

**Raby Estate – Park and Gardens**  
**Gas House**

Heritage Impact Assessment, Design and Access Statement



The Gas House from the East – November 2019

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# 1. Introduction

## 1.1 Preamble

This document has been prepared in support of an application for works to re-fit the Gas House as an energy centre for the Raby Estate Park and Gardens. The building was initially constructed as a gas works, to provide gas to the Castle. Later, in around 1910 it was substantially rebuilt as an electricity generating station. When the Castle and adjoining structures were connected to the National Grid, it became redundant and has been disused ever since.

The works are being undertaken consequent to the grant of planning for the main works in the Park and Gardens (Raby Rising) consent dated 2 December 2020 (ref DM/20/01205/FPA). Within this consent, there was provision for the conversion of the Bull House structure near the Raff Yard, north of the Gardens, to be an energy centre for this project. Further consideration of future requirements for sustainability have led to the desire to future proof the installation, to include the Castle and to use a ground source heat pump system with gas back up for peak loads, rather than the earlier proposed gas powered CHP. The scale of the equipment as well as the earlier history of the Gas House makes it the ideal location for an energy centre.

The works require some external and internal alterations to ensure the efficient operation of the equipment, construction of an external access staircase to the upper floor and construction of a flue to rise above the ridge. The building also requires repairs to masonry, roof coverings, carpentry and joinery (which, if in matching materials, do not require planning or listed building consent).

There are some associated landscape works in connection with the routing of the pipes connecting the Gas House to the Gardens area and the Castle.

### **Outline scope of works:**

- The works will ensure that the building is weatherproof (there has been water penetration at roof level as well as through some of the windows) and structural concerns to the timber roof structure and the masonry walls and chimneys will be addressed.
- One window will be re-fitted with ventilation louvres, for the supply of combustion air; the main entrance door near the south east corner of the building will likewise be so fitted.
- The existing truncated flue on the east elevation will be raised in brick to rise 1000mm above the ridge line.
- A new access staircase to the upper floor will be built on the east elevation, where there is already a full size access door.
- A gas meter enclosure structure will be built south of the Gas House, where there are currently two timber framed garages in dilapidated condition.
- Three new timber framed garages will be constructed in a new location some 30m to the south.
- Internally, a new concrete floor slab will provide a sound base for the equipment – the current floor has various plinths and sumps associated with the former role as a generating station.
- New openings will be formed in the wall separating the main volume from the “garage” to the north to improve service access and to allow ducts to connect the various items of plant.
- The redundant electrical switchgear on the south wall will be recorded before removal to a secure location on the Estate. The glazed tiles which form such a characterful element of the interior will be retained.
- The existing roof coverings and structure will be retained and repaired. The external masonry walls will be repointed with a few new masonry units where the existing ones have decayed.

- There will be some limited underpinning on the west elevation where the main service pipes and ducts enter the building.

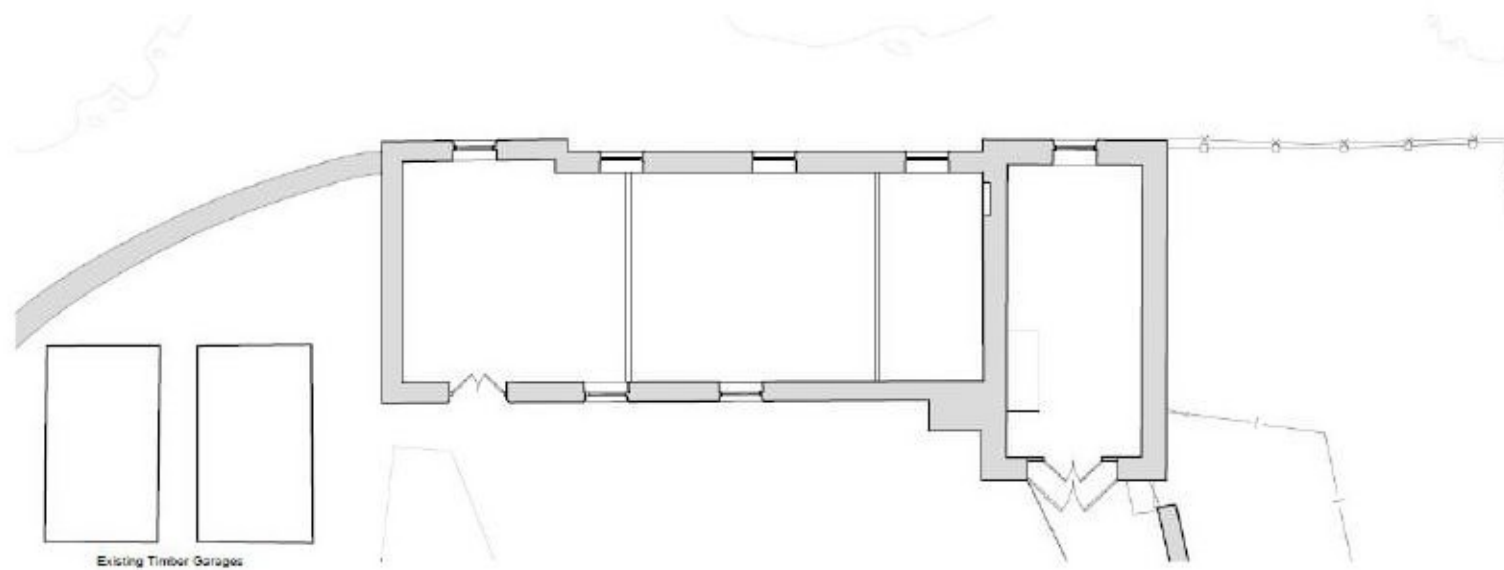
## 1.2 Listing Status and Significance

**The Gas House, Raby with Keverstone** is listed Grade II, entry number 1310898. The listing entry summarises the building thus:

