GROUNDWORK

Groundwork Energy Management Systems

Initial Energy Assessment (IEA)

Address: Knott Memorial Hall, Towne Gate, Heddon on the Wall, NE15 OBH.

Customer reference: [2025/MEJK/NE150BH]

Date of assessment: [27/06/2025]

Assessor: [Matthew Eves, James Kirk]

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1. Report Summary

This energy assessment and report have been self-funded, as part of the Groundwork Energy Management Systems (GEMS). The Energy Assessment at the premises of Knott Memorial Hall was carried out on the 27th of June 2025, conducted by Matthew Eves and James Kirk, as an on-site assessment.

The report describes the hall's current building structure and its main services, such as heating and lighting. It also suggests steps the organisation could take to lower energy use and cut carbon emissions.

The Hall was built in 1936, in the common style of that time. It has solid sandstone walls with a suspended timber floor, and a pitched slate tiled roof.

The fabric of the building is in an average condition. In recent years, the organisation has replaced most of the lighting with LED, replaced the boiler, and modernised the kitchen area of the building to include UPVC double glazing.

Yearly energy use has been modelled at **66,664 kWh** for gas and **2,497 kWh** for electricity. This baselining sits within a small margin of the calculated average energy consumption in each fuel from the data provided. This consumption gives annual carbon emissions of about 15tons (**14,929kg).**

The organisation **could save £2,654 a year** on heating costs, whilst also reducing the building's carbon emissions by **13,900 kg/year, a 92% reduction**. This can be achieved through a range of measures including improving the building's insulation in the roof space and walls, window replacements **(Measures Package B), and the installation of an air-source heat pump** to provide the building with heating. **This would result in the building's annual carbon emissions being 1029kg/year.**

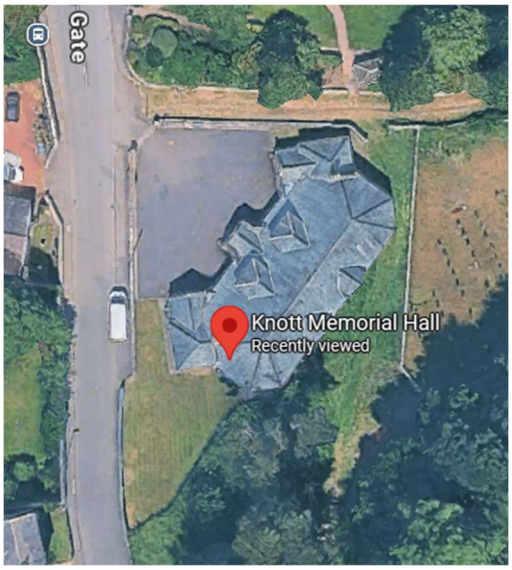
However, for a minimum of an **80% reduction in carbon emissions to be achievable by 2050**, the organisation would need to implement Measures Package B and install an air-source heat pump by **2035**.

To further reduce the building's carbon emissions, the organisation may also need to consider offsetting emissions. This could be done by joining approved offsetting schemes or by planting trees, hedges, and perennials on the hall's green space.

1. Dwelling/building context

Site Context

The premises of the Knott Memorial Hall, NE15 0BH, is located on The Towne Gate, Heddon on the Wall, this comes under the Northumberland Local Authority and is part of the Ponteland South and Heddon Electoral Ward which is part of the wider Hexham Parliamentary Constituency. The hall has a green space located to the south-west side of the building, to the rear south-east of the building is a sloped green space with deciduous trees, the carpark is located to the front entrance of the building.



Easting	413338
Northing	566930
Latitude	54.996777
Longitude	-1.7930481

Architectural Context

The building was constructed in 1936 and has a construction and appearance typical of a community building of this period.

Site usage

Knott Memorial Hall was taken into ownership of the Heddon Parish Council in 1991. The building is regularly used by community groups for the purpose of exercise classes, children's activity sessions, and meetings. The building is used for 10 hours per week with an average of 80 people using the building. The hall is also used to host shows, comedy evenings, weddings, and parties, as well as village fates. The building has a newly modernised kitchen, which can be used to provide food at events.

2. Building Fabric

Walls

Solid sandstone, likely with a brick backing. This is at various thicknesses throughout the building; no additional insulation is present.

