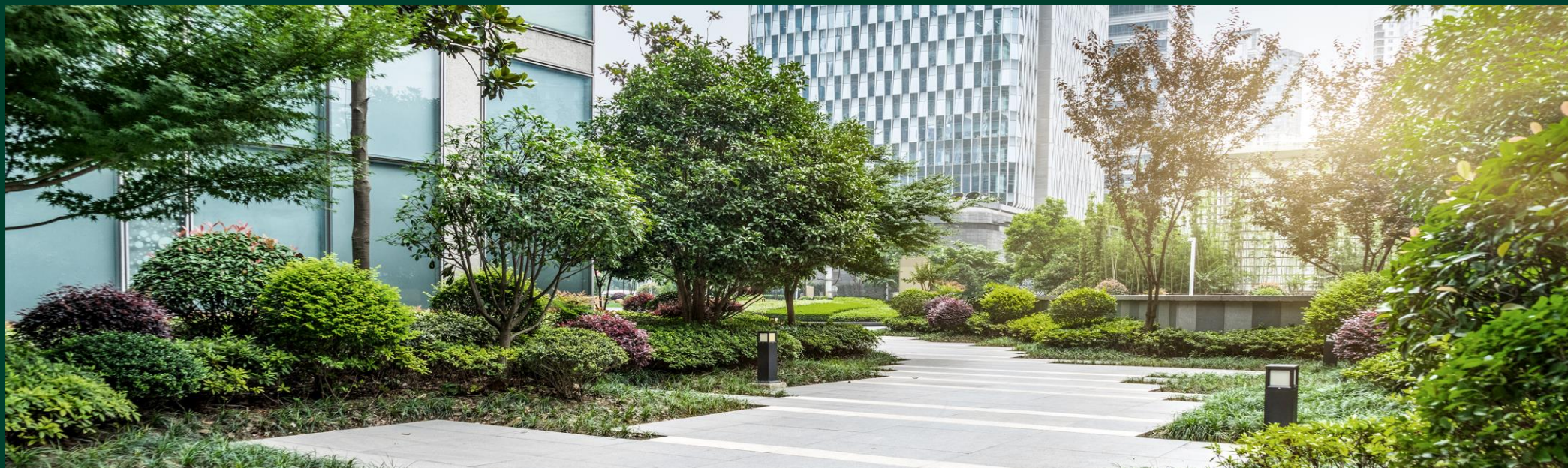


Sustainability Statement

Deal Ground, Bracondale, Norwich

Reserved matters application proposal for
Serruys Property Company Limited

June, 2023



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Introduction

This Sustainability Statement accompanies a reserved matters planning application submitted to Norwich City Council and South Norfolk Council by Serruys Property Ltd (the ‘Applicant’). The proposed development will accommodate 670 residential dwellings alongside shared communal facilities and associated works including new access roads, car parking, flood risk management measures landscaping and biodiversity enhancements at the former disused brownfield site at Deal Ground, Norwich, herein referred to as the “Site”).

The ESG Consultancy Team of CBRE Limited were commissioned to drive the sustainability ambition of the project, set the sustainability performance targets and inform design development for the proposed scheme design against relevant planning policies, technical guidance and legislation.

This report contextualises the scheme against relevant national, regional and local policies and provides the narrative to the sustainable design features that respond to these policy drivers, confirming planning policy compliance.

The Applicant is aware of its responsibility to all matters pertaining to good Environmental, Social and Governance (ESG) and pledges to drive design for performance to honour stakeholder responsibility, whilst creating significant long-term value.

The sustainable design features cover the following sustainability themes:



The applicant

Serruys Property Ltd (the 'Applicant') are seeking reserved matters planning permission for a mixed development consisting of a maximum of 670 dwellings. The Applicant has appointed the ESG Consultancy Team of CBRE Limited (CBRE) to embed sustainability within the design proposal and ensure a future proofed, climate resilient development through the integration of features that demonstrate good practice in relation to energy and carbon, resource use, climate resilience, transportation, biodiversity, community engagement and, where relevant, alignment with environmental certification. This is alongside appointments of complementary CBRE teams, namely supporting the Environmental Impact Assessment (EIA) workstreams.

Site description

The site is located in East Norwich, on the edge of Trowse Newton, bordering to Norfolk Broads. It straddles three local Authorities; Norwich City Council, South Norfolk Council and the Broads Authority. The site lies within a mile of the City Centre and is 1km from Norwich Railway Station. Whittingham Country Park, which is located to the east and north east of the site, offers a range of activities, including sailing, windsurfing, kayaking, rafting and canoeing. Cycles routes are currently available along the A1054 and the A1242 as well as along Bracondale into the centre of Trowse.

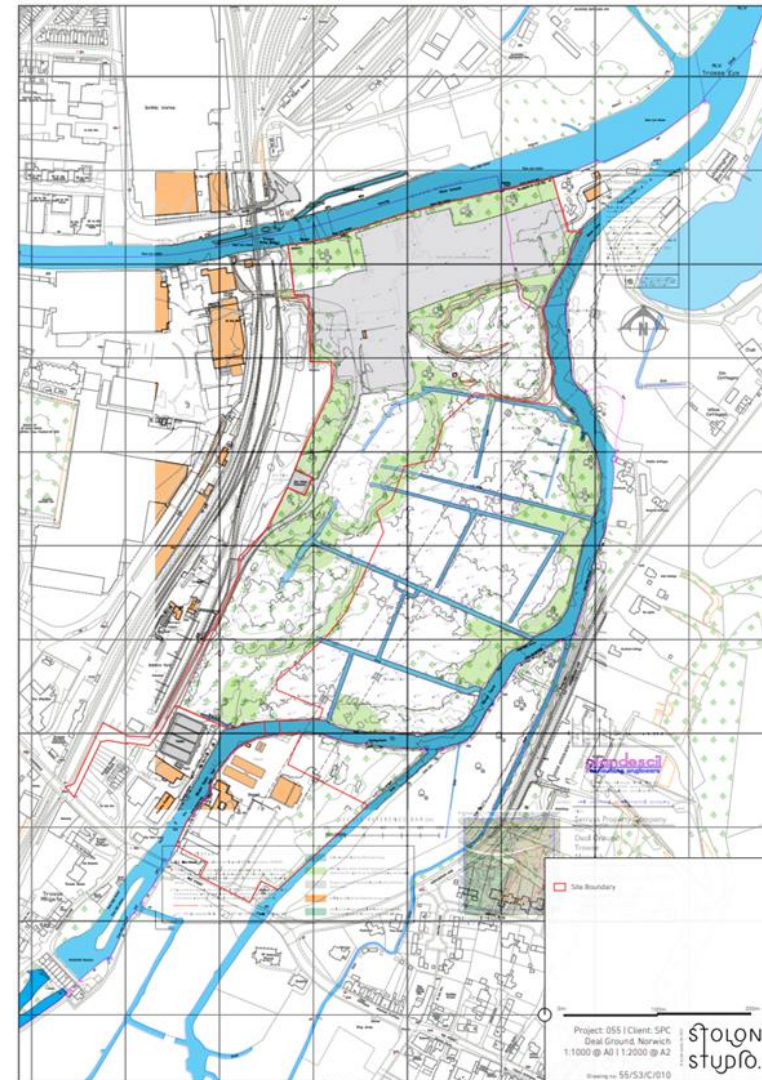


Figure 1: Application Boundary shown in red

Proposed development

The proposal seeks the approval of the reserved matters for application ref: 12/00875/O and 2011/0152/O in relation to scale, layout, appearance and landscaping pursuant to outline planning application (full details of access) for a mixed development consisting of a maximum of 670 dwellings; a local centre comprising commercial uses (A1/A2/A3): a restaurant/dining quarter and public house (A3/A4); demolition of buildings on the May Gurney site (excluding the former public house); an access bridge over the River Yare; new access road; car parking; flood risk management measures; landscape measures inc earthworks to form new swales and other biodiversity enhancements including the re-use of the Grade II Listed brick Kiln for use by bats.



Figure 2: Illustrative masterplan

Supporting documentation

To support this assessment, the following documents have been reviewed, which accompany the planning application.

- Energy Report – (CBRE UK ESGC, June 2023)
- Air Quality Impact Assessment – L&P Engineering (Triptych PD, May 2023)
- Flood Risk Assessment and Drainage Strategy Report – (JBA Consulting, June 2023)
- Design and Access Statement –Stolon (2023)
- Desk Study and Risk Assessment – Norfolk Partnership Laboratory (April 2023)
- Environmental Noise Assessment – Adrian James Acoustics (May 2023)
- Transport Statement – Odyssey (Transport Assessment Addendum, May 2023)
- Highways Technical Note – Odyssey (Highways Technical Note, May 2023)
- Baseline Ecological Appraisal – Aspect Ecology (May 2023)–
- Environmental Management Plan – (Aspect Ecology, May 2023)
- Nature Conservation Management Plan - (Aspect Ecology, May 2023)
- Statement of Community Involvement – GNL Strategic (June 2023)

Planning policy, legislation & technical guidance

Relevant planning policies

This section summarises the key legislative requirements, and the current and emerging planning policy requirements of Norwich. It provides the legislative and regulatory planning context against which this Sustainability Statement appraises the proposed development.

National Policy

HM Government National Planning Policy Framework (NPPF), 2021 (Ministry of Housing, Communities and Local Government, July 2021)

In respect to sustainability, the document retains its focus for the role that the planning system has to play in meeting the challenges presented by climate change. As stated in Paragraph 152:

“The planning system should support the transition to a low carbon future in a changing climate...It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.”

At Paragraph 154 it continues to state:

“New development should be planned for in ways that:

- *avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be*

taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and,

- *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.”*

Regional Policy

Joint Core Strategy (JCS) for Broadland, Norwich and South Norfolk, (Greater Norwich Development Partnership, 2017)

This Joint Core Strategy (JCS), prepared by the three councils of Broadland, Norwich and South Norfolk, working together with Norfolk County Council as the Greater Norwich Development Partnership (GNDP), sets out the long-term vision and objectives for the area, including strategic policies for steering and shaping development.

The strategy sets out the policies addressing climate change and promoting sustainability with the aim to:

- locate development in places that will minimise adverse impact on the environment, and ensure it is designed to be energy efficient and capable of being adapted as circumstances change; and
- use energy and water wisely and secure more energy from renewable sources

Policy 3: Energy and water sets the below targets with regards to energy efficiency:

- aim to minimise reliance on non-renewable high-carbon energy sources and maximise the use of decentralised and renewable or low-carbon energy sources and sustainable construction technologies, providing at least 10% of the scheme's expected energy requirements.

The full list of GNDP JCS policies against which the development has been analysed can be found in Appendix A.

Greater Norwich Local Plan (GNLP) (Broadland District Council, Norwich City Council and South Norfolk Council and Norfolk County Council, 2021)

The Broadland District Council, Norfolk County Council and South Norfolk District Council are currently preparing the Greater Norwich Local Plan (GNLP). The GNLP will build on the long-established joint working arrangements for Greater Norwich which have delivered the current Joint Core Strategy (JCS) for the area. The JCS plans for the housing and job needs of the area to 2026 and the GNLP will ensure that these needs continue to be met to 2036.

The GNLP will include strategic planning policies and will also allocate individual sites for development. It will aim to ensure that new homes and jobs are delivered and the environment is protected and enhanced, promoting sustainability and the effective functioning of the area.

