environmental economics

Greenhouse Gas Emissions and Mitigation Assessment

Lanwades Woodland Park

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Construction

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Revision History

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Contents

1. Introduction

1.1.1. Environmental Economics Ltd has been commissioned by Lochailort Kentford Ltd to prepare a greenhouse gas assessment for the proposed development Lanwades Woodland Park.

1.1.2. This document contains assessments for two planning applications:

- *Full planning application for 302 residential dwellings and a retail unit;*
- *Hybrid planning application for 860 residential dwellings, a retail unit, care home, employment hub and school.*

1.1.3. The proposed development will lead to the direct and indirect release of greenhouse gases, both during construction phase and throughout the lifetime of the development (operational phase). This assessment estimates the greenhouse gas emissions associated with the applicant site, taking a lifecycle approach, and presents the mitigation measures provided by the scheme to minimise its greenhouse gas emissions.

1.1.4. This greenhouse gas assessment has been prepared to accompany the Environmental Statement (ES) for the proposed development. The greenhouse gas assessment only covers the impacts of the application site on climate through quantifying greenhouse gases resulting from the proposals.

1.1.5. This greenhouse gas assessment has been completed for the outline planning application for the site at Lanwades Woodland Park and therefore does not include all emission sources as there are aspects of the proposed development for which there is insufficient data to accurately quantify greenhouse gas emissions associated with certain activities to provide meaningful assessment. The assessment has focused on emissions which are considered to be of material impact of the proposed development and which would lead to residual significant effect.

1.1.6. A summary of the assessment, alongside consideration of future climate change on the resilience of the proposals in provided within the ES at Chapter X - Climate Change.

2. Policy Context and Guidance

2.1. Context

2.1.1. In preparing this greenhouse gas assessment, consideration has been given to the requirements of national, regional and local planning policies.

2.2. National Policy and Guidance

National Planning Policy Framework (December 2024)

2.2.1. The National Planning Policy Framework sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development and that he planning system has three overarching objectives, one of which (Paragraph 8C) is an environmental objective:

"to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating an adapting to climate change, including moving to a low carbon economy".

2.2.2. Part 14 of the Framework is entitled "Meeting the challenges of climate change, flooding and coastal change" and sets out the strategy for minimising the climate change effects of new development. Paragraph 164 states that:

"New development should be planned for in ways that [···] can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards".

2.2.3. Paragraph 165 states further that:

"to help the use and supply of renewable and low carbon energy and heat, plans should:
a) Provide a positive strategy for energy from these sources, that maximizes the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
b) Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure the development; and
c) Identify opportunities for development to draw its energy supply from decentralized, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

2.2.4. Paragraph 166 states that, when determining planning applications, planning authorities should expect new development to:

"a) comply with any development plan policies on local requirements for decentralized energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption."

Climate Change Act 2008 (as amended in 2019)

2.2.5. The overarching framework in relation to climate in the UK is the Climate Change Act 2008. The Act introduced a legally binding target to reduce UK greenhouse gas emissions by at least 80% against 1990 levels by the year 2050. It also instated the Committee on Climate Change (CCC) with the power to set out binding carbon budgets on the government for five-year periods.

2.2.6. In 2009, the first three carbon budgets were announced which set out a binding target of a 34% reduction in CO_2 emissions by 2020. The government have since adopted further budgets which aim to reduce CO_2 emissions by 50% by 2025 and 57% by 2030.

2.2.7. The CCC also produces annual reports to monitor the progress in meeting these budgets.

Carbon Budget Order 2021

2.2.8. The Carbon Budget Order 2021 can into force in June 2021 and sets a legal obligation to meet the targets of the Climate Change Act 2008 and further subsequent amendments to cut greenhouse gas emissions by 78% by 2035.

Approved Document Part L 2021

2.2.9. The latest edition of English Building Regulations (2021) cover the construction and extension of buildings, they protect the health and safety of people in and around buildings, they also provide for energy and water conservation and access to and use of buildings. Approved documents provide practical guidance on about how to meet the requirements of the Building Regulations 2021.

2.2.10. Approved Document L on the Conservation of Fuel and Power define the energy efficiency requirements for new buildings.

2.2.11. Part L 2021 represents a 31% reduction in carbon emissions over the previous 2013 edition.

Future Homes Standard

2.2.12. The Future Homes Standard is the upcoming newest edition of the Building Regulations and is expected to be released in 2025.

