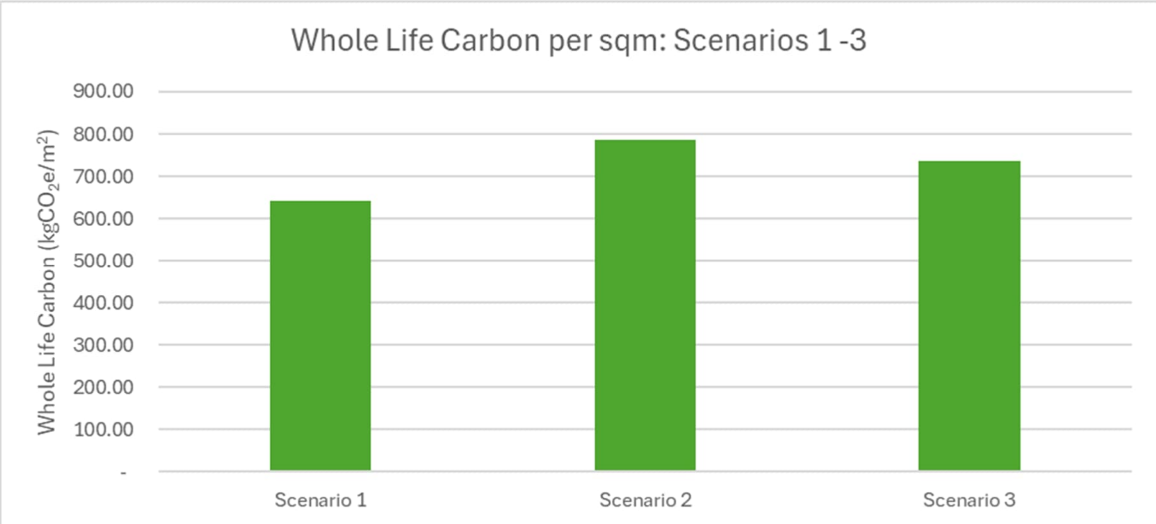
7.1.5 Table 7-1 below summaries the WLC estimates based on each of the three scenario options.

Table 7-1 Whole Life Carbon Assessment

Scenario	Description	$kgCO_2e/m^2$ Commercial
1	Light Refurbishment	641
2	Refurbishment and Extension	786
3	Full Redevelopment	737

7.1.6 Figure 7-1 below illustrates the WLC estimated based on each of the three scenario options.

Figure 7-1 Whole Life Carbon per Scenario



7.1.7 Though Scenario 1 would produce the least operational and embodied carbon, it does not meet the criteria set out in the development brief and is therefore unsuitable to take forward. Whilst Scenario 2 is only marginally worse performing with regard to WLC than Scenario 3, achieving adequate energy efficiency and airtightness would demand extensive alterations, reducing the circular benefits of retention and would likely be economically unviable.

7.1.8 While Scenario 1 would represent the lowest value of WLC per sqm of the three options, it does not meet the requirements set out in the development brief. Scenario 3 is considered to be the only viable option, which has the second lowest values of WLC per sqm of the three options but meets the criteria set out in the development brief.

7.1.9 APPENDIX A includes the detailed results of the WLC modelling exercise for the three scenarios.

8 SUMMARY AND CONCLUSION

8.1 SUMMARY

8.1.1 Three scenarios have been considered as part of the audit to understand the suitability for retention of existing structures or features on the development Site.

8.1.2 The scenarios that were considered were:

- Light Refurbishment;
- Refurbishment and Extension; and
- Full Redevelopment.

8.1.3 The Light Refurbishment scenario offers the lowest embodied carbon impact due to minimal intervention and retention of the existing structures. However, limited adaptability and dated construction significantly constrain its long-term viability. The existing buildings do not meet modern commercial or operational requirements and cannot accommodate the spatial, technical, or performance standards set out in the development brief. As such, this scenario delivers minimal functional benefit beyond short-term carbon savings.