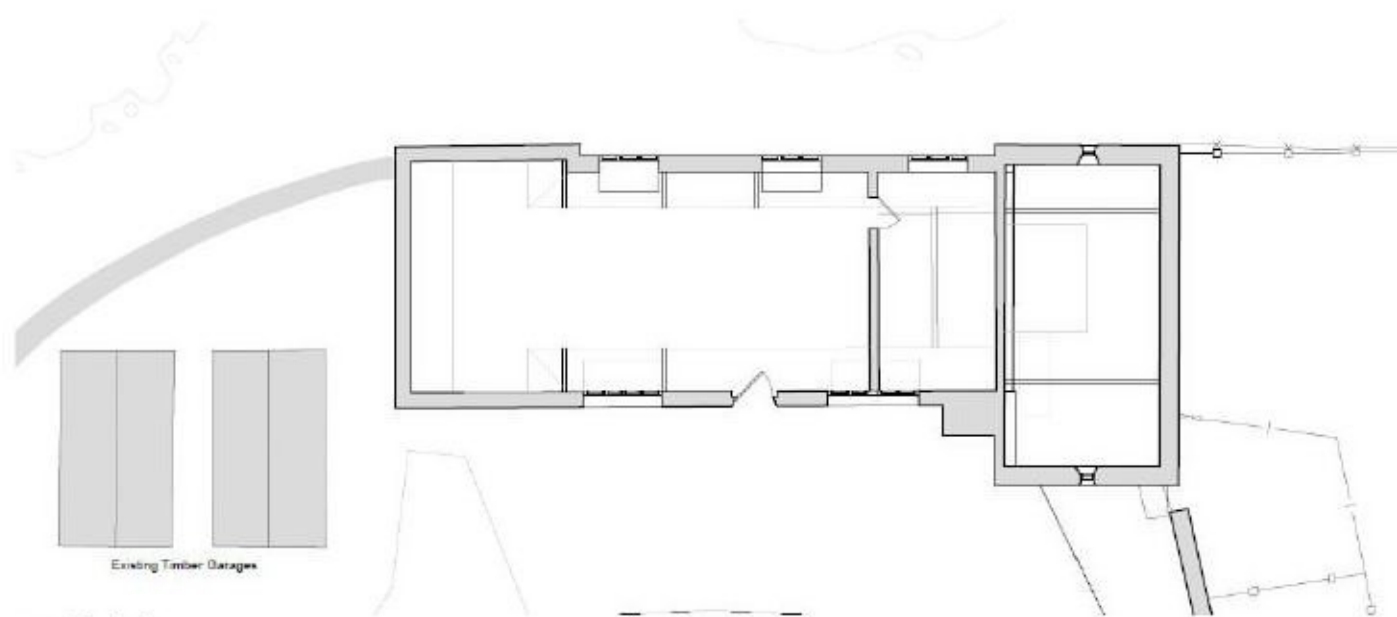
*Gas house. Dated 1910 in panel in left gable, for Lord Barnard. Coursed sandstone rubble with ashlar dressings; Welsh slate roof with stone gable copings and brick chimneys. 2 storeys, 6 irregular bays, the end bays under gables to front. Right end bay projects and contains high round-headed double doors in alternate-block jambs and voussoirs; louvred chamfered slit in gable peak. Left end bay has chamfered square-headed surround to double doors; date Panel in gable peak. Large rectangular windows with glazing bars in ground floor between gables; loading door in third bay under gabled half-dormer; large square chimney rises from fifth bay with gabled louvred coping. Low, square-headed dormers with glazing bars flank half-dormer. Interior not inspected.*

It is acknowledged that the listing description does not reflect the history of the building prior to 1910.

The Gas House lies just within the eastern boundary of the Raby Castle Park and Garden, which is registered at Grade II\*. It is not in a conservation area.



Ground Floor Plan as existing.



First Floor as Existing

Image 1: Floor Plans

## 2. Summary Description and History of the Gas House

### 2.1 Description and layout

#### 2.1.1 The Gas House

The notes below are much informed by the Conservation Management Plan prepared by Purcell in 2018.

The Gas House is a large imposing structure in a similar style to the Laundry on the Estate. The Gas House is built of coursed sandstone rubble with ashlar dressings, Welsh slate roof with stone gable copings and brick chimneys. The structure is two large storeys, with six irregular bays, the end bays under gables to front. The right end bay projects (L-shaped) and contains high round-headed double doors in alternate-block jambs and voussoirs, and louvred chamfered slit in gable peak. The left-end bay has chamfered square-headed surround to double doors and date panel in gable peak (stating 1910). Large rectangular windows with glazing bars in ground floor between gables, loading door in third bay under gabled half-dormer and large square chimney rises from fifth bay with gabled louvred coping. Low, square-headed dormers with glazing bars flank half-dormer.

Internally, there are two spaces on the ground floor, which correspond the main part of the building, and to the transverse gable at the northern end. This northern space is currently sub-let and has been lined out, and has an internal stair to a loft storage space. The main space is lined with attractive glazed tiles up to dado height. Surfaces are otherwise plastered.



Plate 2: main ground floor room



Plate 3: main upper floor room

The upper floor structure is of concrete between filler joists to give a fire proof construction some 300mm deep. Immediately below it there are two transverse steel beams which support small rolling pulleys for the lifting of the, now missing, generating equipment.