Floors

Suspended timber floors, in the main hall area of the building (uninsulated). Solid concrete floors are in the lower areas of the building below the staging.

Roofs

Pitched slate tiled roof – hall and stage area are insulated at the joists with 75mm of mineral wool. All other areas are assumed to be uninsulated.

Windows

Single-glazed windows are present throughout most of the building. The main hall has several large lead-barred windows with timber frames, with ornate features. These have had Perspex secondary glazing installed to the exterior of the building. The single-glazed windows to the front entrance of the building have metal frames. The windows of the kitchen area of the building have recently been replaced for modern UPVC double glazing.

Doors

The main entrance double doors were constructed with solid timber with singled glazed panels to the upper section.

Services

Space heating is provided by a Vaillant ecoTec Plus boiler (80kW), distributing through a wet central heating system, with convector radiators equipped with thermostatic radiator valves (TRV). The heating was controlled with a digital thermostatic control. There is additional heating provided by gas-fired convector heaters, located in the main corridor and in the male toilet.

Water heating is provided by two Zip RCH Instantaneous hot water heaters each with a 25L storage capacity, these were in male and female toilets. An Ariston Aures Slim Multi instantaneous hot water heater provided the kitchen area with water.

Ventilation - Natural ventilation throughout the building with intermittent extract fans present in the toilet areas of the building.

Lighting **-**Most of the lighting was provided by LED tubes, with manual controls. A small number of compact Fluorescent Lights (CFL) and T8 Tubes provided lighting in less used areas of the building.

3. Energy Usage

Gas

The organisation is currently in a fixed term tariff, which ends in May 2027. The organisation is currently paying **6.92p/kWh** of gas and a daily standing charge of **54.06p/day**. It has been estimated using utility data and modelling that the building's annual gas consumption is **66,664kWh/year**, with a cost of **£4,810.47/year.**

Electricity

The organisation is currently in a fixed term tariff, which ends in July 2027. The organisation is currently paying **30.14p/kWh** (weekdays) and **23.51p/kWh (Evening and Weekend)** of electricity and a daily standing charge of **61.80p/day**. It has been estimated using utility data and modelling that the building's annual electrical consumption is **2,497kWh/year,** with a cost of **£895.39/year**.

4. Emissions

Gas

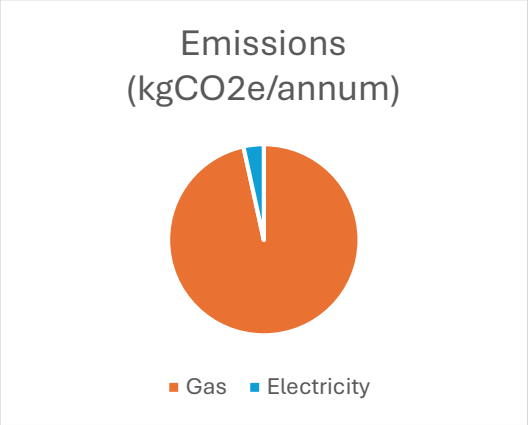
66,664 kWh @ .220 kgCO2e/kWh = 14,666 kgCO2e

Electricity

2497 kWh @ .210 kgCO2/kWh = 524 kgCO2e

Total

15,190 kgCO2e/year



5. Improvement Options

Measures Package A

The organisation could **consider improving the levels of roof insulation** in the areas of the building that are relatively easy to access. The organisation could install these measures without the requirement of scaffolding or specialised equipment to be used, thus keeping installation costs relatively low. *Table 1* outlines the potential annual energy, carbon, and cost savings if levels of mineral wool insulation were increased in the specific areas of the building. The organisation could reduce its gas usage by **13,424kWh** or **£943.16** per year, whilst simultaneously reducing the building's carbon emissions annually by **2,959kg**, if insulation were installed in all areas specified in **Measures package A.**

Table 1 Outline of potential energy, carbon, and cost savings for the installation of roof insulation to several accessible areas to Knott Memorial Hall.