The GNLP promotes housing choice and supports economic activity within the rural parishes that surround market towns and key service centres. It also aims to provide a greater degree of opportunity for smaller builders to develop with their local supply chains and bespoke designs.

The full list of GNLP policies against which the development has been analysed can be found in Appendix A.

South Norfolk Development Management Policies Document, South Norfolk Council (2015)

The South Norfolk Development document forms part of a set of documents that together constitute a Local Plan for the future development of the area. The

document is a culmination of 2 years of discussions and consultation with key stakeholders in the development management process.

This document contributes to the Council's determination of planning application and influences the type and quality of future homes and other new development that is approved by the council, helping to conserve heritage assets, biodiversity, geodiversity and countryside for future generations to enjoy.

A number of key policies relate to sustainable development in the region, namely Policy DM 1.1 – Ensuring Development Management contributes to achieving sustainable development in South Norfolk, DM 1.3 – The sustainable location of new development, DM 1.4 – Environmental quality and local distinctiveness, DM 3.8 – Design Principles applying to all development, DM 3.10 – Promotion of Sustainable Transport, DM 3.13 Amenity, noise and quality of life, DM 3.14 – Pollution, health and Safety, DM 4.1 – Renewable Energy, DM 4.2 – Sustainable drainage and water management, DM 4.3 – Facilities for the collection of recycling and waste, DM 4.8 – protection of trees and hedgerows

A full list of relevant South Norfolk Development Management Policies are included in Appendix A.

Local Policy

Norwich Local Plan: Development Management Policies Plan, (Norwich City Council, 2014)

The Norwich Local Plan: Development Management Policies provides detailed planning policies to help deliver the JCS strategic policies, objectives and priorities.

In particular, the DM policies plan includes a range of policies, primarily in Policies DM1- Achieving and delivering sustainable development, DM3 – Design principles and DM4 – Renewable energy, that respectfully deal with matters relating to sustainable design and construction, energy efficiency and greenhouse gas reduction. Policy DM2- Amenity relates to future occupiers health and wellbeing with particular regard given to high standard of amenity for satisfactory living and working conditions. Future proofing the proposed development against rising

temperatures and tackling the risk of overheating falls within this policy requirements.

The full list of DM policies against which the development has been analysed can be found in Appendix A.

Environmental Strategy 2020-2025 (Norwich City Council, 2020)

This document is the fourth environmental strategy that the city council has produced and details the council's environmental vision and priorities until 2025. The new strategy commits to working in partnership to make a real difference to how Norwich responds to climate change. The strategy includes 10 strategic priorities in order to be recognised as one of the best councils in the country for addressing the issue of climate change.

The full list of Environmental Strategy priorities against which the development has been analysed can be found in Appendix A.

Relevant legislation

HM Government Climate Change Act (2008), Chapter 27, with 2022 amendments (HM Government)

The Act sets out emission reduction targets that the UK must comply with legally. It represents the first global legally binding climate change mitigation target set by a country and, following a 2022 revision, requires the UK to bring all greenhouse gas emissions to at least [100%] lower than the 1990 baseline.

The “1990 baseline” means the aggregate amount of-

- Net UK emissions of carbon dioxide for that year, and
- Net UK emissions of each of the other targeted greenhouse gases of the year that is the base year for that gas.

HM Government Building Regulations Approved Document G: Sanitation, hot water safety and water efficiency, 2015 edition with 2016 amendments, 2016 (HM Government, 2016)

Approved Document G provides guidance on the supply of water to a property, including water safety, hot water supply, sanitation and water efficiency i.e. an easily accessible water supply that doesn't incur wastage.

Guidance given is focused on the supply of sanitary, drinkable water to buildings, including cold drinking water, hot water supplied to bathroom appliances including baths, showers and sinks next to toilets (or in an adjoining room) and to food prep areas in kitchens, and any water needed for the purposes of washing. Hot water systems also require extra safety precautions when they're unvented.

HM Government Building Regulations Approved Document: L2A Conservation of fuel and power in new buildings other than dwellings, 2021 edition (HM Government, 2021)

Approved Document Part L (2021, England edition) is the Building Regulation relating to the conservation of fuel and power in buildings. The Approved Document is separated into two sections: Part L1 and Part L2. Part L1 relates to new dwellings and Part L2 relates to buildings other than dwellings. Part L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO₂ emissions from new buildings. Part L has five key criteria which must be satisfied when demonstrating compliance, as follows:

To gain compliance, only Criterion 1 and parts of Criterion 4 (which states that Building Emissions Rate remains consistent from design through to construction) are regulation and therefore mandatory. The approaches to meet the other criteria are 'reasonable provision' and alternative proposals are permissible. This should be checked with the Building Control Body (BCB) to confirm that they meet the energy efficiency requirements.

The Amendment Regulations and accompanying Approved Documents L: 2A have come into force on 15 June 2022. Part L 2021 proposes an interim reduction in carbon emissions, paving the way for greater reductions and supporting wider adoption of

heat pumps in 2025. This is backed up from the recent ‘Mission Zero’ Chris Skidmore Net Zero review (MP, 2022) detailing the importance of regulation to enable rapid and safe introduction of emerging net zero technologies.

All spaces at the Proposed Development will therefore be assessed in accordance with the Building Regulations Part L2A, 2021 edition.

HM Government Building Regulations Approve Document M – Access to and use of buildings: Volume 2 – M1 buildings other than dwellings, 2015 edition incorporating 2020 amendments, 2020 (HM Government, 2020)

Approved Document M provides information about the ease of access to, and use of, buildings, including facilities for disabled visitors or occupants, and the ability to move through a building easily including to toilets and bathrooms.

Guidance on the use of ramps and steps is covered to provide ease of access, with information including safe degrees of pitch and dimensions when building a wheelchair accessible facility. The construction of accessible stairs and corridors is also addressed, including the safe height of stairs and the accessible width of both corridors and stairs.

United Nations Sustainable Development Goals

In September 2015 the United Nation Member States adopted the Sustainable Development Goals (SDGs) (United Nations, n.d.) to provide a framework to secure peace and prosperity for people and the planet. Achieving these goals requires a collaborative effort between government, the private sector and society. There are a total of 17 goals and 69 supporting targets that address global societal ambitions such as ‘no poverty’, ‘quality education’, ‘clean water and sanitation’, and ‘climate action’, to built environment considerations such as ‘affordable and clean energy’, ‘industry, innovation and infrastructure’, ‘sustainable cities and communities’ and ‘responsible consumption and production’. The 17 SDGs is presented in Figure 3.

Construction and real estate sectors are uniquely positioned to make meaningful contributions towards many of the targets. As such, development projects must consider not just localised impacts, but the wider global goals affected by

development life cycles; from material extraction, transport and manufacturing, to end of life deconstruction and re-use. In addition to environmental SDGs, there are a number of social and governance goals where development projects can drive positive change through use of the asset, supply chain initiatives and community engagement.

The infographic in **Error! Reference source not found.** which follows similar principles led by the World Green Building Council (World Green Building Council, n.d.), illustrates the specific SDGs that are most positively impacted by sustainable buildings. The increasing movement of businesses and organisations, including investors and developers, to invest in sustainable design and the delivery of positive social impact generates opportunities for education and jobs creation targeted at disadvantaged young people and the long term unemployed, improved health and wellbeing, affordable housing, circular economy models, and climate mitigation.

The project specific sustainability strategy, and this Sustainability Statement, are guided by the SDGs to help create a local and global community which is healthier, more equitable, and more sustainable.



Figure 3: United Nations Sustainable Development Goals

Figure 4: How green buildings can support the UN Sustainable Development Goals



Sustainability Strategy

Environmental Themes

To ensure the development delivers holistic environmental performance CBRE have prepared a Sustainability Strategy for the development considering key themes and subsequent Key Performance Indicators to ensure effective delivery of sustainability objectives and compliance against national, regional and local planning policy. This strategy will form part of the project brief to be referred to by the project team through design and construction phases of the scheme.

Key thematic areas of the strategy are summarised below:

Energy & Carbon

The development will minimise operational carbon impacts through passive design measures, efficient building services and generation of on-site electricity via photovoltaic panels. Construction carbon will be minimised through careful selection of materials and development of a procurement strategy with the appointed contractor to encourage low impact products and construction practices alongside durability measures to minimise ongoing maintenance, repair and replacement cycles over the developments lifecycle.

Resources

Careful management of natural resources will be considered throughout the building life cycle by applying the principles of the circular economy hierarchy; specifying and procuring materials with high recycled content and low embodied carbon; designing for flexibility, adaptability and durability to reduce material use in operation; and designing for deconstruction to maximise recovery and reusability at the end of the asset's useful life.

Climate Resilience

The scheme will incorporate design measures to mitigate risks of current and future climate change, specifically in relation to localised flood risk and drainage, overheating, extended periods of drought and material environmental degradation. A climate adaptation risk appraisal will form part of the spatial coordination and detailed design phase of the design to identify these hazards and levels of risk for appropriate mitigation to be identified. Mitigation will link with the development of landscaping proposals and of biodiversity net gain and ecological enhancement measures

Healthy Spaces

User health and wellbeing will be a key focus of the design, balancing thermal comfort, indoor air quality, acoustics and availability of natural light. Focusing on health and wellbeing not only improves the user experience and satisfaction but can contribute to thriving communities with long-stay residents creating a sense of place and identity. Accessibility around the site will be prioritised with appropriate facilities including cycle storage facilities, footpaths and electric vehicle charging points provided to encourage sustainable travel and reduce transportation emissions as a result of the development.

Climate Resilience

The scheme will incorporate design measures to mitigate risks of current and future climate change, specifically in relation to localised flood risk and drainage, overheating, extended periods of drought and material environmental degradation. A climate adaptation risk appraisal will form part of the spatial coordination and detailed design phase of the design to identify these hazards and levels of risk for appropriate mitigation to be identified.

Certification & Verification

The development will look to ensure resilience to emerging Minimum Energy Efficiency Standards by designing to be low energy use in operation and achieving 2030 compliant EPC ratings. Where appropriate measures which align to the residential environmental certification standard, Home Quality Mark, will be incorporated alongside Contractual obligations to deliver against the Considerate Constructors Scheme certification standard.