The upper floor is built into the roofspace. The main volume is above the main ground floor room, with the northern bay separated off by a partition. As the dormer windows on opposite sides of the building do not align, this partition bisects the northern dormer on the east elevation. The upper floor above the northern transverse bay has no communication with the main space. The ceiling soffits are plastered, the walls are bare masonry rubble. This combination of internal finishes has an air of never having been completed.

## 2.2 Historical Development

The 1812 John Dixon map shows a poultry yard to the south of the north lodge, on the site of the current Gas House. The structure appears to relate to the current footprint of the Gas House, but with a larger L-shaped return. A smaller structure exists to the north. The 1839 Tithe Map shows a similar structure, still in use as a poultry yard. A long range has now been constructed along the road.

The Gas House, built to supply Raby Castle with gas lighting, is possibly first shown on the 1856 Ordnance Survey map for Raby Castle, as a rectangular structure with a short L-return to the north. The footprint of this structure is very similar to the extant building, which therefore dates the structure to the mid-nineteenth century, rather than 1910 as assumed in the list description.

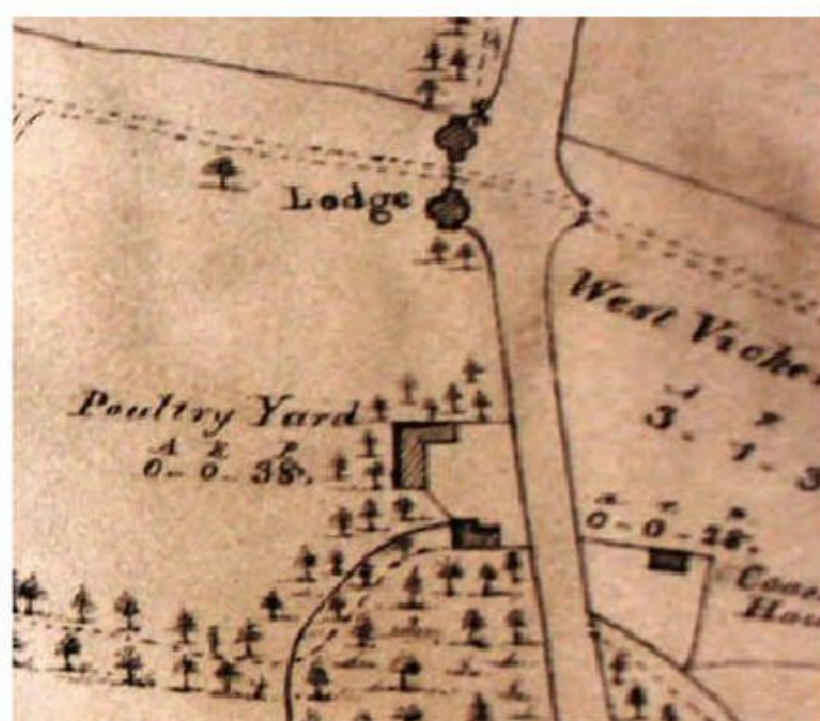


Plate 4 (left) 1812 Plan by John Dixon  
 Plate 5 (above) undated map 1830s.  
 Plate 6 (below left) 1839 tithe map  
 Plate 7 (below) 1856 Ordnance Survey.



The first Ordnance Survey map of 1856 shows three structures on similar footprints, but the gas house appears to have been built on the site of the older poultry shed. The other two buildings appear to have been retained. A circular gas holder is first shown on this plan.

A schematic, undated plan (assumed to date to the 1830s), is possibly earlier than the 1856 Ordnance Survey map, and shows a gas pipe running from this location towards the Castle. Only two small square structures are shown, which do not relate to any prior or subsequent buildings. The gas-works at Raby Castle were established in 1850 by Henry, second Duke of Cleveland, providing gas

lighting to the Castle via an underground pipe. In 1853, a Gas Company was founded in Staindrop and first supplied to the village in 1854.

*The Duke added greatly to the amenities of the Castle when he established the Raby gas-works in 1850, and gas lighting superseded that of candles. The first manager of the works was Thomas Howson, a native of Giggleswick, whose nephew became Dean of Chester. The Duke was very interested in the works and when in residence at the Castle used to visit them twice a week to observe the processes and discuss politics with Howson, who was an advanced Liberal. Howson was manager until his death in 1881.*<sup>1</sup>

The 1893 Estate plan by clerk of works W. Livesey gives a detailed plan of the gas works area, which also includes the range along the road annotated as a malt kiln. The route of the gas pipe to the Castle is indicated by a red dashed line. The footprint of the Gas House appears to be exactly as it stands today, with a slightly projecting northern wing.