Improvement Option	Gas Usage (kWh/year)	Electricity Usage (kWh/year)	Carbon Emissions (kg/year)	Reduction in Carbon Emissions (kg/year)	Emissions reduction (%)	Possible capital costs (£)	Cost reduction (£/year)	Payback Period (Years)
Status-Quo	66664	2497	14929.1					
Measures Package A								
Main Hall + Stage Increase to 350mm	65347	2492	14638.8	290	1.94	1485	92.48	16.06
Main hall panelled annex, loft upgrade (300mm), wall to adjacent hall (175mm)	60408	2473	13550.0	1379	9.24	1782	439.35	4.06
Kitchen and adjacent W/C loft upgrade (300mm)	63796	2486	14296.9	632	4.23	384	201.42	1.91
Green room & adjacent W/C loft upgrade (300mm)	63613	2485	14256.6	673	4.50	408	214.35	1.90
Installation of all the Measures Package A.	53240	2444	11970.10	2959	19.82	4059	943.16	4.30

Measures Package A and Measures Package B Combined

The measures outlined in **Measures Package B**, shown in *Table 2*, are more challenging to implement compared to Measures Package A. This is because some areas that require insulation are inaccessible without the aid of scaffolding or the use of specialised equipment, such as the dormer areas of the main hall. Therefore, additional costs and some level of disruption to the building would be incurred because of installing these measures. However, if both the sloped ceiling of the stage and hall as well as the two dormers are insulated, then these could see a combined **energy saving of 10,085kWh** and a carbon reduction of **2,223 kg a year.**

The organisation may wish to install internal wall insulation (IWI) to the building. This would require stripping the walls back to the solid sandstone, installing insulation board and a plaster layer. Due to the building being constructed from sandstone, which is a porous material (moisture can easily pass through the material), natural permeable materials, such as hemp board, and a lime-based plaster would be recommended, as these allow moisture to pass through the walls, reducing the chances of condensation forming. The installation of IWI to the building would cause a large degree of disruption and has significant costs associated with it. The installation, however, would reduce the building's annual heating demand by **10,514kWh** and a reduction in cost and carbon emissions annually of **£739.10** and **2,318 kg,** respectively**.**

The organisation could consider replacing the single-glazed windows, which are present in the main corridor, toilet areas, and the meeting room, with modern timber-framed double-glazed windows. This could reduce the building's carbon emissions by **479 kg per year.** The windows in the main hall have ornate features and already possess external secondary glazing and therefore have not been considered for replacement in the modelling.

If the organisation was to implement all the measures suggested in the **Measures Package A and B combined** could result in the **building's heating costs being reduced by £2,488 a year** and its carbon emissions being reduced by **7,801 kg/year, a 52 % reduction from the modelled baseline emissions.**

Heating system conversion (ASHP)

The organisation could consider replacing its current heating system with an appropriately sized air source heat pump (ASHP) to provide the building with heating only, which is calculated to be 78kW if no other improvements are made, installation of insulation would impact final peak heat demand allowing for a smaller, though still considerable heating appliance. Due to the building already having instantaneous water heaters in the toilets and kitchen, the system should not require a separate hot water cylinder. The installation would significantly reduce the building's carbon emissions by **12,470kg/year** or around **84%.** Whilst reducing the building's demand for gas to zero, the electricity demand would increase to **23,418kWh/year**.

The installation of all measures set out in Measures Packages A and B, coupled with conversion of the heating system to an ASHP could further reduce the building's carbon emissions by 93% to **1,029 kg/year.** This combination of packages could save the organisation **£2,654 a year.**

Table 2 Outline of potential energy, carbon, and cost savings for the installation of measures to several less accessible areas to Knott Memorial Hall.

Improvement Option	Gas Usage (kWh/year)	Electricity Usage (kWh/year)	Carbon Emissions (kg/year)	Reduction in Carbon Emissions (kg/year)	Emissions reduction (%)	Possible capital costs (£)	Cost reduction (£/year)	Payback Period (Years)
Status-Quo	66664	2497	14929.1					
Measures Package B								
Hall and stage sloped ceiling insulation (100mm)	58881	2465	13213.3	1716	11.49	3390	547.17	6.20
Insulated hall dormers	64362	2489	14421.8	507	3.40	2259	161.44	13.99
Internal Wall Insulation	56150	2454	12611.5	2318	15.52	39258	739.10	53.12
Single Glazed Window Replacement	64494	2486	14450.6	479	3.21	7250	153.11	47.35
Package A + B combination	31273	2351	7127.7	7801	52.26	52157	2488.22	20.96
Fuel conversion, ASHP	0	23418	2458.9	12470	83.53	60000	-1973.97	N/A
Measures Package A+ B with ASHP	0	9800	1029.1	13900	93.11	87157	2654.12	32.84