2.2.13. Future Homes Standard is currently expected to represent a further 49% reduction in carbon emissions over the current 2021 edition.

2.2.14. Owing to current timeframes it is likely that the proposed development will be constructed in accordance with the Future Homes Standard.

2.3. Local Policy

The West Suffolk Council Joint Development Management Policies Document (adopted 24 February 2015)

2.3.1. The Council adopted the West Suffolk Council Joint Development Management Policies Document in February 2015, which details the development and growth strategies for the local area up to 2031. Some key policies which directly tie into this climate change risk assessment is discussed below:

2.3.2. Policies DM6, DM7 and DM8 set out the strategic approach to sustainable design and construction. Strategies to ensure this is achieved include avoiding unacceptable flood risks, incorporating climate resilient design, promoting efficient use of resources such as energy and water, and providing opportunities for enhancing biodiversity. All major developments will be required to incorporate on-site renewable energy generation.

The West Suffolk Council Emerging Local Plan

2.3.3. Whilst not yet officially adopted, there are several policies within the West Suffolk Council Emerging Local Plan which are relevant to this document including SP1 and LP1.

3. Assessment Methodology and Significance Criteria

3.1. Assessment Methodology

3.1.1. The assessment of the effect of the proposals on climate change considers the release of greenhouse gases from activities associated with the proposed development.

3.1.2. The assessment is comprised of the following steps:

1. *Set the scope and boundaries of the greenhouse gas assessment*
2. *Develop the baseline*
3. *Decide upon the emissions calculation methodologies*
4. *Data collection*
5. *Calculate/determine the greenhouse gas emissions inventory*
6. *Consider mitigation opportunities to then repeat steps 4 and 5*

3.1.3. The metric for assessing the climate change impacts of greenhouse gas emissions in this assessment is units of CO_2 equivalent (CO_2e) over 60 years. This allows the use of Global Warming Potential (GWP) for the emissions of seven key greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride and sulphur hexafluoride to be expressed in terms of their equivalent GWP as a mass of CO_2e.

3.2. Scope and Boundaries

3.2.1. The assessment scope and boundary for the greenhouse gas impact assessment are set by the redline boundary of the applications site as well as encompassing a wider set of greenhouse gas emissions from outside of the redline boundary. This includes the embodied carbon emissions from products and materials.

3.2.2. The assessment of greenhouse gas emissions does not include identification of sensitive receptors, as greenhouse gases do not directly affect specific locations, but lead to indirect effects by contributing to climate change as a whole. Impacts on particular areas are not included within this assessment, since the impacts of greenhouse gas emissions will affect the global atmosphere and therefore need to be considered in a total context, rather than on localised areas.

3.2.3. Construction phase is assumed to be 3 years for the purpose of this assessment.

3.3. Baseline Emissions

3.3.1. The application site for the proposed development is currently made up of a redundant brownfield site along with agricultural fields with some trees and other vegetation.

3.3.2. For the purposes of this assessment, it is expected that there are negligible emissions for this current use, as existing development is redundant. Therefore, the baseline will be assumed to be zero. Further to this, a baseline of zero is in line with the worst case scenario for assessing the impact of the proposed development.

3.4. Emissions Sources

Scoped in

3.4.1. The outline assessment has taken a whole-life approach to calculate greenhouse gas footprint for the proposed development. The footprint sources considered at an outline application stage include greenhouse gas emissions from:

- *Embodied carbon;*
- *Construction activities;*
- *Operational energy use;*
- *Operational repair and maintenance.*

Scoped Out

3.4.2. There are some minor sources of greenhouse gas emissions which have been scoped out of the assessment (including waste disposal during construction and water consumption). These emissions are expected to make up a minor component of the overall greenhouse gas footprint of the proposed development. These metrics can also be challenging to estimate with sufficient accuracy to meaningfully inform any assessment. It is expected that best practices will be employed where relevant to minimise any potential emissions from these sources.

3.4.3. At outline application stage construction and operation transport emissions have been scoped out of the assessment. Construction phase transport emissions are accounted for in the whole life carbon assessments undertaken for this project in accordance with RICS lifecycle stage A4. Operational phase transport emissions have not been considered sue to the challenge of identifying with accuracy the proportion and distances of travel solely dedicated to the operational phase of the proposed development. As more detail on these matters become available, more detailed studies can be completed.