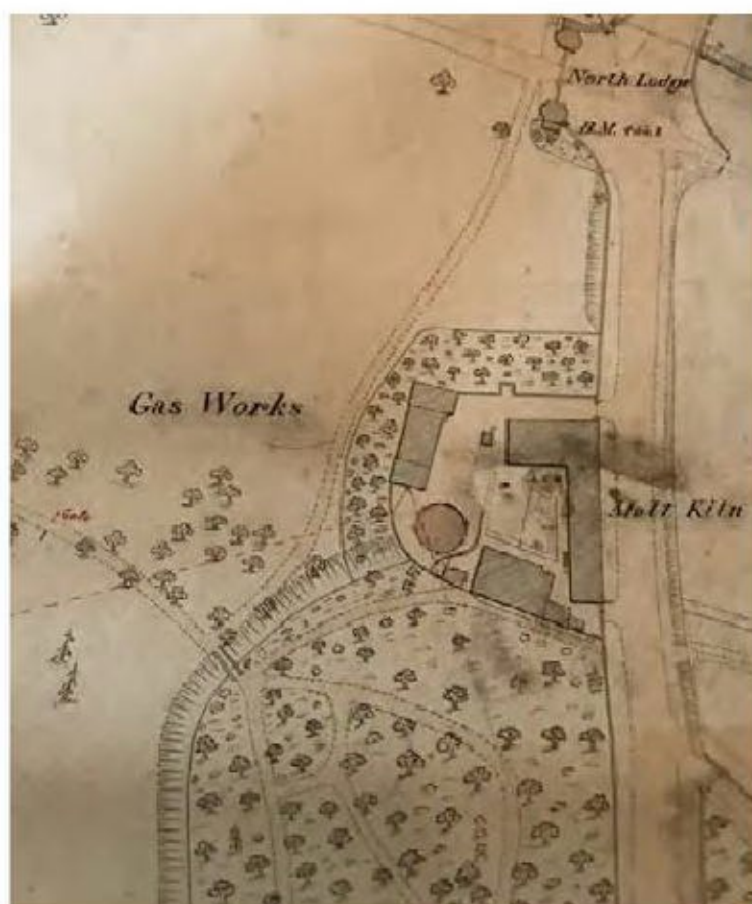


Plate 8 1893 Estate Plan



Plate 9 1914 Ordnance Survey map.

The 1910 date stone on the building is unlikely to relate to the construction of the Gas House, but possibly a series of major repairs at this time. It is unlikely to have been rebuilt on the older footprint at this date as it pre-dates the electrical power station. However, there are stylistic similarities to the 1903 Laundry, such as the pointed gable ends. The vernacular features however indicate an earlier date. More investigation is required to understand this structure fully.

With the coming of electricity to Staindrop in the 1920-1930s, electric lighting was supplied in 1934 and the Gas Company stopped trading soon afterwards.

The Ordnance Survey map of 1914 shows that the gas works for Raby Castle has been converted to an electric power station. The power station is not annotated by the 1948 Ordnance Survey map and the malt kiln has been converted to cottages (or possibly rebuilt or refronted). The assumption is that the Gas House has fallen out of use by this date.

## 2.3 Assessment of Significance

The Gas House relates to the early adoption of gas lighting at Raby Castle in the 1850s and probably dates to the mid-nineteenth century. The 1910 date of the gable date stone has been assumed in the list description to be the date of construction. Cartographic evidence (as set out above) makes this unlikely – this date is more likely to refer to the installation of electricity generating equipment.

The Gas House has importance for its associations to the second Duke of Cleveland and the use of structures on the Estate servicing the Castle, with poultry (on this site in the early nineteenth century),

<sup>1</sup> J.W. Broumley, *The Lords of Raby and Staindrop*, 1957



maltings and gas then electricity works. The association with a pride in developing technology, while scarcely unusual for the date, is nevertheless poignant given the building's current neglected state.

Today, the residential nature of the Malt Kiln Cottages, the location of the Gas House within their curtilage and the dense woodland between the Gas House and the Castle reduces any visual connections. Historical relationships within setting are, however, still high.

The structure itself is of some significance as a relatively unaltered structure (bar the removal of the generating equipment). There are some curiosities, such as the almost non-existent access to the upper floor, which begs the reintroduction of a staircase, and some regrettable but easily reversible features such as the lining out of the northern part of the building at ground floor level.

The wider setting would appear, from the map progression sequence, to retain the tree planting shown in the 1914 OS plan, which was a significant increase on the earlier 1893 Estate Plan. There has been some change to the south of the building, notably the construction of two timber garages, which are detrimental to their setting, though undoubtedly useful. These are of lightweight construction and can fairly easily be removed.

### 3. Proposed works.

#### 3.1 Roof Structure and Chimney

See drawings: RC.01\_DR\_09\_1002\_3P\_0\_Gas House\_Roof Plan Existing, RC.01\_DR\_09\_1201\_3P\_1\_Gas House\_North and South Elevations Existing, RC.01\_DR\_09\_1202\_3P\_1\_Gas House\_East Elevations Existing, RC.01\_DR\_09\_1203\_3P\_1\_Gas House\_West Elevations Existing, RC.01\_DR\_09\_2002\_3P\_0\_Gas House\_Roof Plan Proposed, RC.01\_DR\_09\_2201\_3P\_0\_Gas House\_North and South Elevations Proposed, RC.01\_DR\_09\_2202\_3P\_0\_Gas House\_East Elevations Proposed, RC.01\_DR\_09\_2203\_3P\_0\_Gas House\_West Elevations Proposed

The original roof structure to the Gas House takes the form of a pitched roof with two pitched gabled roofs at the north and south ends and dormer windows to the first floor spaces. To the main roof, there are series of trusses with common rafters and battens above and a slate tile roof finish.

Internally, there is evidence of water ingress to the east facing slope and decaying wall plate and rafter ends. These will be covered in the repairs to the building.

The chimney is constructed with stone up to eaves level, and brick with a timber vent. The chimney is to be extended vertically to 1000mm above the ridge level in brick to match the existing. The flue will be re-lined to allow for use with the new mechanical and electrical equipment to be installed in the building. There are a number of defects to the masonry to the chimney stack; open joints to the brickwork will be repointed in lime mortar and the stonework will receive like for like repairs as to the adjacent external walls.