Sustainability KPIs

Following the identification of key environmental themes, the project team have identified a number of key sustainability Key Performance Indicators (KPIs) which respond to local policy, emerging market expectations and the client's project brief to demonstrate sustainable design and construction practices. These are summarised in the table overleaf to demonstrate sustainable design and construction practices. These are summarised in the table overleaf:

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KPI	Theme	Target	Local Policy alignment
Embodied Carbon	Energy and Carbon	500kgCO2e/m2	Norwich Local Plan Policy DM1, DM3, South Norfolk and Broadland Core Policy 2 , South Norfolk Development Management Policy DM1.3
Whole life Carbon	Energy and Carbon	800kgCO2e/m2	
Whole life Carbon	Energy and Carbon	Report WLC to the Built Environment Carbon Database	
Operational Carbon	Energy and Carbon	50% improvement over Part L 2021	Norwich Local Plan Policy DM1, DM3, DM4, South Norfolk and Broadland Core Policy 1,2,3, South Norfolk Development Management Policy DM1.3, DM1.4, DM3.8, DM 4.
Operational Carbon	Energy and Carbon	≥10% improvement over Part L 2021 via renewables (PV & ASHP)	
Operational Carbon	Energy and Carbon	60kWh eleq/m2 (GIA) - Energy Use Intensity	
Circular Economy	Resources	Circular Economy narrative detailing measures to minimise resource use	Norwich Local Plan Policy DM1, DM3, South Norfolk and Broadland Core Policy 1,2, 3 South Norfolk Development Management Policy DM1.4, DM3.8 , DM 4.2 , DM 4.3
Material reusability	Resources	Minimum 20% recycled content of at least 5 major building elements	
Water consumption	Resources	105 l/p/d internal water consumption	
Responsible Sourcing	Resources	100% timber certified under FSC /PEFC	
Responsible Sourcing	Resources	Environmental Product Declarations (EPD) for major building elements	
Construction waste	Resources	8.5 tonnes of construction waste per 100m2	
Diversion from landfill	Resources	80% construction waste and 90% demolition (both tonnage) will be diverted from landfill	
Climate risk appraisal	Climate resilience	Undertake a climate adaptation risk appraisal of the development, identifying future risks and demonstrating how the proposals mitigate these risks	Norwich Local Plan Policy DM1, DM3, South Norfolk and Broadland Core Policy 1
Flood risk / drainage	Climate resilience	Undertake a FRA and confirm drainage strategy (with SuDS) to ensure resilience to future flooding	Norwich Local Plan Policy DM1, DM3, DM5, South Norfolk and Broadland Core Policy 1, South Norfolk Development Management Policy DM 4.2
Biodiversity Net Gain	Climate resilience	Develop a design that delivers a BNG of ≥10% as calculated by a suitably qualified ecologist	Norwich Local Plan Policy DM1, DM6, DM7, South Norfolk and Broadland Core Policy 1,

Ecological Enhancement	Climate resilience	Appoint a suitably qualified ecologist to recommend species to enhance on site ecology	South Norfolk Development Management Policy DM3.8, DM 3.13 , DM 4.8
EV Charging	Healthy Spaces	Prioritise EV charging to encourage non-ICE vehicles and minimising air quality impacts. 10% of spaces to be EVCP	Norwich Local Plan Policy DM1, DM6, DM7, South Norfolk and Broadland Core Policy 1
Active Commuter Facilities	Healthy Spaces	Provide cycle storage spaces for residents in line with HQM - - 1 cycle every 2 studio / 1 bed flat - 1 cycle every 2-3 bed home / flat - 2 cycles every 4+ bed home/ flat	Norwich Local Plan Policy DM1, DM11, DM28, DM32, South Norfolk and Broadland Core Policy 2, South Norfolk Development Management Policy, DM 3.13 DM 3.14, DM 3.10
Thermal comfort	Healthy Spaces	Part O compliance	Norwich Local Plan Policy DM1, South Norfolk and Broadland Core Policy 2
Natural daylight	Healthy Spaces	2% ADF in kitchens, 1.5% in studios, living rooms and dining rooms	Norwich Local Plan Policy DM1, DM3
EPC	Certification	Minimum EPC B rating	Norwich Local Plan Policy DM1, DM3,DM4, South Norfolk and Broadland Core Policy 2
CCS	Certification	Minimum 39 score for principal contractor	Norwich Local Plan Policy DM1, DM3, South Norfolk and Broadland Core Policy 2

Table 1: Deal Ground Sustainability KPIs

The next sections of this Sustainability Statement highlight specific features incorporated within the design and how this addresses Norwich and Norfolk and South Broadland planning policy.

Energy and carbon

Background

In June 2019, the UK Government announced its commitment to eradicate its net contribution to climate change by 2050, and became the first major economy to set a net zero emissions target into law

The Climate Change Act 2008 (HM Government) was subsequently amended with legally binding greenhouse gas emission reduction targets to reduce UK emissions by at least 100% of 1990 levels by 2050 (with interim targets of 37% by 2020, 51% by 2025 and 78% by 2035) and has positioned the UK on a transition pathway to a low-carbon economy.

All regions in the UK must face up to the reality of climate change and the need to limit their future contribution to this major global challenge. The effects of the climate emergency are already being felt across the UK both in cities and rural areas. Developments urgently need to build resilience into its proposal and adapt to these changes, whilst also mitigating its own contribution to carbon emissions.

Norwich City Council and North Norfolk City Council declared a Climate and Ecological Emergency in January and July 2019 respectively and set a 2030 operational net zero target.

To support these ambitions and requirements the proposed development has a target to be developed and operated to Net Zero Carbon (NZC) standards.

Operational Carbon

An Energy Strategy has been developed for the proposed development in accordance with national, local and regional policy. The Energy Report (CBRE UK ESGC, June 2023) produced by CBRE has been designed to meet the requirements of the Greater Norwich Development Partnership (GNDP) and Norwich policies.

The energy use carbon targets for the project accord with the energy hierarchy principles, to minimise regulated energy demands on site. This hierarchical approach comprises four key principles for reducing regulated energy demand:

1. 'Reduce Energy Demand': Considers passive design measures to reduce energy demand;
2. 'Use energy efficiently' explores how system efficiencies maximise the use of energy;
3. 'Renewable energy' identifies additional energy production opportunities through installation of low and zero carbon technologies.

Reduce energy demand

The (GNDP) Joint Core Strategy (JCS) (Greater Norwich Development Partnership, 2017) promotes considered energy and water use. In response, the proposed development has followed a fabric first approach and is designed with enhanced thermal envelope performance and envelope airtightness to reduce regulated energy demands.

Furthermore, consideration has been given to ensuring that buildings are orientated such that heat losses, solar gains and daylighting are balanced, with compact building forms applied to reduce heat losses.

For full details of the energy efficiency measures proposed for the project, please refer to the CBRE Energy Statement (CBRE UK ESGC, June 2023) submitted as part of the planning application.

Use Energy Efficiently

After reducing energy demand, the next step is to use energy efficient building services systems, low energy lighting and energy saving controls to reduce fuel consumption.

An all-electric, fossil fuel free heating strategy, using heat pumps, is proposed for the development to take advantage of the ongoing grid decarbonisation, thus allowing the development to become net zero carbon in due course. Individual Air Source Heat Pumps (ASHPs) are proposed for the houses to provide both space heating and domestic hot water. A communal energy centre with ASHPs is proposed for each apartment block to provide low carbon heat. In addition, where possible, the ASHPs will utilise refrigerants with a low Global Warming Potential (GWP – such as CO₂) to limit the impact of system leakages over the lifetime of the proposed development.

Additionally, a natural ventilation strategy will be applied to ensure indoor air quality, with relevant building services insulated to a high standard to reduce heat losses. Low energy LED lighting will be used throughout.

Renewable Energy

Installation of Photovoltaic panels, mainly on flat roofs and pitched roof areas facing due south, is proposed for all the houses and apartment blocks. Where possible, the PV installation will be maximised, with consideration given to restrictions; including allowances for safe roof access and avoidance of shading.

The CBRE energy statement (CBRE UK ESGC, June 2023) estimates that the combined PV array will comprise an area of 4,456m², with a total output of 917kWp.

Carbon Dioxide Savings

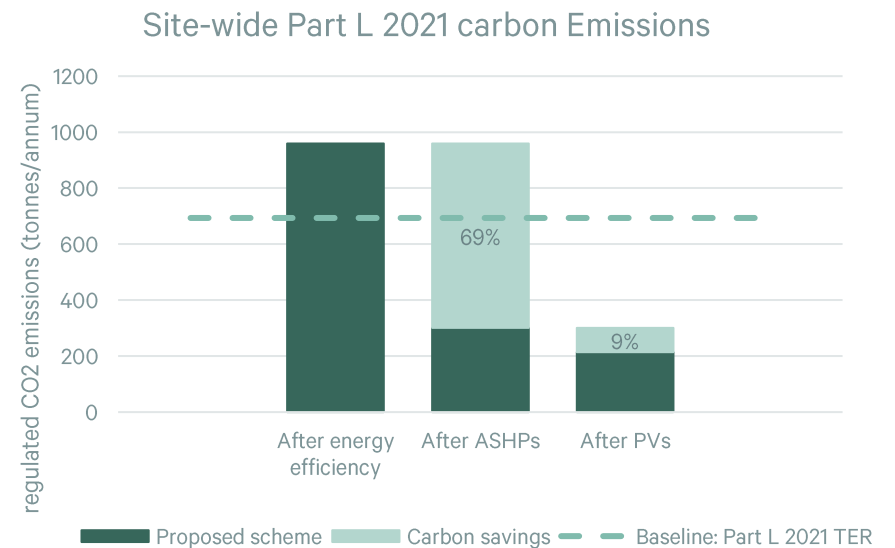
Table 2 demonstrates the overall reduction in regulated carbon emissions estimated for the proposed development. An overall reduction of 70% over the Part L 2021 target emission rate could be achieved by integrating the recommended energy efficiency measures and renewable energy technologies to the proposed design.

Table 2: Regulated carbon dioxide emissions (site-wide)

	Carbon emissions rate	
	tnCO ₂ per annum	% Reduction from baseline
Baseline: Part L 2021 of the Building Regulations Compliant Development	693.5	-
Proposed scheme: After energy demand reduction & renewable energy	214.4	69%

The following figure shows the percentage reduction achieved as a result of the Low and Zero Carbon technologies proposed for on-site generation of renewable energy.

Figure 5: Carbon dioxide savings from LZC technologies



Embodied carbon

The Applicant is committed to delivering a development that is sustainable over its lifetime. To address this, the project team have considered appropriate Whole Life Carbon benchmarks for residential developments and reviewed low impact design measures to be developed further as part of the spatial coordination and detailed design phases. Below outlines the purpose of a Life Cycle Assessment and initial considerations of the scheme to Whole Life Carbon.

BS EN 15978:2011 (‘Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method’) is the recognised European standard for embodied carbon assessments in the built environment. *Figure 7* shows the different lifecycle modules included in the standards framework as well as the differences between embodied carbon and WLC. Embodied carbon emissions from construction and materials for all applicable life cycle module stages A-C, otherwise known as a cradle-to-grave study, are required. These lifecycle modules include embodied emissions from raw extraction of materials, their processing in a factory or equivalent, transport and construction on site, any replacements assumed over the study period, and finally, end of life processes.

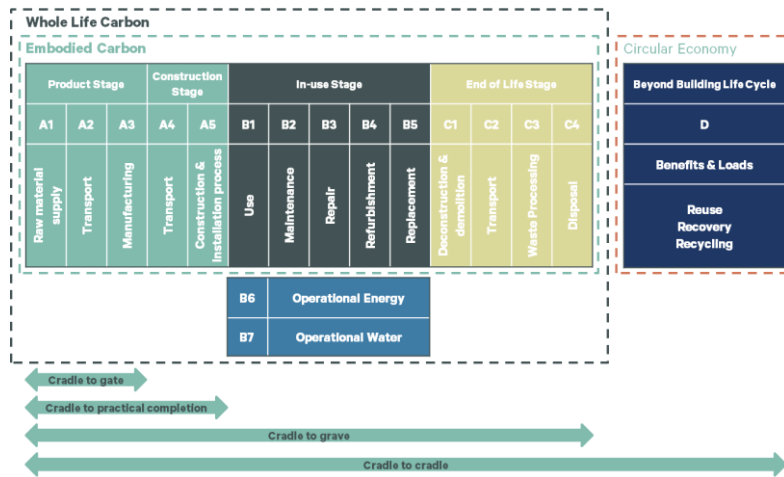


Figure 6: WLC and life cycle modules diagram, as per EN 15978:2011

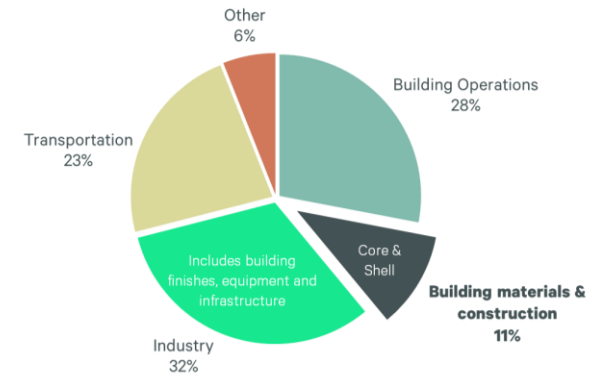
Purpose of Life Cycle Assessments

Carbon emissions relating to buildings currently contribute approximately 40% of all global CO₂ emissions, with 11% of carbon emissions related to the buildings materials.