Measures Package C

The measures outlined in Measures Package C, summarised in *Table 3*, though possible, are unlikely to be implemented due to the access restrictions. To be able to implement insulation to the suspended flooring in the hall and insulate the pipework, the entirety of the timber flooring would need to be taken up. This would cause significant disruption and capital costs to install these measures in comparison to the carbon savings that would be made.

Table 3 Outline of potential energy, carbon, and cost savings for the installation of measures to several areas which are relatively inaccessible in Knott Memorial Hall.

Improvement Option	Gas Usage (kWh/year)	Electricity Usage (kWh/year)	Carbon Emissions (kg/year)	Reduction in Carbon Emissions (kg/year)	Emissions reduction (%)	Possible capital costs (£)	Cost reduction (£/year)	Payback Period (Years)
Status-Quo	66664	2497	14929.1					
Measures Package C								
Suspended floor insulation	62146	2499	13935.2	994	6.6	12438	312.11	39.85
Pipework insulation	62706	2482	14056.6	873	5.84	260.15	277.92	0.94
Corridor and porch insulation	63460	2485	14222.9	706	4.73	661.00	224.94	2.94

Air tightness improvement

The organisation could consider having an air-tightness test carried out at the premises. This would indicate any significant areas in the building where air could leak from, such as gaps and cracks in the walls, floors, and roof spaces. This would allow the organisation to target those locations with sealants, membranes, etc, which would result in less thermal energy escaping the building. The building has been modelled with an air permeability of **11m^3/m^2/h**; however, if this were reduced to **5m^3/m^2/h** by filling gaps in the building perimeter, the organisation could reduce the building's heating demand by **3,757kWh/year**, with a reduction of **£264.01/year** in costs and **828kg/year** in the building's carbon emissions.

Solar photovoltaics

The installation of Solar Photovoltaic (PV) panels has not been considered in the modelling, due to the orientation of the building, the obstruction caused by dormer structures on the roof space, and the shading caused by the incline in the landscape and the surrounding trees.