8.1.4 The Refurbishment and Extension scenario provides partial retention of the large stables, supplemented by horizontal extensions to achieve additional floorspace. While this approach reduces demolition and preserves some embodied carbon, it remains heavily constrained by the poor structural quality, inefficient layout, and incompatibility of the retained elements with modern MEP systems. The resulting scheme would offer limited operational efficiency and adaptability, with high refurbishment costs offsetting much of the environmental benefit. The scenario falls short of meeting the full functional and spatial requirements of the development brief.

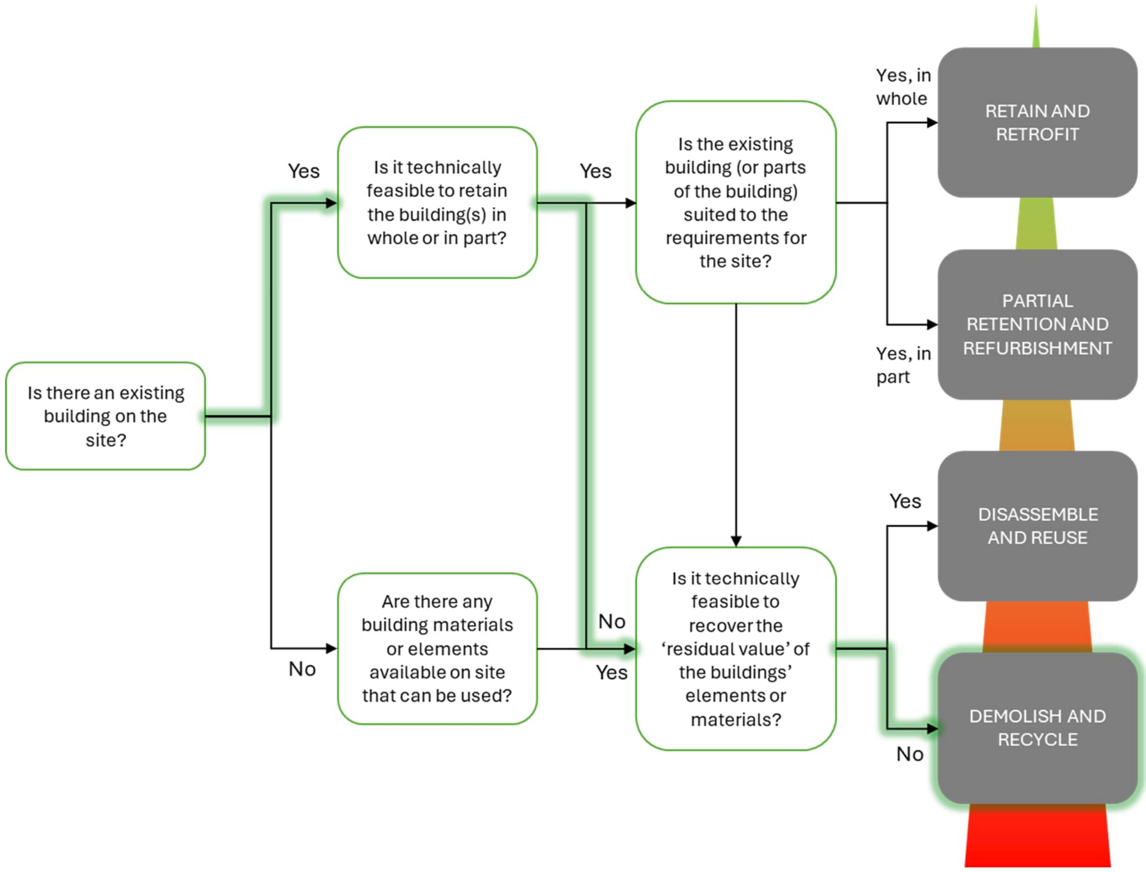
8.1.5 The Full Redevelopment scenario involves complete demolition of the existing structures and construction of a new purpose-built facility designed to meet all operational and performance criteria. Although this approach results in the highest initial embodied carbon, it enables delivery of a fully compliant, adaptable, and energy-efficient development with the lowest operational carbon emissions per square metre. The new buildings would achieve optimal spatial configuration, durability, and design quality, providing long-term sustainability and circular value through modern construction practices and design for adaptability.