‘Embodied’ carbon refers to the carbon emissions associated with the materials within a building and includes the emissions from:

- Raw extraction, processing and manufacturing of materials and products;
- Transport of materials to the construction site;
- Installation and construction on site, in-use emissions including those from replacements over the building’s lifespan, and refrigerant use during operation; and,
- Emissions relating to how materials are treated and/or disposed at the end of life.

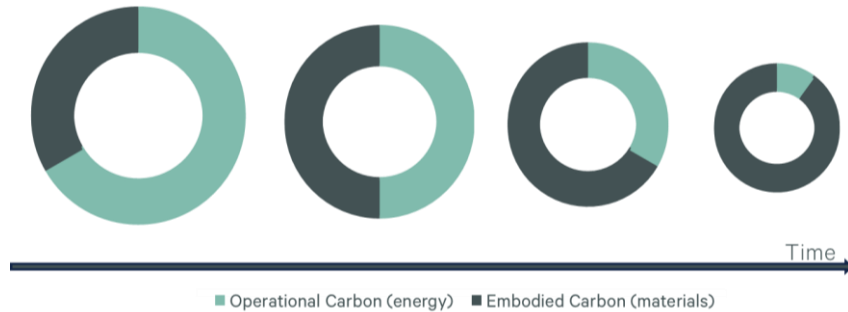
Figure 7: Global CO₂ emissions by sector



As operational-related energy demands and associated emissions reduce, due to, amongst other factors, the tightening of Building Regulations (including Part L regulations) and the electrification of space heating and DHW, and the decarbonisation of the national grid, the proportion of embodied carbon emissions relating to materials and the construction of buildings will increase, resulting in an

increased industry and regulatory focus to reduce embodied carbon emissions and mitigate climate change.

Figure 8: Illustrative embodied carbon vs operational carbon comparison



Undertaking LCA's offer many benefits including:

- Ensuring a significant source of emissions from the built environment are accounted for through reporting;
- Identifying significantly contributing building elements and materials to establish holistic reduction strategies;
- Encouraging local sourcing of materials and short supply chains;
- Encouraging the integration of circular economy principles;
- Encouraging durable construction methods and improving lifetime resource efficiency; and,
- Identifying and promoting material transparency whilst encouraging improved material certification.

The Low Energy Transformation Initiative (LETI), in collaboration with RIBA have developed a set of upfront embodied carbon and embodied carbon across lifecycle benchmarks which are increasingly used to establish appropriate carbon targets for new build developments across different asset classes. Figure 9 below details LETI residential embodied carbon benchmarks, noting this is in reference to >6 storey buildings. A band C target has been agreed with the project team for the residential

areas, which is 500 kgCO₂e/m² for upfront carbon at practical completion, and 800kgCO₂e/m² total cradle to grave embodied carbon .

Commercial areas within the proposed development (i.e. shops and restaurants) have used the equivalent Band C LETI / RIBA retail benchmark, which is currently 550 kgCO₂e/m² for upfront carbon at practical completion, and 690 kgCO₂e/m² total cradle to grave embodied carbon.

In lieu of full material quantity information typically available during detailed design stage these benchmarks have been deemed most appropriate to determine approximate embodied carbon emissions for the development which will form the basis of a subsequent LCA to be undertaken during future design development.

Figure 9: LETI Embodied carbon benchmarks for residential developments

Building Type: Residential	Upfront Carbon A1-A5 exc. sequestration (kgCO ₂ e/m ²)	Total Embodied Carbon A1-A5, B1-B5, C1-C4 inc. sequestration (kgCO ₂ e/m ²)
A++	100	150
A+	200	300
A	300 (LETI 2030 Design Target)	450
B	400	625 (RIBA 2030 Build Target)
C	500 (LETI 2020 Design Target)	800
D	675	1000
E	850	1200
F	1000	1400
G	1200	1600

Life Cycle Embodied Carbon - Benchmarking

The development is targeting a LETI/RIBA 2030 carbon benchmark rating of ‘C’ for both upfront and total life cycle embodied carbon. Applying the proposed GIA of the residential and commercial areas of the development (c.63,182m² and 1827m² respectively), target cradle-to-grave embodied carbon emissions across a 60 year reference study period are c.51,800 tonnes CO₂e. This is equivalent to:

Greenhouse Gas emissions from:

133,000,000 miles driven by an average passenger vehicles



Greenhouse gas emissions avoided by:

1,960,000 incandescent lamps switched to LEDs



Carbon sequestered by:

61,800 acres of forests in one year



Note: All values are reported to three significant figures. Source: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

The split of this total, by the main lifecycle module categories, can be seen in *Table 3*.

Table 3: Target Embodied Carbon

	Upfront A1-A5 Carbon emissions	Lifecycle Module B1-B5, C1-C4 Carbon emissions	Total
Total Residential kgCO ₂ e/m ²	500	300	800
Total Residential Tonnes CO ₂ e	31,591	18,955	50,546
Total Commercial kgCO ₂ e/m ²	550	140	690
Total Commercial Tonnes CO ₂ e	1,005	256	1,261
Total Development kgCO₂e/m²	501	296	797
Total Development Tonnes CO₂e	32,596	19,210	51,806

Embodied Carbon Reduction Measures

The baseline results presented are based upon LETI embodied carbon benchmarks which will need to be updated with results from a Life Cycle Assessment when the design is sufficiently developed to afford material quantification. To minimise the

embodied carbon impact of the development, recommendations are presented in this section.

General

Locally Sourced

Whilst the embodied carbon from the product stages to produce the material is by far the most significant lifecycle stage, sourcing materials locally should be considered as it not only reduces the carbon impact, but also has local social and economic benefits.

Design for disassembly

An important consideration for embodied carbon and circular economy is to ensure that materials can be easily dismantled, reused, replaced and recycled wherever possible. Designing interior finishes and MEP equipment for disassembly given these elements are likely to be replaced much more often over a building’s lifespan than the structural elements will support optimal resource use. Adhesives and welding should also therefore be avoided where possible.

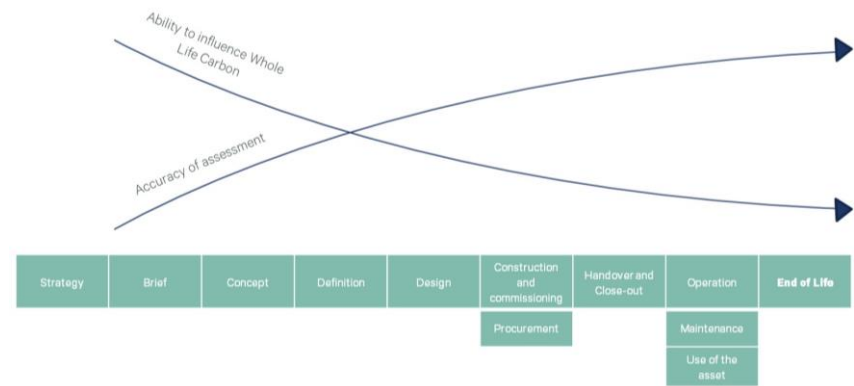
Modular

Efficient construction methods such as modular systems can result in better build quality, more efficient transport of construction materials, reduced time on site and a reduction in construction waste; all of which contribute significantly to the overall carbon impact of the development. Offsite and modern methods of construction will be considered.

Timing of WLCA

The process of estimating WLC and considering WLC reduction measures should be incorporated into decision making processes from the outset of a developments design. The earlier WLC is considered the greater impact the assessments and analysis can have in minimising the carbon impact from a building, as outlined in **Error! Reference source not found.10** below.

Figure 10: WLCA timing vs impact



Structures

Concrete

The production of cement is responsible for the majority of the embodied carbon associated with the use of concrete. It is possible to replace up to 70-80% of the cement content in concrete with an alternative binder, otherwise known as cement replacements. These are typically by-products of other carbon intensive process. One such common example is GGBS (Ground Granulated Blast Furnace Slag) which is a by-product of the iron manufacturing process and therefore has a much lower carbon factor (kgCO_{2e}/kg material) than Portland cement.

It should be noted that the availability for large quantities of GGBS are currently uncertain due to high levels of demand. The amount of cement replacement within concrete will also affect the curing times, consistency, and appearance of the finished concrete (the use of GGBS results in a lighter finish than 100% Portland cement concrete).

Timber

Timber should be considered as an alternative to energy intensive materials such as concrete structures and stud walls, PVC/aluminium framed windows and doors and

other man-made internal finishes. Timber is not only likely to be less carbon intensive in its production and require less structural reinforcement due to its lightweight profile, but also locks up carbon sequestered during the growth of the plant.

Building Services

Estimating the embodied carbon of buildings services can be challenging due to the typically complex and composite nature of MEP products and a low availability of data and EPD's. However, example qualitative strategies to minimise the carbon impact from services over the building's lifespan may include:

- Improving energy efficiency for the building to reduce the demand and size of MEP equipment required which is already being explored through the connection to a district heating from the adjacent site
- LED lights are not only more energy efficient than incandescent lights but also have a longer lifespan. Therefore, LED lights will need to be replaced much less often which reduces the lifetime carbon from these MEP elements
- Where active cooling is required low GWP (global warming potential) refrigerants should be sourced for heat pumps, to minimise the impact from leakages over the building's lifespan.
- Request data from manufacturers using the CIBSE TM65 methodology and data request form. Applying pressure on manufacturers to provide carbon data from their products will increase the accuracy of embodied carbon calculations for building services and create market competition for manufacturers to drive down the embodied carbon from their products.

Internal finishes

Products supported by EPDs should be specified as a preference, as this allows the carbon footprint of like for like products to be compared. Products with EPDs also typically have a lower-than-average carbon footprint because they are not mandatory and therefore are produced for marketing purposes. Bare and exposed finishes reduce the amount of materials and therefore embodied carbon from typical alternative such as painted plasterboard and suspended ceiling systems. Low carbon materials such as glass mineral wool insulation will also be encouraged.

Whole Life-Cycle Carbon

The results from the embodied carbon benchmarking exercise have been added to the operational carbon results from the Developments Energy Statement, i.e. the module B6 figures, to produce an indicative Whole Life-cycle Carbon (WLC, i.e. embodied + operational carbon) estimate over a 60 year study period as is industry standard.