3.4.4. End-of-life emissions include the demolition of the buildings, transport and processing of waste and disposal. As the UK has committed to achieving net zero carbon emissions from 2050 onwards (before the end of the expected minimum 60 year lifespan of the development) it can be reasonably expected that the emissions associated with demolition, transport and processing of waste will be net zero. Residual emissions from waste disposal are expected to be minimal.

3.5. Methodologies by Scenario

3.5.1. Key sources of data and methodologies for assessing the scoped in greenhouse gas emissions scenarios are outlined in Table 1 below:

Table 1- Methodologies for greenhouse gas assessment

Development Phase	*Baseline*	*Proposal*	*Methods and Data Sources*	*References*
Construction: Embodied Carbon	Baseline is assumed to be zero	The completed proposed development as defined in ES Part One report	Greenhouse gas calculation using RICS embodied carbon benchmarks Whole Life Carbon Report (Appendix X.5)	RICS Whole Life Carbon guidance Whole Life Carbon Report (Appendix X.5)
Construction: Site Activities	Baseline is assumed to be zero	Site activities including construction plant, site offices etc.	Based on an estimate of the project value	Data provided by Project Team
Operation: Repair, Maintenance and Refurbishment	Baseline is assumed to be zero	Maintenance, repair and refurbishment required during the proposed development's lifespan	Application of the RICS embodied carbon factors to calculate emissions embedded in construction materials Whole Life Carbon Report (Appendix X.5)	RICS Whole Life Carbon guidance Whole Life Carbon Report (Appendix X.5)
Operation: Energy	Baseline is assumed to be zero	Energy used during operational phase	Energy and Sustainability reports (Appendices X.3 & X.4)	Energy and Sustainability reports (Appendices X.3 & X.4)

3.5.2. To estimate total lifecycle greenhouse gas emissions, this assessment estimates emissions across the construction and operational phases while taking into account relevant changes that are projected by the UK Government concerning building standards and the carbon intensity of grid electricity.

3.5.3. Embodied carbon is an area of increasing significance to the overall carbon budget of the UK. As the national grid decarbonises, embodied carbon will make up a greater proportion of the overall carbon emissions related to developments. The Royal Institute of Charters Surveyors (RICS) Building Carbon Database is comprised of the following life cycle stages:

Table 2 - RICS life cycle stages

Product Stage			***Construction Process Stage***		***Use Stage***							***End of Life Stage***			
Raw material supply	Transport	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4

3.5.4. The embodied carbon associated with construction materials from Environmental Products Declarations (EPDs) are used to estimate embodied carbon at the construction stage.

3.5.5. The energy emissions associated with the operation of the site have been calculated for the first year of full operation taking account of national projections with regard to energy production etc.

3.5.6. Lifetime operational emissions for the site have been calculated based on an estimated operational lifetime of 60 years, which is a typical assumption for a development of this type and is in accordance with British Standard EN 15978:2011.

3.5.7. The 'net emissions' are the change in greenhouse gas emissions between the baseline and the proposed development, taking account of greenhouse gas reduction measures embedded within the design. As the benchmarks for the proposed development are zero, all emissions are included within the 'net emissions'.

3.5.8. For both the construction and operational phases when considering secondary mitigation and residual effects, the Institute of Environmental Management and Assessment (IEMA) recommends the use of the Greenhouse Gas Mitigation Hierarchy which provides a process for mitigating greenhouse gas emissions and has been adopted in relation to the proposed development:

Table 3 - The Greenhouse Gas Mitigation Hierarchy

Hierarchy	*Description*
Eliminate	Investigate and deploy options to eliminate greenhouse gas emissions
Reduce	Ensure that construction and operational activities will deliver efficient use of energy and resources
Substitute	Commit to deploying renewables and low-carbon materials, methods and technologies in place of more carbon-intensive sources
Compensate	Develop a strategy to compensate for residual or unavoidable emissions

3.6. Construction

3.6.1. The greenhouse gases associated with the construction phase of the proposed development relate to those embedded in the construction materials and those generated during the construction activities.

Embodied Carbon

3.6.2. Embodied carbon from the construction phase has been estimated based on the proposed development breakdown of development type and standard house type area. In order to do this, sample house types were assessed using the current assumed build specification which is to be utilised on this development.