8.1.6 While retention of existing structures can offer short-term embodied carbon savings, the poor condition, limited flexibility, and non-compliance of the current buildings mean that Scenarios 1 and 2 are not feasible options in achieving the objectives of the development brief.

8.1.7 Overall, Scenario 3, Full Redevelopment, represents the most appropriate option moving forward. It delivers the required functional capacity and operational performance, while aligning with circular economy principles through design for efficiency, disassembly, and future reuse. Despite higher upfront embodied carbon, it provides the most resilient and sustainable solution consistent with the strategic aspirations of the development brief and the policy expectations for whole-life carbon performance.

8.1.8 Figure 8-1 below shows the outcome of the decision tree for the approaches taken for the existing structures on the site as part of the PRA.

Figure 8-1 Decision Tree Outcome



8.2 CONCLUSION

8.2.1 The existing structures on site are of low quality and not considered well suited for alteration to meet the development brief to provide a gun manufacturing facility. Further, the opportunities to retrofit or reuse structural elements of the existing building is extremely limited due to the structural composition.

8.2.2 Full redevelopment is considered to be optimal, with the most benefits of the three options.

8.2.3 The methodology of this Pre-Redevelopment Audit meets the requirements of relevant policy and applicable guidance.

APPENDIX A

WHOLE LIFE CARBON MODELLING

Individual Properties	Existing (m^2)					
	GIA			NIA		
	Commercial	Residential	Total	Commercial	Residential	Total
H&H Gun Making Facility	930	-	**930**		-	-

Building	Scenario		
H&H Gun Making Facility	Light Refurbishment	Refurbishment & Extension	Full Redevelopment

Individual Properties	Proposed (m^2)					
	GIA			NIA		
	Commercial	Residential	Total	Commercial	Residential	Total
H&H Gun Making Facility	1,416	-	**1,416**		-	-
Total	**1,416**	**-**	**1,416**	**-**	**-**	**-**

Energy	Commercial	Residential	Operational Carbon Factor ($kgCO_2e/kWh$)
Gas	60%	75%	0.21
Electric	40%	25%	-0.018

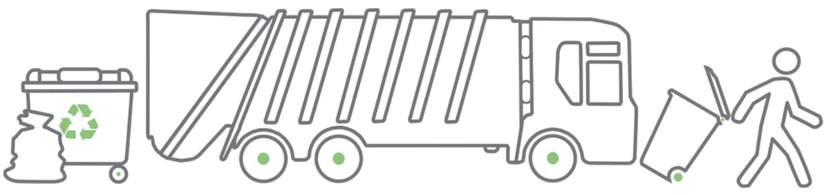
Proposal	Operational Energy ($kWh/m^2/y$)		Operational Carbon Factor ($kgCO_2e/m^2/y$)		Embodied Carbon ($kgCO_2e/m^2$)		Building Lifetime (Years)	Maintenance Cycle (Years)
	Commercial	Residential	Commercial	Residential	Commercial	Residential		
Stables Light Refurbishment							10	5
Light Refurbishment	130	120	15.44	18.36	40	128	60	10
Major Refurbishment	75	60	- 1.35	- 1.08	350	264	60	30
New-Build	55	35	- 0.99	- 0.63	600	500	60	60
Extension	55	35	- 0.99	- 0.63	600	500	60	60
Demolition	-	-	-	-	3.4	3.4		