#### 3.2 External Wall Repairs

See drawings: RC.01\_DR\_09\_1201\_3P\_1\_Gas House\_North and South Elevations Existing, RC.01\_DR\_09\_1202\_3P\_1\_Gas House\_East Elevations Existing, RC.01\_DR\_09\_1203\_3P\_1\_Gas House\_West Elevations Existing, RC.01\_DR\_09\_2201\_3P\_0\_Gas House\_North and South Elevations Proposed, RC.01\_DR\_09\_2202\_3P\_0\_Gas House\_East Elevations Proposed, RC.01\_DR\_09\_2203\_3P\_0\_Gas House\_West Elevations Proposed

There are a number of defects present on the existing masonry to the Gas House, most notably:

- Areas of heavily weathered stone, particularly at ground floor level. Heavily eroded stones will be renewed while stones with smaller defects may be repaired with mortar or partial renewal in new stone.
- Loss of mortar, especially where there is weathered stone. Lime mortar will be used to repoint these areas.
- Open joints between brickwork to chimney. Joints will be repointed in lime mortar.

- Some lost of detail to stone surround to windows and doors. Stones will be carefully removed and replace to match surrounding masonry.
- Areas of vegetation growth. Vegetation is to be removed and the area treated to prevent any regrowth.
- Cracks within the masonry to the elevations. These will be repaired as per structural engineer JC Consulting's details.

### 3.3 External Joinery

Generally, the existing sash windows are in good condition. These would be retained and redecorated, with repairs made as necessary, with the exception of the central window the west elevation.

Similarly, the existing external doors are in good condition and as such would be re-decorated and new ironmongery fitted. The timber double entrance doors are to be replaced with double louvred doors to allow for ventilation to the plant.

### 3.4 Structural Alterations

A structural survey was carried out by JC Consulting and their report is included in full in Appendix 6.2.

The survey indicated that there has been a lack of maintenance of the building and notes the need for repairs, particularly significant and ongoing water ingress which is affecting the walls, roof and floors. There are also several cracks present in the masonry.

JCC are recommending repair works to restore the integrity of the structure, including repairs to the roof timbers, covering and flashings, stitching the cracks within the masonry, removing and replacing failed mortar and replacing heavily eroded stone.

### 3.5 External Staircase

To allow for access to the upper floor of the Gas House, a new external staircase is proposed. This would be a bespoke metal staircase.

### 3.6 Gas Meter Enclosure

The proposed gas meters are to be enclosed in a simple timber clad structure which will sit to the south of the Gas House, behind the current garages.

### 3.7 New Garages

The 2no. existing garages are to be dismantled and 3no. new timber garages, of similar design to the existing, are to be built away from the Gas House and surrounding buildings.

### 3.8 External Landscaping and the Proposed Service Routes

#### 3.8.1 Above ground

Proposed above ground landscaping will include the removal of the existing sheds and providing a new crushed stone gravel finish to the area to match the existing track directly in front of the Gas House. This will provide access to the new gas meter enclosure.

#### 3.8.2 Below Ground

New service trenches are proposed between the Gas House and the main site. These have been planned to cause minimal disruption to the trees.

2no. bore holes are to be constructed for the installation of ground source heat pumps. Access to the bore holes and below ground equipment will be fully recessed to finished ground level.

## 4. Further Design considerations

### 4.1 Structural Engineer:

TGA's Heritage Impact Assessment for their proposed services installation can be found in full in Appendix 6.3.

The proposals are to reinstate the Gas House to its former use as an energy centre for the entire Raby Castle site. There will need to be minor and sensitive adaptations to the building to allow for this to happen, such as extending the height of the existing chimney and installing a new flue liner and creating new openings for plant and connections.

New plant, including Ground Source Heat Pumps, Gas Fired Boilers, Heat Exchangers and Pumping Stations is to be installed to allow for both present and future needs.

### 4.2 Services Engineer:

Please refer to the Services Engineer's Statement in Appendix 6.2

### 4.3 Ecology and Bats:

See E3 Ecology Bat Report.

### 4.4 Trees:

Disturbance to trees during the digging of service trenches will be mitigated with the use of careful trench moling beneath the trees and hand digging where necessary. The service trench connecting the Gas House to the main site has been set out to be 15m from the bank of existing trees to avoid any disruption. These proposals have been developed in consultation with the arboriculturist.

## 5. Commentary on the Proposals

### 5.1 Impact on the Listed Building

### 5.2 Policy Justification of the proposals

#### 5.2.1 The Town and Country Planning (Listed Buildings and Conservation Areas) Act 1990

The Act is legislative basis for decision making on applications that relate to the historic environment.

Section 66 of the Act imposes a statutory duty upon local planning authorities to consider the impact of proposals upon listed buildings and conservation areas. It states that:

*in considering whether to grant permission for development which affects a listed building or its setting, the local planning authority, or as the case may be the Secretary of State shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses.*

As may be seen in the discussion on the previous pages, this point has been considered throughout the design process. The Gas House, listed Grade II, is both preserved and enhanced through these proposals. Additionally, the works will involve repairs to the fabric which will help to preserve the building into the future.

#### 5.2.2 The National Planning Policy Framework 2019

The general policies of the NPPF include the following which are particularly relevant to the proposals at the Gas House.

**Paragraph 7** of the Framework states that the purpose of the planning system is to ‘contribute to the achievement of sustainable development’ and that, at a very high level, ‘the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs’. The proposals forming this application are very much within this objective and enable the retention of the Gas House for future use as the site’s energy centre, and thus making best use of existing resources.

**Paragraph 10** states the requirement for sustainable development and it is considered that the proposals meet this objective.

With specific reference to the historic environment, the policies in **section 16** are met as described below:

**Paragraph 184:** Conservation of Heritage Assets; the heritage assets are being conserved in manner appropriate to their significance and bringing underused buildings back in to use will enable them to be enjoyed and to contribute to the quality of life of current and future generations.