6. Carbon emission projections and offsetting

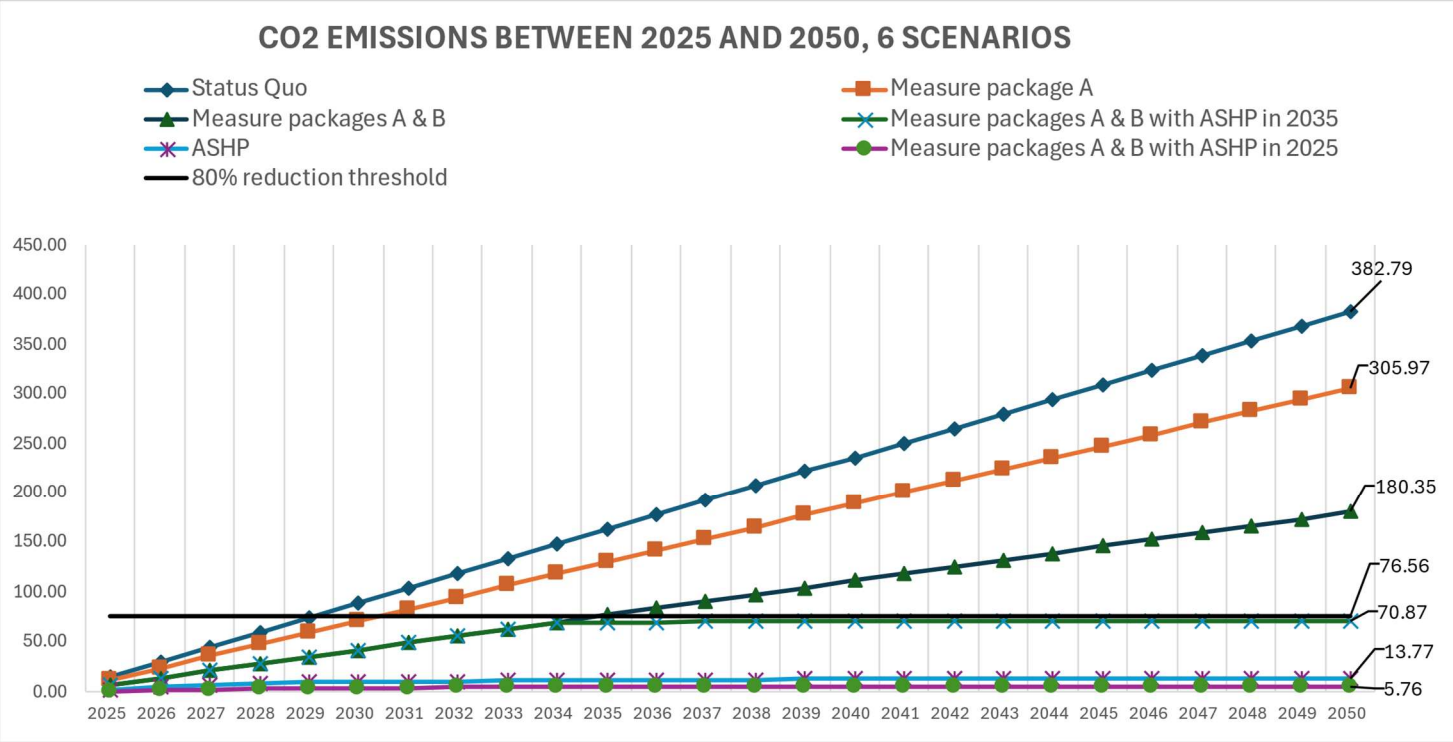


Figure 1 Carbon emission projections (2025-2050)

Looking forward to 2050 it is important to assess the impact of a decarbonising grid on the emissions from your building going forward. Within Figure 1 is the projected emissions in tCO2e over the next 25 years for six scenarios. This highlights the significant volume of carbon emissions emanating from the building if no measures are implemented (Status Quo – dark blue). If Measures Package A and B are implemented, they will decrease the building's emissions considerably; however the this still would not be significant enough for the organisation to reach their 80% carbon reduction. For the organisation to achieve an 80% reduction in carbon emissions, the organisation must implement Measures Package A in conjunction with the conversion of the current heating system to an Air Source Heat Pump (ASHP) no later than 2030 and packages A & B by 2035, this is highlighted by the green line. The lowest carbon emissions over the period can be achieved by implementing Measures Package A, B and C in conjunction with an ASHP if installed in 2025, shown by the purple line.

Other Carbon Reductions

With few exceptions, there is little capacity for any individual building to become carbon neutral or even negative without significant microgeneration, which, given the site context, is not possible here. However, at very low levels of annual emissions, offsetting either on-site or off-site can mitigate the intrinsic carbon emissions of occupying a building.

Onsite - Planting a tree-focused garden.

The organisation may wish to utilise the green spaces on its site, which are currently covered by a grass lawn, to sequester carbon dioxide from the atmosphere. The organisation could incorporate a range of perennial plants, small to medium-sized trees, and hedges to their green space at the entrance of the building. This would also increase the biodiversity of plant and animal species in the area, which would benefit the natural environment.

Below is a potential range of plants that could be planted by the organisation, which includes the possible amounts of carbon that can be captured.

For maximum CO_2 capture, prioritise tree planting.

98 m² Wildlife-Friendly Carbon Sequestering Garden

🌿 **Proposed Layout**

Feature	Area (approx.)	CO_2/year
Native mixed hedge (12m run)	~6 m²	25–45 kg
2 small native trees	~8 m²	35–55 kg
Wildflower meadow patch	~30 m²	3–5 kg
Perennial pollinator border	~20 m²	4–8 kg
Log pile, rocks, mini pond	~3 m²	-
Rough grass & native grasses	~15 m²	1–2 kg
Mulched shrub beds (hazel, currants, dogwood)	~16 m²	8–15 kg

Estimated Carbon Sequestration

- **Total annual CO_2 capture: 75–130 kg/year**
- Over **10 years**: ~0.75–1.3 tonnes CO_2

Trees such as silver birch, rowan could be suitable for the available space. English oak can sequester much greater amounts of carbon dioxide over its lifetime; however, there is only limited space at the site.