Scenario 1	GIA (m^2)			Operational Carbon ($kgCO_2e/y$)		Operational Carbon for Building Lifetime ($kgCO_2e$)		Embodied Carbon ($kgCO_2e$)		Embodied Carbon ($kgCO_2e$) for Building Lifetime		WLC ($kgCO_2e$) for Building Lifetime (A + B)		Disposal ($kgCO_2e$) for Building Lifetime (C1)		WLC ($kgCO_2e$) for Building Lifetime (A + B+ C)		
Proposal	Commercial	Residential	**Total**	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	**Total**
Light Refurbishment	930	-	**930**	14,363	-	143,629	-	37,200	-	446,400	-	590,029	-	5,900	-	595,929	-	**595,929**
Major Refurbishment	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
New-Build	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Extension	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Demolition	-	-	-	-	-	-	-	-	-	-	-	-	-			-	-	**-**
Total Carbon Value (KG)						**143,629**	**-**	**37,200**	**-**	**446,400**	**-**	**590,029**	**-**	**5,900**	**-**	**595,929**	**-**	**595,929**
Total Carbon Value (Tonnes)						**144**	**-**	**37**	**-**	**446**	**-**	**590**	**-**	**6**	**-**	**596**	**-**	**596**

Scenario 2	GIA (m^2)			Operational Carbon ($kgCO_2e/y$)		Operational Carbon for Building Lifetime ($kgCO_2e$)		Embodied Carbon ($kgCO_2e$)		Embodied Carbon ($kgCO_2e$) for Building Lifetime		WLC ($kgCO_2e$) for Building Lifetime (A + B)		Disposal ($kgCO_2e$) for Building Lifetime (C1)		WLC ($kgCO_2e$) for Building Lifetime (A + B+ C)		
Proposal	Commercial	Residential	**Total**	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	**Total**
Light Refurbishment	179	-	**179**	2,764	-	165,869	-	7,160	-	42,960	-	208,829	-	2,088	-	210,917	-	**210,917**
Major Refurbishment	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
New-Build	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Extension	1,255	-	**1,255**	- 1,242	-	- 74,547	-	753,000	-	753,000	-	895,558	-	17,911	-	913,469	-	**913,469**
Demolition	751	-	**751**	-	-	-	-	2,553	-	2,553	-	2,553	-			2,553	-	**2,553**
Total Carbon Value (KG)						**91,322**	**-**	**762,713**	**-**	**798,513**	**-**	**1,106,940**	**-**	**19,999**	**-**	**1,126,939**	**-**	**1,126,939**
Total Carbon Value (Tonnes)						**91**	**-**	**763**	**-**	**799**	**-**	**1,107**	**-**	**20**	**-**	**1,127**	**-**	**1,127**

Scenario 3	GIA (m^2)			Operational Carbon ($kgCO_2e/y$)		Operational Carbon for Building Lifetime ($kgCO_2e$)		Embodied Carbon ($kgCO_2e$)		Embodied Carbon ($kgCO_2e$) for Building Lifetime		WLC ($kgCO_2e$) for Building Lifetime (A + B)		Disposal ($kgCO_2e$) for Building Lifetime (C1)		WLC ($kgCO_2e$) for Building Lifetime (A + B+ C)		
Proposal	Commercial	Residential	**Total**	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	Commercial	Residential	**Total**
Light Refurbishment	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Major Refurbishment	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
New-Build	1,416	-	**1,416**	77,880	-	- 77,101	-	849,600	-	849,600	-	1,019,698	-	20,394	-	1,040,092	-	**1,040,092**
Extension	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
Demolition	930	-	**930**	-	-	-	-	3,162	-	3,162	-	3,162	-			3,162	-	**3,162**
Total Carbon Value (KG)						**- 77,101**	**-**	**852,762**	**-**	**852,762**	**-**	**1,022,860**	**-**	**20,394**	**-**	**1,043,254**	**-**	**1,043,254**
Total Carbon Value (Tonnes)						**- 77**	**-**	**853**	**-**	**853**	**-**	**1,023**	**-**	**20**	**-**	**1,043**	**-**	**1,043**

	GIA m^2			Whole Life Carbon ($kgCO_2e/m^2$)		
Scenario	Commercial	Residential	**Total**	Commercial	Residential	**Total**
1	930	-	**930**	641	-	**641**
2	1,434	-	**1,434**	786	-	**786**
3	1,416	-	**1,416**	737	-	**737**



VELOCITY