**Paragraph 185:** Positive Strategy: a). the uses of the various buildings and other heritage assets are consistent with their conservation; b). the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring are fully expressed in the proposals; c). n/a; d). the historic environment defines the character of the spaces as whole.

**Paragraph 186:** Designation of Conservation Areas: n/a

**Paragraph 187:** Historic Environment Records; the listing description (attached as an appendix) is brief, and as we have seen, inaccurate. Further information is held by the Raby Estate, including much of the source material on which this report is based.

**Paragraph 188:** Public Access to Records: n/a

**Paragraph 189:** Understanding of Significance: this document has been prepared to meet this policy objective. See section 2 of this report.

**Paragraph 190:** Effect of Proposals on Significance: This document explains the significance of Gainford Hall, and how this has been taken into account in the proposals.

**Paragraph 191:** Deliberate Neglect: n/a

**Paragraph 192:** Determination of Applications: a). the repairs to the structure and external envelope will enable suitable uses consistent with the conservation of the various heritage assets, which will; b). reinforce the positive contribution the Gas House can make to the local community, and to increase its economic vitality; c). n/a.

**Paragraph 193:** Great Weight has been attached to the conservation of the assets on site, as has been described elsewhere in this document, particularly in Section 3. In particular, the retention of so much of the original structure, including the main structure, and of the original plan form, is noteworthy and the proposals have been designed to meet this objective. The new use, as a continuation of the original historic use, is noteworthy.

**Paragraph 194:** Harm: the majority of the proposed works are to carry out repairs to the existing historic fabric with no harm arising. The installation of services are planned to cause minimal change to the historic fabric and, with the exception of the new gas meter enclosure, all external works are to be below ground.

**Paragraph 195:** Substantial Harm: n/a

**Paragraph 196:** Less than Substantial Harm: the proposed alterations to the Gas House are to facilitate its future use as an energy centre for the Castle and Park and Gardens at Raby, enabling the retention of fabric which is currently at risk of decay and therefore minimising future harm.

**Section 197:** Non-Designated Heritage Assets: n/a

**Section 198:** Loss of Heritage Assets: n/a.

**Section 199:** Recording and Advancing Understanding of assets which may be lost: the remaining wiring and switchgear within the Gas House, left from its former role as an electricity power station will be photographed in situ, carefully removed and preserved elsewhere on the estate.

**Section 200:** Opportunities for new Development: n/a.

**Section 201:** Loss of Buildings and Associated Harm: the removal of the timber garages will improve the setting, to which they were detrimental.

**Section 202:** Enabling Development: this is covered in the separate approved applications for housing at Staindrop and Gainford, ref DM/20/01205/FPA.

The Gas House sits within the Grade II\* Raby Castle registered park and garden. None of the proposed works will affect its siting within the park.

### 5.2.3

#### Local Policies

##### **Teesdale Local Plan 2002**

The policies within this plan have all now been superseded.

##### **County Durham Plan Adopted 2020**

The Council has prepared a County-wide Local Plan, accessed [here](#), which will replace all saved policies of the Teesdale Local Plan on its adoption. The County Durham Plan was adopted on 21 October 2020.

**Policy 41-** Biodiversity and Geodiversity: the proposals include measures to maintain biodiversity.

**Policy 44 –** Historic Environment: the proposals will sustain the significance of the Grade II listed designated heritage asset at the Gas House. This statement has been prepared as required under paragraph 5.453 et seq.

The criteria for assessment, notably for Listed Buildings, a, b. and c. have been fully considered in the preparation of the proposals, as described in this document.

### 5.3 Conclusion

The proposals described in this document have been designed with full regard for the current national and local conservation policies. They will ensure the protection of the Gas House through limited structural interventions, repair of the external envelope of the building and some improvement to its immediate setting, as part of the work necessary to bring it back into beneficial use as an Energy Centre for the Raby Castle, Park and Gardens.

## 6. Appendix:

### 6.1 Listing descriptions.

#### Gas House

##### **Overview**

Heritage Category: Listed Building

Grade: II

List Entry Number: 1310898

Date first listed: 30-Sep-1987

Statutory Address: GAS HOUSE, A 688

##### **Details**

RABY WITH KEVERSTONE A 688 NZ 12 SW (West side, off) 9/74 Gas house

GV II

Gas house. Dated 1910 in panel in left gable, for Lord Barnard. Coursed sandstone rubble with ashlar dressings; Welsh slate roof with stone gable copings and brick chimneys. 2 storeys, 6 irregular bays, the end bays under gables to front. Right end bay projects and contains high round-headed double doors in alternate-block jambs and voussoirs; louvred chamfered slit in gable peak. Left end bay has chamfered square-headed surround to double doors; date Panel in gable peak. Large rectangular windows with glazing bars in ground floor between gables; loading door in third bay under gabled half-dormer; large square chimney rises from fifth bay with gabled louvred coping. Low, square-headed dormers with glazing bars flank half-dormer. Interior not inspected.

Listing NGR: NZ1322121997

## 1 Introduction

Further to Client instruction - confirmed by Glen Bland of GR Bland & Co - an inspection of the grade II listed historic building referred to as Gas House, situated on the eastern end of Raby Estate was carried out 22nd March 2021. The following visual structural inspection report identifies our findings, assessment and subsequent recommendations for repairs of structural defects plus commentary upon likely requirements for the reinstatement of the derelict building to serve as the energy centre for the proposed development. A statement is provided pertaining to each part of the building's construction being permanent and substantial or otherwise.

## 2 Structural Configuration

The Gas House is a short return L shaped building in plan assumed to be built before 1856. It is a two-storey utilitarian building made of rubble stone load-bearing external walls and brickwork internal walls.