- CO_2 sequestration increases as plants mature (especially trees and hedges).
- These numbers are **annual sequestration rates**; over 10 years, even a small garden could sequester **800–2000 kg of CO_2**.

Soil health is key—**no-dig gardening, composting**, and **mulching** boost long-term carbon storage in the soil.

Offsite - Carbon offsetting

Currently, there are only two accredited standards for carbon offsetting in the UK – The Woodland Carbon Code and the Peatland Code. Further research is needed to develop more offsetting schemes. (Environment Agency, https://assets.publishing.service.gov.uk/media/60cc698cd3bf7f4bcb0efe02/Achieving_net_zero_-_a_review_of_the_evidence_behind_carbon_offsetting_-_report.pdf)

Organisational/Habitual Changes

The building's energy demands can also be reduced through the service users' awareness and training of energy-saving measures and ensuring that these are implemented when the building is in use. Some examples of these could be:

- Switching off electrical equipment when they are not in use.
- Ensuring that portable electrical heaters are only used when necessary.
- Ensuring that thermostatic controls are set correctly, so that heating systems only operate when required.
- Ensuring that TRVs are used correctly to regulate rooms to a suitable temperature.
- Ensuring lighting systems are not being used when rooms are unoccupied.
- Ensuring that windows are closed when the heating is on in a room.

7. Conclusions

The fabric of the Knott Memorial Hall building is in average condition. The organisation aims to reduce its current carbon emissions of **14,929 kg/year and reach a target of an 80% carbon reduction by 20250.**.

For the organisation to achieve this ambition, it is recommended that **Measures Package B** is implemented, which would involve the improvement of and installation of roof and internal wall insulation to the building, replacing the single-glazed windows in the main corridor, toilet areas, and meeting room with UPVC equivalents, and converting the heating system to an air source heat pump. The installation of these measures could reduce the building's annual heating costs by £2,654, whilst realistically achieving a **93% in its carbon emissions**, equivalent to **13,900 kg/year** less than the baseline levels. This installation could cost the organisation about **£87,000.**

The organisation has recently updated their current heating system for a new gas boiler. However, for the organisation to achieve an **80% reduction in carbon emissions by 2050,** the organisation would need to implement **Measures Package A and B** and replace the current heating system with an **air source heat pump by 2035**. The organisation should implement this into its financial planning to implement the above measures.

The organisation would also need to consider offsetting some of its carbon emissions through accredited schemes and through the generation of a garden space to be able to achieve a target of becoming net zero.

J.Kirk 

The Groundwork audit was carried out in good faith and within a limited time frame. Groundwork's advisors make every effort to ensure the information provided verbally and through this document is appropriate and accurate.

Groundwork reserves the right to amend their conclusions and recommendations should further, or more detailed information become available. The final decision regarding any advice/ information provided by Groundwork is the commercial responsibility of the company.

The preceding report provides advice and guidance in relation to environmental good practice and highlights potential environmental legal breaches which may require attention. It is your responsibility to check if any relevant health and safety regulations apply, and to ensure that you comply with these.

Groundwork Yorkshire

Groundwork was founded in the North of England at a time of political, social, and economic challenge. It was an experiment to help communities cope with change; to work together; to make their lives and neighbourhoods better. That spirit of enterprise and innovation has never been more needed.

In every community – however disadvantaged – there are deep reserves of pride: people with the passion and ideas to improve their circumstances and surroundings.

Groundwork exists to harness that pride: to unlock that passion. Our services, projects and programmes change people's lives. They can also make our communities more resilient for the future.

Groundwork is an organisation that embraces transformation. We positively change places and people's lives - in partnership - where we can.

Head Offices

Yorkshire

Environmental and Business Centre,
Merlyn-Rees Avenue,
Morley,
Leeds,
LS27 9SL

Tel: 0300 3033 292
E: Retrofit@groundwork.org.uk

Appendix A – Collated retrofit measures

Improvement Option	Gas Usage (kWh/year)	Electricity Usage (kWh/year)	Carbon Emissions (kg/year)	Reduction in Carbon Emissions (kg/year)	Emissions reduction (%)	Possible capital costs (£)	Cost reduction (£/year)	Payback Period (Years)
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