SAP energy and carbon modelling, including reductions for electricity by renewable photovoltaic (PV) arrays proposed, provided the following yearly carbon results (please refer to the Energy Statement (CBRE UK ESGC, June 2023) by CBRE for further information):

Table 4: Deal Ground yearly Tonnes CO₂e from developments operational energy (as per the Sites Energy Statement)

	Regulated Tonnes CO ₂ e / year	Unregulated Tonnes CO ₂ e / year	Total Tonnes CO ₂ e / year
Total Residential	193.9	341.2	535.1
Total Commercial	20.6	18.5	39.1
Total Development	214.4	359.7	574.1

The total in Table 4 above is equivalent to ~8.83 kgCO₂e/m² per year, or 530 kgCO₂e/m² over 60 years (34,446 tonnes CO₂e over 60 years), not accounting for decarbonisation of the electricity grid in the future. Figure 11 overleaf demonstrates that this would be equivalent to 40% of the development total WLC, with upfront

carbon contributing approximately 38% and in use/end of life embodied carbon making up 22% of the total WLC.

It must be noted that the total embodied carbon (tCO²e) results reported differ to the results reported in the Climate Change ES Addendum chapter as the climate change ES Addendum chapter has included a number of additional, more conservative, assumptions in line with EIA best practice.

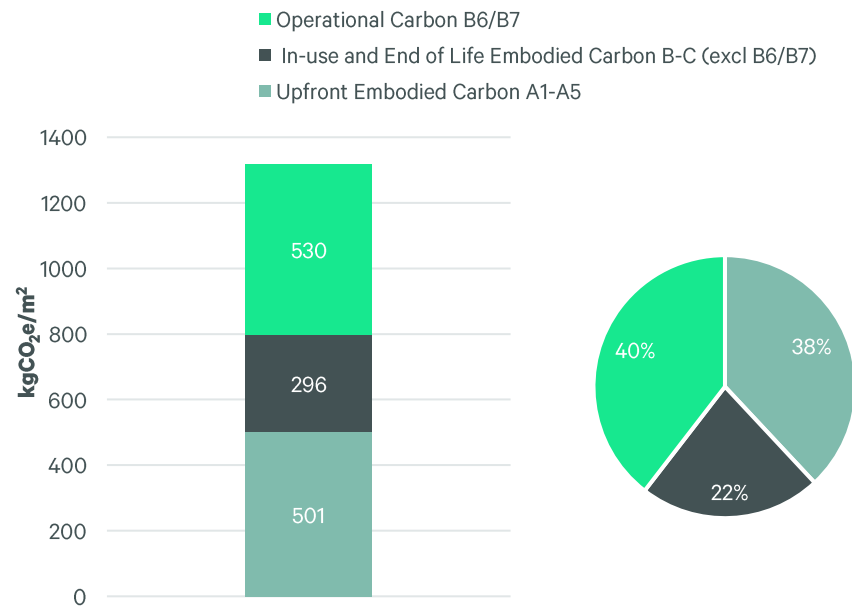


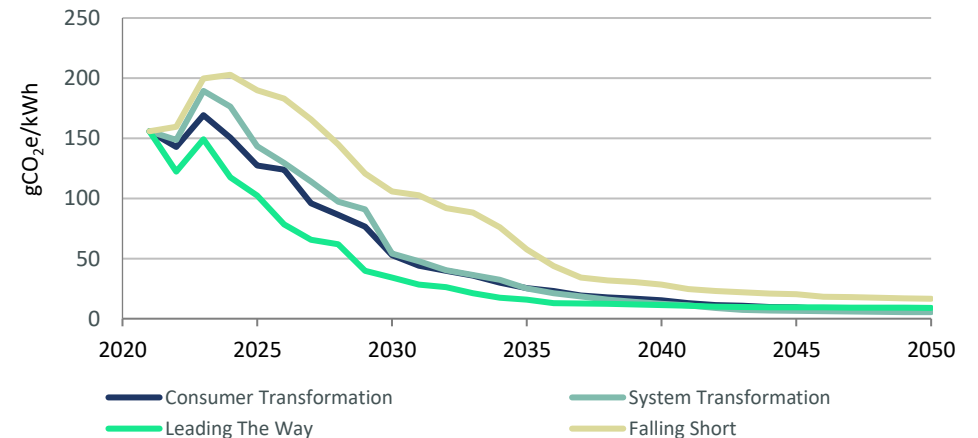
Figure 11: Deal Ground Whole Life Carbon by main lifecycle stages, not accounting for a decarbonising electricity grid

Accounting for future decarbonisation of the UK electricity grid

As previously noted, the previous results do not take into account future decarbonisation to the grid and therefore the in-use emissions are based on calculations using current carbon factors only. All-electric developments (i.e. non-direct use of fossil fuels) such as the proposed site, will benefit significantly from a decarbonising electricity grid, noting that the annual carbon savings from renewable energy production will reduce. Nevertheless, a decarbonising grid will serve to reduce the Site emissions.

The UK National Grid has created 4 different pathways for the future of energy between now and 2050 which provides potential future grid electricity carbon intensity factors as seen in Figure 12.

Figure 12: National Grid Future Energy Scenarios – CO₂e intensity of electricity grid (excluding negative emissions from BECCS)



Applying carbon factors from the most conservative ‘falling short’ Future energy Scenario to the Site’s operational energy predictions (a net total of 3,274 MWh), allows the difference between results with and without decarbonising carbon factors

to be shown. This can be seen in Figure 13 below, which demonstrates the indicative cumulative carbon over the 60 year study period, assuming constant energy demand.

Figure 13: Deal Ground Cumulative WLC (kgCO₂e/m²), with and without accounting for a decarbonising electricity grid.

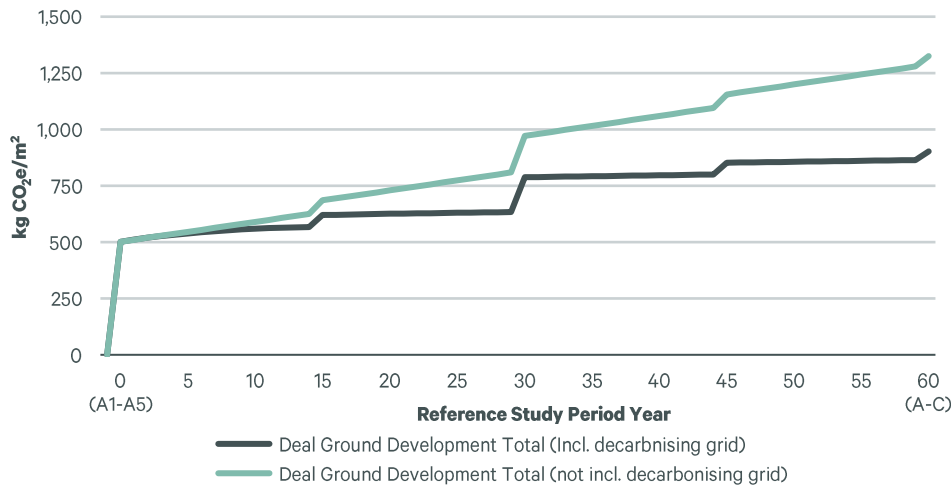


Figure 13 shows how carbon impacts associated with the development will accumulate over time for scenarios with and without a decarbonising electricity grid. Initial, both scenarios show an equal initial increase from the upfront carbon during construction (A1-A5). There is gradual increases each year from operational carbon (B6), with the decarbonising scenario have a much flatter line due to the smaller increase in carbon over time. There are also increases at year 15, 30, 45 and 60 representing illustrative lifecycle embodied carbon impacts in the future from replacements of building elements (e.g. internal finishes, MEP etc.).

It should be noted that the carbon calculation for operational energy from the SAP modelling use a different methodology for carbon from residential energy use and

therefore the results are no directly comparable, but nevertheless serve to demonstrate the likely diminishing impact of the operational carbon.

Table 5 Deal Ground WLC (Tonnes CO₂e), with and without accounting for a decarbonising electricity grid.

Scenario for Operational Carbon		Constant Carbon as per SAP Carbon Calculations from Energy Statement	Decarbonising Carbon as per Future Energy Scenarios – ‘Falling Short’ grid factor
Predicted electricity use	MWh/year	3,340	
	Operational energy (B6) tCO ₂ e over 60 years	34,446	6,854
Upfront embodied carbon (A1-A5) tCO ₂ e		32,596	
Lifecycle embodied carbon (B-C excl. B6/B7) tCO ₂ e over 60 years		19,210	
WLC total (A-C incl. B6/B7) tCO ₂ e over 60 years		86,258	62,000

The proportion of the total WLC from operational energy is much lower under the decarbonising scenario (105 kgCO₂e/m² over 60 years, or 12% of total WLC) compared to the non-decarbonising scenario (530 kgCO₂e/m² over 60 years, or 40% of total WLC). In contrast, most of the embodied carbon emissions are produced prior to practical completion (modules A1-A5) and cannot be reduced during the asset’s life and operational phase. Such emissions should therefore be a priority as the design develops.

Construction phase impact mitigation

Construction phase sustainability will be managed through a robust Construction Environmental Management Plan (CEMP) prepared for the project by the Principal Contractor. The CEMP will set out the management standards and procedures required to mitigate against environmental, public health and safety impacts which may affect interests of local residents, businesses, general public and the surrounding vicinity during the construction phase.

The CEMP will seek to minimise construction site impacts and the generation of construction and demolition waste by requiring the Demolition and Principal Contractors and appointed sub-contractors / consultants to:

- Monitor and record energy consumption, CO₂ emissions, and water consumption as a result of the use of construction plant, equipment (mobile and fixed) and site accommodation.
- Implement a detailed Resource Management Plan (RMP) covering the waste hierarchy; Reduce, Reuse and Recycle. The RMP will include strict targets for management of hazardous and non-hazardous waste materials, and the processes and procedures for recording and reporting on waste arisings and management routes. The Principal Contractor and their supply chain partners will be required to limit total construction waste to less than 8.5 tonnes per 100m² GIA and target 80% diversion (by tonnage) of construction waste and 90% diversion of demolition waste from landfill.
- Implement best practice pollution policies in regard to noise, air (dust) and water pollution.

Summary

The Energy Strategy and approach to whole life carbon, including embodied carbon and operational efficiency, accords with the following local policies:

- Greater Norwich Development Partnership, Joint Core Strategy, Policy 1 – Addressing climate change and protecting environmental assets.
- Greater Norwich Development Partnership, Joint Core Strategy, Policy 3 – Energy and Water
- Norwich Development Management Policies Local Plan Policy DM1 - Achieving and delivering sustainable development
- Norwich Development Management Policies Local Plan Policy DM2 - Amenity relates to future occupiers' health and wellbeing
- Norwich Development Management Policies Local Plan Policy DM3 - Design principles
- Norwich Development Management Policies Local Plan Policy DM4 - Renewable energy
- South Norfolk Council's Development Management Policy DM 1.1
- South Norfolk Council's Development Management Policy DM 4.1

The scheme's consideration to energy efficient design also contributes to the UN SDP goals 7, 11, 12 and 13.

Health and wellbeing

Healthy design

The integrated and inclusive approach to design considers the health and wellbeing of both the future residents and occupiers and the maintenance crew using the building amenities, through a series of measures, including:

- Setting water quality standards;
- Lighting design to provide appropriate lighting levels and occupant control;
- Ensuring that noise levels are appropriate to the space usage;
- Maintaining thermal comfort for building occupants;
- Encouraging occupants to adopt active commuting;
- Access to external gardens and green roof for connection with nature; and
- Quiet spaces for mental restoration, surrounded by planting.

Air quality

Poor air quality has been shown to significantly reduce the health outcomes of those exposed. As a result, effective management of local air quality is becoming an area of increasing focus for residents and businesses alike, driven by the European Air Quality Directives (European Commission, 2008) and government guidance (DEFRA, 2016).