The elevation can be divided into three distinct bays: the northern and southern ends of the building having gable elevations facing East-West with separate ground floor entrances to the East with a third, middle bay spanning between the gables with access door to the 1<sup>st</sup> floor facing East.

The southern and middle bays of the building form a single functional unit. The ground floor was used historically for gas production and electricity distribution and the first floor was used as storage. The northern bay formed a double-storey single volume space with a temporary timber infill structure inside currently used as a garage.

The roof is a mansard roof with bay windows to East and West covered in slate tiles. It comprises of three intersecting duo-pitched roofs made of softwood timber with rafters supported of timer and steel purlins. The purlins are supported by the gable walls at the northern and southern bays and by internal timber trusses and columns in the middle bay.

The first floor in the southern and middle bays is made of a concrete slab suspected to be of steel filler joist construction with a subsequently added reinforced concrete topping. The northern bay is a double storey high single space. The first floor here is formed by the subsequently added timber joist, which are spanning North-South and are built off the temporary internal timber lining of the garage.

The ground floor is made up of ground-bearing concrete slab to both parts of the building. There are several disused concrete upstands and floor trenches with steel covers in the concrete slab at middle and southern bays associated with the historic gas works.

There is a rectangular chimney at the East Elevation at the junction of northern and middle bays. The chimney was made of stonework at ground floor and brickwork above first floor and appears to have been subsequently built, as there is a continuous joint between the chimney and the building walls observed aft first floor.

Trial pitting revealed that the foundations of the southern and middle bays are of stone construction having the same width as the walls above. The foundations are typically 600mm deep bearing into the good, low plasticity sandy clay present throughout the site.

The foundations of the chimney and the gable wall of the northern bay facing East were shallower (around 385mm deep measured from external ground level) and built off made ground. This also could suggest that these elements were a later addition to the original building.

## 3 Condition Assessment & Discussion of Findings



The structure was of substantial construction, but the lack of maintenance and need for repair was evident. There were signs of extensive, ongoing water ingress both internally and externally affecting the structural integrity of roof, walls and floors. There were also signs of some structural distress in forms of various cracks in walls and ceiling. We understand that the building was unused and unmaintained from the 1950's to date.

The roof timbers of middle and southern bays were concealed by finishes therefore could not be inspected, except parts of the main trusses and the wall plate. The ridge appeared to be straight, constant and relatively true. Excessive water ingress was noted, which was concentrated around the south-facing bay windows, chimney and the junction between walls and roof at the South Elevation. In these areas extensive timber decay was observed in the wall plates and end bearing of rafters and around the bay windows. Some movement and deformation were noted around the bay windows most likely due to loss of end bearing of timber members. The roof structure of the northern bay was in reasonable condition and no excessive movement or deformation was noted.

The rubble stone external walls and internal brick walls were relatively true and plumb, but a number of structural defects were identified affecting the structural integrity of the walls as follows:

- Loss of mortar and stonework erosion due to a combination of excessive water ingress, lack of maintenance and use of non-compatible material (cementitious re-pointing)
- Vertical and diagonal cracks were present around corners and junctions of walls in all three bays and were more accentuated in the areas affected by water ingress. The width of the cracks in the walls varied, generally getting larger with height. The most likely cause of these cracks is a combination roof spread due to loss of bearing and insufficient tying at corners and junction, which was progressively made worse by the loss of mortar.
- High level horizontal and diagonal cracks around lintel and first floor slab bearing due a combination of embedded steel corrosion and some degree of historic settlement.
- Vertical cracks around subsequently built chimney due to insufficient tying between chimney and existing walls and insufficient foundation depth.
- Vertical and diagonal cracking in internal wall between middle and northern bays around subsequently infilled arched doorways.
- Localized cracking was also present at high level in the gable walls below purlin bearings.

Most of the internal cracks were not visible on the external elevation which might suggest some degree of separation of the external and internal layers and the rubble infill, but no excessive bulging or other sign of distress was noted, therefore this is not considered of having any significant impact on the structural integrity of the walls. However, further investigation will be required to confirm the extent of this.

The internal face of wall in the north bay garage at ground floor level were concealed by plasterboard fixed on subsequently introduced timber studwork, therefore could not be inspected, however there was excessive water ingress noted around the incorrectly terminated flue line.

The first-floor suspected steel filler joist slab was of solid construction and no excessive movement or deflection was noted. There was excessive concrete cracking and spalling in the form of multiple horizontal cracks present at underside of the slab spanning side-to-side at regular centres. These cracks are likely to be the result of corrosion of the embedded steel filler joists. Corroding steel due to water ingress can expand up to ten times of its original volume, thus exerting stress on the surrounding concrete which can lead to cracking and spalling.

The subsequently introduced timber joists forming the first floor in the north bay (garage) were in good condition, but there was no over boarding on top.

There was excessive debris and various items stored throughout the ground floor obstructing full view and inspection of both the concrete slab in the garage and the main floor and trenches associated with the gas works in the middle and southern bays. The areas which could be inspected including the concrete upstands were in poor state of maintenance, but no excessive movement was noted. There were minor signs of historic settlement in forms of cracks in both slabs.

The foundations appeared to be performing adequately and bearing into the good soil. There were only minimal signs of historic settlement in form of minor cracking around openings, which could be considered normal for the age and type of buildings of this nature. Exception to this is the chimney structure, where differential movement was noted, with the foundations bearing into made ground.

There is vegetation and trees relatively close to the West Elevation in the expected influence line of the tree roots. The walls were in reasonable condition at the time of our inspection and did not appear to be any worse than other parts of the building,

where no vegetation was present. Therefore, it is believed that the vegetation currently does not have a significant impact on the structure and its foundation.