3.6.3. Emissions from embodied carbon have been calculated using One Click LCA software, which utilises a library of EPDs to assign embodied carbon emissions to specific building materials. Where no specific manufacturer has yet been selected, generic data which closely resembles the building material has been used.

3.6.4. Further details on the assessments used for calculating embodied carbon emissions for this development can be found in the associated Whole Life Carbon Report (Appendix X.5)

Construction Site Activities

3.6.5. Emissions from construction activities (excluding transport during construction) are estimated based on an industry benchmark for average construction site greenhouse gas emissions from the project value.

3.7. Operation

3.7.1. Greenhouse gas emissions associated with the operational phase of the proposed development relate to emissions from energy use as well as repair, maintenance and refurbishment of the buildings during their operational lifetime.

Energy Use

3.7.2. Greenhouse gas emissions associated with the energy use of the proposed development have been estimated based on the illustrative site breakdown from the Energy and Sustainability Reports (Appendices X.3 and X.4). The energy calculations have been completed based on sample house types from the development.

3.7.3. The assessment of energy use considers the regulated energy consumption of the sample dwellings. Regulated energy consumption includes energy used for heating and cooling, lighting and on-site infrastructure.

Repair and Maintenance

3.7.4. Over the lifetime of the site there will be greenhouse gas emissions associated with the repair and maintenance of buildings. These emissions are effectively unregulated as there is no current policy or standard for establishing requirements or compliance. There is also no currently published data for good practice to allow for benchmarking.

3.7.5. The annual value for repair and maintenance has therefore been calculated utilising the embodied carbon of the construction, at 35% of its value split across the 60 year life cycle of the proposed development.

3.8. Significance Criteria

3.8.1. There are no impact magnitude descriptors for greenhouse gas emissions. The approach taken is to consider the calculated greenhouse gas emissions from the site in the context of regional greenhouse gas emissions as published within the UK Local Authority and Regional CO_2 Emissions by the BEIS for 2020.

3.8.2. The approach to classifying and defining likely significant effects relies on Institute for Environmental Management and Assessment (IEMA) guidance and applying judgement on the significance of the site's lifecycle greenhouse gas emissions, taking into account their context, compliance with policy and mitigation measures. IEMA updated their guidance in 2022.

3.8.3. The revised IEMA guidance defines five distinct levels of significance which are based on the degree to which a project's greenhouse gas emissions are consistent with science-based 1.5 degrees aligned emission trajectories towards net zero. For the UK, these trajectories are defined by carbon budgets as discussed in Section 2.2. These significance criteria are described in the Table 4:

Table 4 - Greenhouse Gas Significance Criteria

Significance of Effect	*Criteria*
Major Adverse	The project's greenhouse gas impacts are not mitigated or are only compliant with minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
Moderate Adverse	The project's greenhouse gas impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals. Falls short of fully contributing to the UK's trajectory towards net zero.
Minor Adverse	The project's greenhouse gas impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measure necessary to achieve the UK's trajectory towards net zero.
Negligible	The project's greenhouse gas impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides greenhouse gas performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
Beneficial	The project's net greenhouse gas impacts are below zero and it causes a reduction in atmospheric greenhouse gas concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

3.8.4. Establishing the significance of greenhouse gas emissions from a development requires judgements on the consistency with policy requirements and the degree to which the development seeks to mitigate these emissions.

3.8.5. The significance of a project's emissions should therefore be based on its net impact over its lifetime.

3.8.6. The IEMA guidance advises that:

- In the case of large-scale developments, irrespective of the level of mitigation, if the net greenhouse gas emissions exceed 5% of the UK or devolved administrations' carbon budget, that this is a level of change that is considered significant;
- Meeting the minimum standards set through existing policy or regulation cannot necessarily be taken as evidence of avoiding a significant adverse effect, and it is recommended therefore that the assessment also considers emerging policy / standards and the guidance of expert bodies such as the CCC on necessary policy developments, particularly for multi-phased projects with long timescales; and
- To aid decision making it is important to inform the decision maker about the relative severity of environmental effects such that they can be weighed in a planning balance. Therefore, it is essential to provide context for the magnitude of greenhouse gas emissions reported in the EIA in a way that aids the evaluation of these effects by the decision maker. IEMA advises that context can be provided through a comparison of the whole-life greenhouse gas emissions resulting from the development with national, local and sectoral totals, as well as carbon budgets.