The original Environmental Statement issued as part of the outline application referenced Planning Policy Statement PPS 23: Planning and Pollution Control which has since been replaced by the National Planning Policy Framework (NPPF), most recently updated in 2021.

In reference to the NPPF, an Air Quality Impact Assessment (Triptych PD, May 2023) has been produced by Triptych PD to assess if the proposed development is

likely to give rise to any significant dust and air quality impacts, and to establish the magnitude and the significance of such impacts caused as a result of the proposed development in respect to the prevailing environmental conditions.

A qualitative assessment of the potential dust impacts during the construction of the development was undertaken. Through good practice and implementation of appropriate mitigation measures, it is anticipated that the release of dust would be effectively controlled and mitigated, with resulting impacts considered to be 'not significant'. All dust impacts are considered to be temporary and short-term in nature.

The proposed development is expected to result in a negligible impact on annual mean NO₂, PM₁₀ and PM_{2.5} concentrations at all human receptor locations as a result of additional development trips. No exceedances of NO₂, PM₁₀ and PM_{2.5} concentrations are predicted with the overall effect is considered to be 'not significant'.

A non-combustible heat source has also been proposed for the development, as such, no harmful NO_x emissions will be produced on site, ensuring that the building does not adversely contribute to local air quality. This aligns with Norwich City Council, South Norfolk District Council and Broadland District Council' Joint Core Strategy (Greater Norwich Development Partnership, 2017).

Noise

An environmental noise assessment (Adrian James Acoustics Limited (AJA), May 2023) identified a series of potential noise impacts, generally resulting from the March reach / Wensum Riverside areas of the development. Particular identified sources included:

- Rail sidings, aggregates depot and asphalt plant to the west of the site which is currently operated by Tarmac;
- Trowse Rail Bridge in the north-western corner of the site; and,
- Crown Point Rail Depot to the north, across the river Yare.

The initial noise assessment undertaken in 2012 determined the first two sources being of particular concern. AJA’s assessment aimed to:

1. To confirm the rail sidling, Trowse Rail Bridge and Crown Point Rail Depot are the main sources of noise affecting the site;
2. To quantify typical noise levels produced by those sources; and
3. To identify the acoustic measures necessary to ensure that acoustically appropriate conditions can be provided for residents.

Following an assessment of ambient noise levels and a review of design proposals AJA concluded that acceptable internal noise levels should be achievable in the May Gurney area using standard building envelope elements. Furthermore, AJA noted that good acoustic design principles present within the proposed development layout, particularly in terms of the use of buffer zones and the use of buildings nearest to the main noise sources to screen other buildings further away will suitably mitigate many potential impacts.

AJA’s overall conclusion is that acceptable levels of acoustic amenity can be achieved provided that general recommendations are followed. As such, development should comply with the noise-related planning conditions imposed on the outline planning approvals issued by NCC and SNDC.

Land Contamination

A land investigation study has been undertaken with a purpose to review and summarise all previous works undertaken within the site and to assess contamination sources, pathways and receptors to determine the presence of any contamination.

A number of potential contaminants of concern and source areas were confirmed with a variety of potential pollution linkages which have been assessed against likely risk level and subsequent actions where the probability of an event happening is identified. The report confirms that of the contaminant sources the following were identified as have a pollution risk alongside remediation measures in combination with a targeted site investigation and quantitative risk assessment:

Contaminant area	Contaminant source	Risk Level	Remediation recommendation
Asbestos containing material (ACM) in north west corner	Cement board fragment	Very High	All potential ACM should be removed by a suitably licensed contractor and disposed of to a suitably licensed facility
Historical landfilling in the north east and east (north site)	Elevated metal values	Medium	Suitable for screening and recycling subject to further testing
	Unidentified 45 gallon drums	High risk	Remove with surface and subsurface soils in this area to be tested for residual contents and remediated accordingly

Contaminant area	Contaminant source	Risk Level	Remediation recommendation
Made Ground from various industrial land use (south site)	Underground fuel storage tanks	High risk	Further intrusive work is carried out in the location of the tanks to assess the current impact on the groundwater and surrounding soils.
	Generation of ground gas	Medium	Further gas monitoring to be undertaken

For more details of contaminant sources and remediation measures please refer to the Norfolk Partnership Laboratory's Desk Study and Risk Assessment report (Norfolk Partnership Laboratory, 2023)

Summary

The proposals considers health and wellbeing across a number of sub-themes and demonstrate compliance against the following policies:

- North Norfolk Core Strategy: Policy EN 13
- Norfolk County Council Planning Obligations Standards : Feb 2022 (section 8)
- Norwich development Management Policies Local Plan : DM2, DM3, DM6, DM7, DM11
- Greater Norwich Local Plan – Policy 2, Policy 3, Policy R9
- South Norfolk Development Management Policies DM 1.4, DM 3.13, DM 3.14,

In addition, the proposed development contributes to UN SDP goals 3 , 11 and 15.

Climate resilience

In November 2018, the Met Office released the UK's most comprehensive picture yet of how the climate could change over the next century. The UK Climate Projections (UKCP), which use the latest science from the Met Office and around the world, illustrate a range of future climate scenarios until 2100, showing that increasing summer temperatures, more extreme weather and rising sea levels are all on the horizon and urgent action is needed.

Climate change is happening, and the industry has a duty to ensure buildings are designed to cope with these changes, which will be ongoing. To help the industry to plan for the future, the 2018 UKCP presents a range of possible outcomes over the next century based on different rates of greenhouse gas emissions into the atmosphere. The high emissions scenario shows:

- Summer temperatures could be up to 5.4°C hotter by 2070, while winters could be up to 4.2°C warmer;
- The chance of a summer as hot as 2018 is around 50% by 2050; and,
- Average summer rainfall could decrease by up to 47% by 2070, while there could be up to 35% more precipitation in winter.

The broad UK headline result is for 'a greater chance of warmer, wetter winters and hotter, drier summers'.

The proposed development is targeting BREEAM credit WST 05 (Adaptation to Climate Change). In support of this credit, the design team will undertake a systematic risk assessment to identify the impact of expected extreme weather conditions arising from climate change on the building over its projected life cycle. The assessment will cover the installation of building services and renewable systems, as well as structural and fabric resilience aspects. Recommendations will

be incorporated into the design during RIBA Stage 3, ensuring that the Site can adapt to future predicted changes in the UK's climate.

The proposed architectural design of the building avoids the use of fragile bolt-on elements (such as canopies, pergolas and brise Soleil's) that could be damaged during extreme weather events.

Flood risk & sustainable drainage

A flood risk assessment has been undertaken by JBA Consulting (JBA Consulting, June 2023) which builds upon the previously approved FRA and to assess the impact of the updated development proposals. Based on the Environmental Agency's flood maps the following level of risk from sources of flooding have been identified:

Surface water : Very Low / Low (a very limited number of isolated and localised areas at medium risk)

Reservoir: Not affected (when river levels are normal)

Groundwater: High risk (where solution features may be present).

The previous flood risk management design principles set out in the 2010 FRA issued by Total Flood Solutions Limited and DBR Associates Limited included:

- Maintaining and making space for flood flow pathways (i.e. between the River Yare and River Wensum;
- Application of the sequential approach to site master planning;
- Ground raising within Flood Zones 2, 3a and 3b to provide development platforms above the design flood level;
- Provision of level-for-level floodplain storage compensation to mitigate the impacts of ground raising within the floodplain;
- Raised floor levels, including a minimum freeboard of 300mm above the design flood level;
- Elevated building floor slabs (i.e. allowing floodwater to enter the void beneath;
- Flood resilient construction;

- Provision of safe access/egress, dry vehicular access and dry refuge within buildings;
- Car-parking areas elevated above the design flood level, including the use of geocellular systems that enable floodwater to pass beneath the finished car-park surface;
- Vehicles moved off site should an extreme (0.1% probability) flood event be forecast
- Implementation of a flood warning and evacuation plan;
- Incorporation of SuDS to manage the quantity and quality of surface water run-off arising from the development (post-development rate of run-off reduced by 30% compared to the pre-development rate and storage provided using below ground tanks with pumped outflows to the River Yare and River Wensum).

JBA's updated FRA and drainage strategy reports concludes that the previous application does not now fully align with current guidance and policy. To meet these current requirements additional design standards will need to be applied to the proposals.

The updated FRA proposes suitably sized drainage pipes and drainage storage where possible to provide a free discharge, reduced discharge rates, and separate drainage systems for adoptable highway and private residential/commercial areas. SuDS proposed around the proposed development include providing green roofs on flat roofs, permeable paving, communal pond / rain garden, street scene swales and locating rainwater storage under private roads and parking areas.

The scheme also recognises the importance of reducing demand on mains water as water resources become stretched in the future. Therefore water butts serving residential properties, rainwater recycling and collection for communal use, rainwater harvesting for communal toilet facilities and direct connections of downpipe to green street scene area are currently part of the development proposals.

Flood resilience measures currently proposed include appropriately elevated property threshold and access road levels, and voids under residential blocks to provide sufficient floodplain compensatory storage and to limit risk of damage from flooding.

For further details of the design standards and requirements for incorporation please refer to JBA's Flood Risk Assessment (JBA- June 2023)

Thermal comfort

CBRE have undertaken thermal modelling against Part O 2021 (CBRE UK ESGC, June 2023) to ensure that overheating has been mitigated. Part O of the building regulations came into force in June 2022 and applies to dwellings and other forms of residential accommodation.

The results of the thermal modelling demonstrated that all sample rooms meet the thermal comfort requirements of Part O, under Design Summer Year 1 (DSY 1) weather file.

The following key strategies have been included in the design proposals to ensure occupant wellbeing and to secure thermal comfort:

- Optimisation of building orientation and glazing to reduce solar gains
- Improved envelope performance, in terms of U-values and airtightness.
- Thermal insulation to minimise the amount of heat entering the building during summer. Enhanced insulation will be installed to the pipework distribution.
- External shading to be integrated into designs, in the form of balconies and deep window recesses, to further reduce solar gains.
- A natural ventilation strategy with fully openable windows is proposed for all dwellings. The openable area of the windows has been optimised to increase fresh air supply.

- The proposed landscape design will contribute to improving the site's microclimate thus reducing the impact of the heat island effect.

Please refer to CBRE Energy Statement (CBRE UK ESGC, June 2023) for further details on the overheating risk analysis.

Summary

This section confirms compliance with the following policies:

- Greater Norwich Development Partnership, Joint Core Strategy, Policy 1 – Addressing climate change and protecting environmental assets.
- Norwich Development Management Policies Local Plan Policy DM1 - Achieving and delivering sustainable development
- Norwich Development Management Policies Local Plan Policy DM2 - Amenity relates to future occupiers' health and wellbeing
- Norwich Development Management Policies Local Plan Policy DM3 - Design principles
- Norwich Development Management Policies Local Plan Policy DM5 – Flooding
- South Norfolk Development Management Policy DM 1.1
- South Norfolk Development Management Policy DM 1.4
- South Norfolk Development Management Policy DM 3.8

The proposed development also contributes to UN SDP goals 9, 11, 12, 13 and 15.



Green Infrastructure

A baseline Ecological Appraisal has been undertaken by Aspect Ecology to update initial survey work undertaken in 2008 and 2009 as part of the schemes outline planning application made in 2013. The updated surveys conclude that the area predominantly comprises former industrial land to the north and south, and an area of fenland to the centre and east. There is also woody vegetation such as wet and dry woodland, scrub, scattered trees and bramble thickets identified alongside small areas of species – poor neutral grassland and tall ruderal vegetation. The survey confirmed the potential to support roosting bats within trees and built structures whilst a number of protected species were identified, within the fen and associated wetland habitats.