## 4 Recommendations & Conclusions

The building is of permanent & substantial construction. In general, it is in relatively fair condition for the age of the structure however, there are signs of excessive water ingress and structural distress in the form of cracking and movement.

The proposals are all within the capability of the building and will provide the best solutions to protect and minimise the impact on the historical fabric of the building provided that strengthening and repair works are carried out to restore the integrity of the walls, slabs and roof as follows:

- The integrity of roof should be restored by repairing/replacing elements affected by biological degradation. The required repairs will be mostly constrained to the areas of excessive water ingress and affecting wall plates, rafter ends and some of the trusses. The repairs should be carried out by splicing in new timber, where is necessary carefully reviewed on a case-by-case basis on site during construction to minimise loss of historic fabric, when access is available.
- The roof covering and flashing around dormer windows should be repaired / restored to provide watertightness to the building. All rainwater pipes and gutter should be repaired / reinstated.
- All cracking should be repaired by restoring the continuity of walls using Heli-bar stitching or mortar injection as required.
- All corners at internal-external wall junctions, where cracking occurred should be tied back using Cem-ties or L shaped helical bars wrapping around the corners.
- Chimney should be tied back to wall using Heli-bars / Cem-ties.
- Loose, crumbling lime base mortar should be removed and walls should be repointed throughout as necessary using weak hydraulic lime mortar externally (NHL2 or less by my mixing 1:1 NHL2 and lime putty).
- Debonded cementitious pointing should be also removed with the caveat that if cementitious pointing is well bonded to the stones, it could cause more damage by removing it by force. Therefore, should be given leaving it in place and allow by natural erosion to loosen the bonding to avoid harm and unnecessary loss to historic fabric.
- Where excessive erosion occurred on elevations some individual stone masonry elements will require carefully cutting out and replacing it in a like for like basis. Exact quantities to be replaced to be reviewed in high detail and agreed with SE and specialist Stonemason when scaffold access is available in order to minimize intrusive works and loss of historic fabric.
- Cracking in ceiling should be further investigated by removing finishes a minimum of 300mm to each side of cracking to allow inspection of steel filler joists and the extent of corrosion and be repaired as required.
- Core drilling should be carried out both for first and ground floors to ascertain floor build-up and allow for assessment of structural capacity and allowable storage loading to avoid over-loading or excessive strengthening works.
- The accumulated debris and item stored at ground floor level in both areas should be removed to allow further inspection of concrete slabs. It is likely that the concrete slabs due to the geometry and build-up would not be fit for the proposed use and would require strengthening / replacement.
- Localized underpinning will be required around chimney and at locations where M&E services are required to pass under the existing foundations.

We trust that the above meets with your requirements at this stage. However, in the meantime if we can provide you with any further information or assistance then please do not hesitate to contact us.

Yours faithfully,

On behalf of James Christopher Consulting Ltd

Prepared by:

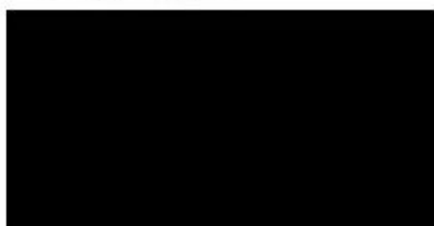
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## 6.3 Services Engineer's Statement

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### **M&E HERITAGE IMPACT STATEMENT**

**Project :** Raby Rising – Gas House

**Job No :** 8065

**Date :** 20.07.2021

The building known as the “Gas House”, is a former energy centre that delivered heating to the Castle. The buildings current status is “in need of repair and renovation”. One section of the building is currently used as a domestic vehicle garage. This space will also be allocated for new plant.

It is proposed to return the building to its former use as a mechanical and electrical energy centre, delivering thermal energy to the needs of several buildings within the Raby estate.

The building fabric will require minor/sensitive adaptations to allocate new thermal energy generating plant, such as Ground Source Heat Pumps, Heat Exchangers, Gas Fired Boilers, Pumping Stations, and ancillary equipment. The building is considered for both the immediate thermal energy requirements and also the future provision for the estate.

In order to facilitate the proposed M&E plant, the fabric adaptations are noted and justification provided.

1. Existing entrance door and single window apertures will require the installation of louvred panels.
  - This is a requirement of the current gas regulations to provide sufficient plantroom ventilation where gas fired boiler plant is installed.
2. The existing chimney will require extending in height.
  - This is to comply with the current gas regulations for suitable flue gas discharge at roof level, but to also consider the protection of the fabric from the products of combustion.
3. The existing chimney will require an internal liner.
  - This is to allow the safe discharge of the flue gas and products of combustion. The existing chimney will remain intact.

4. Relocation of the existing door between the main plant area and the adjoining garage section.
  - o This is to allow safe maintenance access to/from the plant areas. Plant layout and coordination approach has been extensively considered to allow the safe access for maintenance personnel.
5. Create a new services distribution penetration in the dividing wall between the plantroom and garage area.
  - o This is to allow horizontal distribution of M&E services and connection between both spaces.
6. Replacement of the existing floors and concrete plinths.
  - o This is necessary due to needed repairs and levelling, but to also aid the appropriate setting out of the plant.
7. Create new internal below ground services entry/exit points on the east and west sides of the building.
  - o This is to allow the M&E services distribution to and from the building out to the site wide infrastructure. The entry/exit positions are coordinated considering the tree route protection and any other existing buried services identified within the vicinity.
8. Provide a new free standing gas meter enclosure adjacent the building. A gas pipeline entry position will be required above ground into the building.

Where practicable, all existing and previous M&E services penetration will be re-used for the new installation and made good.