3.9. Limitations and Assumptions

3.9.1. It is necessary to make a number of assumptions when carrying out the assessment. To account for some uncertainty in the approach, assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:

- Operational life of the proposed development.
- Operational energy use of the proposed development based on the benchmark figures and sample house type measurements.

3.9.2. In addition, several components contribute to the uncertainty of greenhouse gas emissions as a result of the assumptions above> these limitations include:

- The accuracy of future emissions. These are based on the best available data.

4. Baseline Emissions

4.1.1. The site is currently made up of redundant brownfield development along with agricultural land. Several tree belts are present within and surrounding the development site. Although there is likely to be minimal greenhouse gas emissions associated with on-site activities, a baseline of zero is considered to be appropriate for this assessment. The Greenhouse Gas Protocol recognizes that, whilst all relevant emissions sources should be accounted for so that a comprehensive and meaningful emissions inventory is compiled, lack of data or challenges in gathering certain data may in practice be a limiting factor. An assumption of zero emissions is considered worst case assumption and so appropriate for this assessment.

4.1.2. In the absence of the proposed development, it is anticipated that the future baseline would evolve as per current day and therefore, site emissions would continue to be negligible and so assumed as zero for the purpose of this assessment.

5. Proposed Development Emissions

5.1. Construction

5.1.1. As noted in Section 3, the greenhouse gas emissions associated with the proposed development consist of those embedded in the construction materials and processes, excluding construction transport.

Embodied Carbon

5.1.2. Assessments in this report are based on the residential build specification, owing to the higher proportion of the development site which is to be residential in nature. Due to the sizing and nature of the non-residential aspects of this development, it is considered that the build specification is likely to be very similar to the residential build specification. It can therefore be assumed that the embodied carbon results per square meter will be highly consistent across the development as a whole.

5.1.3. The calculation of greenhouse gases embedded in construction materials are shown in Table 5.

Table 5 - Embodied carbon of proposed development

Parameter	*Value (full application)*	*Value (hybrid application)*
Development Floor Area (m^2) (based on current site layout)	30,619.5m^2 of residential floor area 1002m^2 of non-residential floor area	88,864.7m^2 of residential floor area 2,752m^2 of non-residential floor area
Embodied Carbon Benchmarks ($kgCO_2e/m^2$) (One Click LCA assessments)	Current specification: 449 $kgCO_2e/m^2$	Current specification: 449 $kgCO_2e/m^2$
Total Estimated Embodied Carbon	**14.20 $ktCO_2e$**	**41.14 $ktCO_2e$**

Construction Activities

5.1.4. The calculation of the greenhouse gas emissions from construction activities from the proposed development is shown in Table 6:

Table 6 - Emissions associated with construction site activities

Parameter	*Value (full application)*	*Value (hybrid application)*
Construction Value	£100 million	£325 million
RICS Construction Emissions Factor	14,000 $kgCO_2e$/£1m	14,000 $kgCO_2e$/£1m
Estimated Construction Site Activity Emissions	**1.40 $ktCO_2e$ (0.47 $ktCO_2e$/yr)**	**4.55 $ktCO_2e$ (1.52 $ktCO_2e$/yr)**

Operation

5.1.5. As noted in Section3, greenhouse gas emissions associated with the operation of the site are those relating to energy use as well as repair and maintenance of the buildings during their operational lifetime.

5.1.6. Table 8 summarises the energy consumption of the proposed development for the first year of operation and the operational lifetime (60 years). The figures are based on the currently available site layout and breakdown as used in the Energy and Sustainability Reports (Appendices X.3 and X.4).

Table 7 - Predicted Operational Energy Consumption

	kWh/yr (first year)		*$ktCO_2e$/yr (first year)*		*$ktCO_2e$ (60 years)*	
	Full application	*Hybrid application*	*Full application*	*Hybrid application*	*Full application*	*Hybrid application*
Total	1,392,718.74	4,027,470.13	0.1279	0.3707	1.41	4.10

Repair and Maintenance

5.1.7. Greenhouse gas emissions relating to the repair, maintenance and refurbishment of the proposed development over its lifetime have been estimated based on the embodied construction carbon emissions as 35% of the values presented in Table 5.