A number of statutory ecological designations are present in the vicinity of the survey area, more notably The Broads SAC / Broadland SPA, which lies approximately 5.4km east of the survey area. Part of the survey area itself is designated as a non-statutory CWS, ‘Carrow Abbey Marsh’. The CWS is designated for its tall fen and tall herb vegetation with young woodland and willow carr, and for the presence of Desmoulin’s Whorl Snail.

A subsequent Environmental Action Plan and Nature Management Plan to address the scheme’s outline applications planning conditions (8 parts a-d) have been prepared with mitigation measures and recommendations relating to:

- The protection of retained trees and woodland
- Protection of retained fen
- Protection of rivers and riverbank habitats
- Fen translocation
- Plant translocation
- Invasive species

- Protected species

Where there will be impacts on existing ecological features as a result of the development a number of ecological compensation and enhancements have been proposed to ensure overall benefits to habitats and fauna. This will include creation of new swales, species-rich grassland, tall herbaceous vegetation, scrub, amenity grassland and green / brown roofs alongside enhancements to bat, breeding birds, otter and invertebrates.

Furthermore, physical measures to safeguard the retained CWS from disturbance from the public or domestic pets are proposed which combined with the outlined mitigation and ecological enhancement measures will avoid a significant harm to biodiversity with long time biodiversity enhancement delivered in the long term through the appropriate management of proposed features. For more details please refer to Aspect Ecology’s Baseline Ecological Appraisal (Aspect Ecology, 2023), Environmental Action Plan (Aspect Ecology, 2023) and Nature Management Plan (Aspect Ecology, 2023).

Given the presence of several European designations within the site surround Aspect Ecology have also prepared a technical guidance note to inform a Habitat Regulations Assessment. A screening exercise which informs this guidance note concludes that in absence of mitigation, the potential for a likely significant effect arising from the development alone cannot be ruled out in relation to water quality at both The Boards SAC and Broadland Ramsar site as well as the potential for recreational disturbance at a number of Norfolk SACs, SPAs and Ramsar sites.

A Stage 2 Appropriate Assessment has subsequently been undertaken and concludes that in the view of the designations’ conservation objectives, following the implementation of mitigation measures comprising a nutrient neutrality scheme, contributions to a recreational impact Avoidance and Mitigation Strategy, and delivery of accessible Green infrastructure, the proposed development has no effect on the integrity of the surrounding European designations.

Furthermore it has been confirmed that as a result of the proposed mitigation, compensation and enhancement measures combined with a Construction Method Statement, Construction and Environmental Management Plan and SuDS scheme, would result in a significant fauna and flora benefits across the site. It is concluded

that the Proposed Development would result in a slight to moderate significant beneficial effect at the local to county level.

As confirmed by the Council a BNG assessment will not be required for this application as the outline was approved prior to mandatory BNG and will only apply to new applications submitted once BNG is mandated (in November 2023). Condition 8 of the outline consent relating to the preparation of an Environmental Action Plan, which is being submitted as part of this application, is required to address biodiversity net gain.

Summary

For more details of the biodiversity and ecological measures proposed for Deal Ground refer to the Baseline Ecological Appraisal, Environmental Action Plan, Nature Management Plan prepared by Aspect Ecology and the Woodland and Habitat Management Plan prepared by A.T Coombes Associated Ltd.

These reports address the following policies:

- North Norfolk Core Strategy: Policy SS 4 & Policy EN 9
- Norfolk County Council Planning Obligations Standards : Feb 2022 (section 8)
- Norwich development Management Policies Local Plan : DM6, DM7
- Greater Norwich Local Plan – Policy 2, Policy 3
- South Norfolk Development Management Policy DM 1.3
- South Norfolk Development Management Policy DM 3.10
- South Norfolk Development Management Policy DM 4.8

Transport and access

Odyssey on behalf of the client have undertaken a Transport Assessment Addendum to the previously submitted assessment as part of the outline application and have prepared a Highways technical note to identify the historic and current traffic flows, on-site and off-site accessibility for pedestrians and cyclists and a site Travel Plan. This has been undertaken to demonstrate alignment with local planning policy and confirm that the previously submitted outline application and relevant planning conditions in respect to transport are still valid.

Public Transport Accessibility

Ensuring good levels of public transport accessibility to encourage sustainable methods of travel provides health benefits to both residents and neighbouring communities, limits the developments impact in relation to air quality and pollution and environmental degradation and ensures inclusive and accessible design for all.

The site is located close to the village of Trowse in east Norwich, and benefits from close proximity to Norwich city centre. The site can currently be accessed from The Street to the south, and will be accessible via the riverside towpath and Utilities site to the north.

The Transport Assessment addendum notes that bus links are available from a bus stop in close proximity to the site on The Street and from Trowse and services connect the site to the city centre and surrounding area. Bus services are also available from Martineau Lane and Bracondale to the west, these again offer connections to the city centre and wider area. Services to the north on Thorpe Road will be available via a pedestrian and cycle bridge at the northern end of the site, this will have been constructed prior to development occupation.

Norwich Railway Station will be within reasonable walking distance of the site. It offers regular services to the surrounding region and to London Liverpool Street.

The site is adjacent to the river Wensum; a potential river ferry link may be installed depending on viability.

Improvements to local bus stops will be implemented as part of the development, in accordance with Condition 6 of the previously approved outline consent. Future residents will also be encouraged to use local bus services with incentives such as reduced season tickets and free trial tickets.

Walking

Existing walking and cycle routes are available to and from public transport links, local shops, and to major local employers including NCC and Unilever. A welcome pack will be provided to residents to highlight walking routes and includes materials on the benefits of walking and active travel such as health and wellbeing and financial savings.

Cycling

National Route 1 (NR1) currently runs on The Street to the south of the site and is a popular route used by recreational and commuter cyclists travelling to and from the city centre. Additional designated cycle routes, internal to the site and segregated from the carriageway also forms part of the design proposals to encourage cycling for all abilities alongside 'Beryl Bike' facilities in the public realm of the development.

To support active travel, suitable facilities will also be provided; comprising secure and sheltered cycle parking for homes, with numbers and specifications aligning with the Home Quality Mark performance standards. The following cycle storage spaces are proposed which will be accessible, within close proximity to the homes entrance where not provided internally:

- 1 cycle every 2 studio / 1 bed flat
- 1 cycle every 2-3 bed home / flat
- 2 cycles every 4+ bed home/ flat

Parking

Car parking at the development is being provided to cater for the expected demand of future residents and businesses and to avoid overspill parking on the proposed local highway network. A proportion of spaces will be provided with active electric vehicle charging points to encourage combustion free transportation. Details of EV charging including number and capacity of points and location will be confirmed during the detailed design phases of the development.

Public Realm

IDP in collaboration with Stolon Architecture have developed the landscaping proposals and open space provision to include informal amenity open space, parks and gardens, natural green spaces, allotments, play provision and a country wildlife site (no public access). The combination of these features delivers 13.24 hectares (ha) which exceeds Norwich City Council Standards. This requires 4.68 ha per 1000 population which based on a site population analysis that confirms 1510 anticipated population would require 7.07 ha.

Summary

Odyssey's Transport Assessment Addendum confirms that the previously submitted outline documents are still valid and that the permitted development is still considered suitable from a transport and highways perspective. For more details refer to Odyssey's Transport Assessment (Transport Assessment Addendum, May 2023) and Highways Technical Note.

These reports alongside the original Transport Assessment confirm compliance with the following policies:

- Greater Norwich Development Partnership (GNDP) Joint Core Strategy (JCS) for Broadland, Norwich and South Norfolk Policy 6 – Access and transportation
- Norwich Local Plan: Development Management Policies Plan Policy DM28 – Encouraging sustainable travel

- Norwich Local Plan: Development Management Policies Plan Policy DM31 – car parking and servicing
- Norwich City Council Environmental Strategy Priority 6– support and encourage more sustainable transport solutions
- South Norfolk Development Management Policy DM 1.3
- South Norfolk Development Management Policy DM 3.8
- South Norfolk Development Management Policy DM 3.10
- South Norfolk Development Management Policy DM 3.14

The proposals also align with UN SDP Goal 11 (Sustainable Cities and Communities).

Minimising Water Consumption

With the east of England regarded as the driest part of the UK, with many areas receiving less than 700mm annually, it is important to ensure any development mitigates against the risk of future water stresses through low impact design.

Water efficient fixtures and fittings will be specified throughout the development, in line with DM3 of Norwich's local plan (Norwich City Council, 2014) to deliver an internal water consumption limit of 105 l/p/d. This will be achieved through low flow sanitaryware fittings such as basin and kitchen taps, showers and dual flush cisterns alongside efficient washing machine and, where specified, domestic dishwashers. A water calculation tool detailing indicative flow rates and internal water consumption confirms the development will meet a 105 l/p/d target and has been included in Appendix B.

The European Water Label scheme will also be used to inform sanitary product selection, specifying products that have both a low water and energy rating under this scheme. In addition, automatic metering for residents to monitor water consumption in use will be specified to give transparency of water consumption to residents and incentivise reduced water use.

To minimise potable water consumption rainwater harvesting systems will be specified for the houses, contributing to the site's drainage strategy and mitigation to future flood risk.

Summary

The above approach to water consumption addresses the following policies:

- Norwich Local Plan (2014) – DM3;
- Norwich Local Plan (2014) – DM5;
- South Norfolk and Broadland Core Strategy; Policy 3
- South Norfolk Development Management Policy DM 1.1 South Norfolk Development Management Policy DM 3.10
- South Norfolk Development Management Policy DM 4.2

The scheme also contributes to the principles of UN SDP goals 11 and 13.



Community

General Approach

A Statement of Community Involvement (SCI) report (GNL Strategic, June 2023) has been produced to assist both Norwich City Council and South Norfolk Council in their assessments of the reserved matters applications. The document sets out the Client's inclusive approach to community consultation and the clear principles that have underpinned the programme of consultation. Seeking a collaborative approach, GNL Strategic sought to work with key stakeholders with a strong interest in the planning process; including, the local Planning Authority, residents, and elected representatives.

Stakeholder Engagement

Such an approach was sought to ensure that the development proposal that would deliver the best scheme possible for Norwich and Trowse. Four key meetings were held with elected and community representatives in March 2023, which helped to guide the project team in finalising design of the emerging scheme.

Public Consultation

The process of public consultation commenced on May 6th 2023, when invitations to attend public events were sent out to over 3,000 businesses and residential dwellings within the site's radius of influence. These invitations were reinforced by a series of social media adverts, local newspaper articles and a dedicated project website, encouraging interaction with the consultation process.

Subsequently, two drop in public consultation events were held on the 16th and 17th May 2023. The events followed the format of a public exhibition, with banners positioned around the room that introduced the site and planning context and gave an overview of the emerging scheme and design concepts. Members of the project team were present to answer queries, with breakout tables also placed around the exhibition room with feedback forms for attendees to complete and submit after reading the exhibition banners on display. A further online webinar was held on the 18th May 2023, with 16 local residents in attendance.

Consultation communication was made through a number of channels to ensure accessibility to all residents including Facebook adverts, newspaper articles and a dedicated project website which will remain active for residents to view throughout the planning process - www.dealgroundconsultation.co.uk.

Summary

Overall, 68 pieces of written feedback were collected by the project team and used, where possible, to prepare the final reserved matters application for the site.