Table 8 - Predicted Greenhouse Gas Emissions for Repair and Maintenance

Parameter	*Value (full application)*	*Value (hybrid application)*
Development Floor Area (m^2) (based on current site layout)	30,619.5m^2 of residential floor area 1002m^2 of non-residential floor area	88,864.7m^2 of residential floor area 2,752m^2 of non-residential floor area
Greenhouse Gas Emissions for Repair and Maintenance ($kgCO_2e/m^2$)	Current specification: 157.15 $kgCO_2e/m^2$	Current specification: 157.15 $kgCO_2e/m^2$
Total Greenhouse Gas Emissions for Repair and Maintenance	**4.97 $ktCO_2e$**	**14.40 $ktCO_2e$**

Total Greenhouse Gas Emissions

5.1.8. Estimated greenhouse gas emissions for the proposed development are shown in Table 9 (for both the first year of operation and for the lifetime of the development). The proposed development will result in a net increase in greenhouse gas emissions during its first year of operation.

5.1.9. The greenhouse gas emissions from embedded materials used in construction and emissions from construction activities have been annualised against a construction period of 1 year to allow for comparison with operational emissions.

Table 9 - Total Greenhouse Gas Emissions for the First Year of Operation and Operational Lifetime

Phase	Emissions Type	Baseline	tCO_2e/yr First Year Development (full application)	First Year Development (hybrid application)	$kt\ CO_2e$ Lifetime (full application)	Lifetime (hybrid application)
Construction	Embodied Carbon	0	4,733	13,713		
	Construction Activities	0	0.47	1.52		
Operational	Energy Use	0	127.90	370.70	1.41	4.10
	Repair and Maintenance	0	82.83	240	4.97	14.40
Total		**0**	**4,944.20**	**14,325.22**	**6.38**	**18.50**

5.1.10. For the full application, the table above shows a net increase in emissions for the first year of operation, including an annualised construction phase, of +4,944.20 tCO_2e. Total lifetime operational emissions will be a net +6.38 $ktCO_2e$.

5.1.11. For the hybrid application, the table above shows a net increase in emissions for the first year of operation, including an annualised construction phase, of +14,325.22 tCO_2e. Total lifetime operational emissions will be a net +18.50 $ktCO_2e$.

6. Mitigation

6.1. Construction

6.1.1. A Construction Environmental Management Plan is recommended for the construction phase to ensure that all construction works associated with the development will minimise or mitigate any construction effects on the environment within the context of compliance with local legislation.

6.1.2. A Travel Plan Framework and subsequent occupier-specific Travel Plans will incorporate measures to reduce reliance on private vehicles and promote active transport modes. By doing so, this will increase physical activity for workers on the site and reduce private vehicle movements that will reduce emissions.

6.2. Operation

6.2.1. In line with existing and emerging climate policy and regulation, the design process will continue to identify opportunities to explore measures to minimise the impact of the proposed development's carbon emissions, including the preference for the materials with lower embodied carbon. Action to achieve carbon reductions is best taken during the design stage to utilise building design and fabric efficiency to reduce energy demand whilst implementing renewable technologies to meet a proportion of that demand with renewably generated energy.

6.2.2. An outline specification with enhanced fabric efficiency and the use of renewable technologies has been put forward in the Energy and Sustainability Reports for the proposed development (Appendices X.3 and X.4). The report includes an assessment of available low or zero carbon technologies and puts forward a suggested specification to allow the development to achieve compliance with both local and national standards and requirements. Utilising these recommendations will allow the proposed development to minimise its impact on climate change through the reduction in reliance of fossil fuels for space heating and hot water, whilst meeting the needs of the operational phase of the development.

7. Residual Effects

7.1.1. At this outline planning stage it is difficult to ascertain all potential residual effects owing to the expected evolution of the detailed design which will impact energy reduction, efficiency and low or zero carbon technologies choices.

7.1.2. The applicant will consider the use of low or zero carbon technologies at detailed design stage.

Construction

7.1.3. There are no expected residual effects from the construction phase that will have a significant impact based on the proposed development.

Operation

7.1.4. There are no expected residual effects from the operational phase that will have a significant impact based on the proposed development.

8. Summary and Conclusions

8.1.1. The proposed development has considered greenhouse gas emissions across both the construction and operational phases and the potential impacts these will have on local and national carbon budgets. The greenhouse gas emissions have been assessed against relevant policy, guidance and technical evidence relevant to the proposed development.

8.1.2. The project greenhouse gas assessment outcomes show that the greenhouse gas emissions associated with the proposed development will have a negligible impact.