In general, feedback received shows support exists for the emerging scheme and highlights that local residents' appetite for key issues (traffic management, flooding, parking and tree cutting, sustainability measures, building scale, connectivity and local infrastructure) to be at the heart of the design process. The Client has observed this position and will continue to engage with stakeholders and local residents with the aim of building positive relationships and forging a dialogue that can continue long term.

The Statement of Community Involvement report confirms compliance with the following policies:

- Norwich City Council Statement of Community Involvement – Amended September 2020
- South Norfolk Council Statement of Community Interest – Updated 2022

The approach also aligns with UN SDP Goal 11 (Sustainable Cities and Communities).

Circular Economy

Efficient use of resources throughout the building life cycle is an aspiration for the Site to contribute to a transition to a more circular economy. This includes measures to make best use of materials and resources, reduce the construction waste through the application of the waste hierarchy and incorporate circular economy principles.

The proposed sustainability strategy encourages a transition to a more circular localised economy, requiring the following principles to be incorporated wherever possible:

- Efficient use of resources, utilising standardised components to reduce materials; preferring natural materials and specifying materials with a low embodied carbon (analysed through Whole Life Carbon assessment at RMA).
- Modular and prefabricated building elements will be considered to reduce construction waste, time and energy use.
- Designing for a circular economy and deconstruction, by designing for long life and loose fit, utilising modular systems with components that can be more readily taken apart at end of life. The design team will also ensure that the proposed development is designed for durability, ease of maintenance and part replacement where feasible.
- Preference will be given to products that carry third-party verification, either by an Environmental Products declaration (EPD) or Cradle-to-Cradle Certification™.
- Use of either reclaimed or recycled materials where feasible, prioritising a minimum of 5 major building elements to have ≥20% recycled content.
- Setting construction resource efficiency targets of 8.5 tonnes of construction waste per 100m² in line with good practice Home Quality Mark criteria
- Engage with the Principal Contractor to develop a Site Waste Management Plan and set diversion from landfill waste targets with a minimum 80% construction waste and 90% demolition waste diverted.

- Establish suitable construction servicing and delivery strategy with adequate storage to protect and minimise damage to materials and products

In addition, the following environmental standards will be required for all materials procured for the development, including any temporary structures associated with the construction phase.

- Timber supplies holding Chain of Custody certificates such as FSC.
- Steel, any other metals used within the primary structure, steel reinforcement holding certification under either BRE Global BES 6001 certification, CARES Sustainable Construction Steel (SCS) Scheme or Eco-reinforcement Responsible Sourcing Standard.

Concrete and cement products, glass, plasterboard, and insulation holding certification under either BES 6001 or ISO14001.



In summary, the design of buildings and infrastructure within the development will aim to select materials and products that offer the greatest opportunity of re-use and repair. An example of this is the reuse of the existing Grade II listed brick kiln for the purpose of roosting bats.

Summary

The above approach to materials efficiency, waste management and water consumption addresses the following policies:

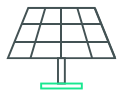
- Norwich Local Plan (2014) – DM2;
- South Norfolk and Broadland Core Strategy; Policy 1
- South Norfolk and Broadland Core Strategy; Policy 2
- South Norfolk Development Management Policy DM 1.1
- South Norfolk Development Management Policy DM 3.8

The scheme also contributes to the principles of UN SDP goals 11,12 and 13.

Conclusion

In summary, this Sustainability Statement confirms that the design incorporates the sustainability features required to comply with the current and emerging planning policy requirements of Norwich City Council, South Norfolk and Broadlands Planning Policy. The design team have engaged with the planning department and local residents to ensure all opportunities and concerns are considered and addressed to achieve the best resulting design.

A summary of the sustainability features is detailed below:



Energy & Carbon

- The development is predicted to achieve a 69% overall on-site carbon reduction below Part L 2021 of the Building Regulations.
- An all- electric, fossil fuel free heating strategy is proposed to take advantage of ongoing grid decarbonisation to become a net zero carbon development in due course.
- The development proposes utilising 4,456m² of available roof space for the installation of photovoltaic panels.
- A preliminary embodied carbon assessment has been undertaken to identify construction impacts and highlight opportunities to minimise emissions.



Climate resilience

- An updated flood risk assessment has been undertaken confirming design standards to include within the proposals to align with current policy. It is also concluded that a surface water drainage system will be required to utilise SuDS and restrict discharge rates to as close to greenfield runoff as possible.
- Thermal modelling has been undertaken against Part O 2021 (CBRE UK ESGC, June 2023) by CBRE to ensure that potential risks of overheating have been mitigated through design interventions. The results have determined that all individual rooms meet the thermal comfort requirements of Part O, under a Design Summer Year 1 (DSY 1) weather file.
- A climate strategy appraisal will be developed during the detailed design stages to explore current and future risks and incorporate mitigation measures into the proposals.



Minimising water consumption

- Target 105 l/p/d potable water consumption through efficient sanitaryware fittings alongside rainwater harvesting where feasible to contribute to reduced external water consumption and flood risk and surface water run off mitigation.



Health and wellbeing

- The proposed development is expected to be 'air quality neutral' for both transport and building emissions.
- A non-combustible heat source has been chosen for the development, ensuring the building does not adversely contribute to the local air quality.
- A number of potential contaminants have been identified with recommendations to remediate risks to identified receptors.
- Outdoor gardens and seating lounges have been proposed to support mental restoration and social cohesion.

Transport and Access



- The site is located in an area of good public transport accessibility bus and rail services.
- Active travel by bicycle will be encouraged through policy compliant cycle storage spaces.
- Improvements to local bus stops will be made as part of the development proposals.
- EV charging points will be provided as part of the car parking strategy.



Green infrastructure

- The proposed development is not anticipated to have a significant increase in recreational pressure upon nearby statutory or non-statutory designated sites.
- As a result of the proposed mitigation and , compensation and enhancement measures there will be a significant increase in flora and fauna benefits across the site.



Community

- A Stakeholder Consultation exercise has been undertaken alongside meetings with key elected and community representatives
- Feedback received relating to traffic management, flooding, parking and tree cutting, sustainability measures, building scale, connectivity and local infrastructure has been acknowledged and engagement will continue through the development process.



Circular Economy

- Whole Life Carbon appraisal to identify low impact material alternatives and prioritisation of responsibly sourced materials with environmental certification or product standards
- Diversion of construction and demolition waste from landfill shall be targeted at the highest value possible.
- Waste will be minimised during both construction and operation through engagement with supply chain partners and the occupants, and the provision on sufficient storage.

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Appendix A - Planning Policy

This section summarises the key legislative requirements, and the current and emerging planning policy requirements of Norwich. It provides the legislative and regulatory planning context against which this Sustainability Statement appraises the proposed development.

Greater Norwich Development Partnership (GNDP) Joint Core Strategy (JCS) for Broadland, Norwich and South Norfolk, 2011

- Policy 1 – Addressing climate change and protecting environmental assets
- Policy 2 – Promoting good design
- Policy 3 – Energy and water
- Policy 4 – Housing delivery
- Policy 6 – Access and transportation

Greater Norwich Local Plan (GNLP) Publication Draft Plan

- Policy 1 – The Growth Strategy
- Policy 2 – Sustainable Communities
- Policy 3 – Environmental Protection and Enhancement
- Policy 4 – Strategic Infrastructure
- Policy 5 – Homes

Norwich Local Plan: Development Management Policies Plan, 2014

- DM1 – Achieving and delivering sustainable development
- DM3 – Delivering high quality design
- DM4 – providing for renewable and low carbon energy
- DM5 – Planning effectively for flood resilience
- DM6 – Protecting and enhancing the natural environment

- DM8 – Planning effectively for open space and recreation
- DM11 – Protecting against environmental hazards
- DM12 – Ensuring well-planned housing development
- DM28 – Encouraging sustainable travel
- DM31 – car parking and servicing

South Norfolk: Development Management Policies 2015

- DM1.1 – Planning effectively for open space and recreation
- DM1.3 – The Sustainable location of new development
- DM1.4 – Environmental quality and local distinctiveness
- DM3.8 – Design principles applying to all development
- DM 3.10 – Promotion of Sustainable Transport
- DM 3.13 Amenity, noise and quality of life
- DM 3.14 -Pollution, health and safety
- DM 4.1 – Renewable energy
- DM 4.2 – Sustainable drainage and water management
- DM 4.3 – Facilities for the collection of recycling and waste
- DM 4.8 – Protection of trees and hedgerows

Norwich City Council Environmental Strategy 2020-2025

- Priority 1 – work with partners, through the Norwich 2040 City Vision, to develop a citywide response to climate change to reduce the city's carbon dioxide emissions
- Priority 2– reduce the council's own carbon dioxide emissions
- Priority 3– increase reuse and recycling in the city and reduce the amount of residual waste
- Priority 4– increase the energy efficiency of all the housing stock in the city
- Priority 5– ensure that new development is carried out in a sustainable way
- Priority 6– support and encourage more sustainable transport solutions

- Priority 7– support a low carbon economy in Norwich
- Priority 8– prepare for the impacts of climate change
- Priority 9– work with local communities to ensure our local environment is protected and enhanced where possible
- Priority 10– work with partners to promote behavioural change to establish a more sustainable society.

Appendix B – Water Calculator

Installation Type	Unit of Measure	Capacity/Flow rate (1)	Use Factor (2)	Fixed use (litres/person/day) (3)	Litres/person/day = [(1)x(2)] + (3) (4)
WC (single flush)	Flush Volume (litres)		4.42	0.00	0
WC (dual flush)	Full flush Volume (litres)	6	1.46	0.00	8.76
	Part flush Volume (litres)	3	2.96	0.00	8.88
WC (multiple fittings)	Average effective flushing Volume (litres)		4.42	0.00	0
Taps (excluding kitchen/utility room taps)	Flow rate (litres/min)	5.00	1.58	1.58	9.48
Bath (where shower also present)	Capacity to overflow(litres)	150.00	0.11	0.00	16.50
Shower (where bath also present)	Flow Rate(litres / minute)	8.00	4.37	0.00	34.96
Bath Only	Capacity to overflow(litres)		0.50	0.00	0
Shower Only	Flow Rate (litres/minute)		5.60	0.00	0
Kitchen/Utility room sink taps	Flow rate (litres/minute)	7.00	0.44	10.36	13.44
Washing Machine	(Litres/kg dry load)	8.00	2.1	0.00	16.80
Dishwasher	(Litres/place setting)	1.25	3.6	0.00	4.50
Waste disposal unit	(Litres/use)	<input type="checkbox"/> Present	3.08	0.00	0
Water Softener	(Litres/person/day)		1.00	0.00	0
	(5)	Total Calculated use (litres/person/day) =SUM(column 4)			113.32
	(6)	Contribution from greywater (litres/person/day)			0
	(7)	Contribution from rainwater (litres/person/day)			0
	(8)	Normalisation factor			0.91
	(9)	Total internal water consumption = [(5)-(6)-(7)]x(8) (litres/person/day)			103.12
	(10)	External water use			5.0
	(11)	Total water consumption (Building Regulation 17.K) =(9)+(10)(litres/person/day)			108.1

Installation Type	Make/Model (mandatory)	Litres/Person/Day
WC (dual flush)	TBC	17.64
Taps	TBC	9.48
Baths (shower(s) present)	TBC	16.50
Showers (bath(s) present)	TBC	34.96
Kitchen Taps	TBC	13.44
Washing Machines		16.80
Dishwasher		4.50



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