WELBORNE, FAREHAM

SUSTAINABILITY STATEMENT INCLUDING ENERGY STRATEGY

MARCH 2017

WSP | PARSONS BRINCKERHOFF

WELBORNE, FAREHAM

SUSTAINABILITY STATEMENT INCLUDING ENERGY STRATEGY

Buckland Development Ltd.

Final – For Client Approval

Project no: 50400027
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WSP | Parsons Brinckerhoff
6 Devonshire Square
London EC2M 4YE

Tel: +44 (0) 207 337 1700
Fax: +44 (0) 207 337 1701
www.wsp-pb.com

QUALITY MANAGEMENT

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Prepared by	Sabbir Sidat / Harry Knibb	Sabbir Sidat / Harry Knibb	
Signature			
Checked by	Barny Evans	Barny Evans	
Signature			
Authorised by	Richard Hutchings / Michael Spoor	Richard Hutchings / Michael Spoor	
Signature			
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1 SUMMARY

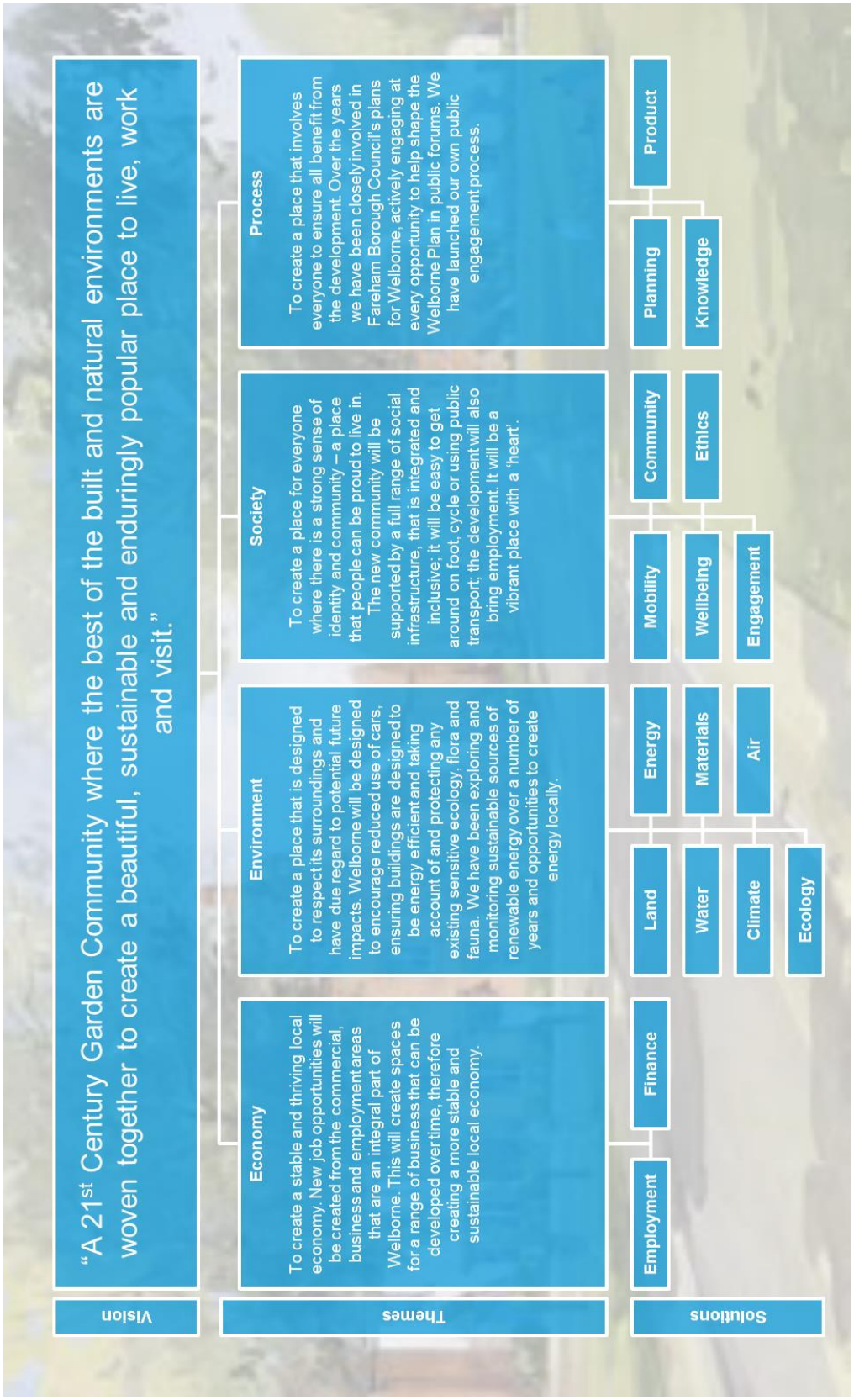
Buckland Development Limited (BDL) are bringing forward proposals for Welborne - a 6,000 dwelling, mixed use and sustainable new community to meet the growth needs of Fareham. Welborne is a critical element of the Fareham Development Plan and is an important component of the South Hampshire Strategy. It is located largely north of the M27 at Junction 10 – east and west of the A32. The red line boundary of the application also extends to the south of the M27, as part of the delivery of Green Infrastructure. Fareham Borough Council's (FBC) adopted Welborne Plan (forming Part 3 of the Local Plan) provides site specific guidance to shape the practical development of the new community over the period to 2036. Welborne will set new standards for high quality sustainable development and contribute significant new public open spaces, community facilities and employment generation for the whole Borough.

For the purposes of this report, the issues of sustainability have been broken down into four sections; economy, environment, society and process. The WSP | Parsons Brinckerhoff "Orbis" tool has been used to review the Welborne Plan and break down the issues raised in to sub-issues (or solutions) with a response set out. Other documents (which form part of the application) have been referenced where they should be consulted for further detail.

Considering the build out period of this project (projected to be completed in 2036), the proposals have been purposely designed to be flexible and adaptable for future updates to good practice. Further information will be made available in the form of the detailed applications for each phase, although in general they will conform to the themes and ambitions set out in this document. This strategy intends to form the framework which subsequent detailed applications will follow.

Figure 1-1 describes the overall vision for Welborne as well as our approach to tackling each of the four sustainability themes. Table 4-1 provides a brief outline of how the proposals respond to The Welborne Plan.

Figure 1-1 Welborne sustainability principles



2 INTRODUCTION

2.1 PROJECT DESCRIPTION

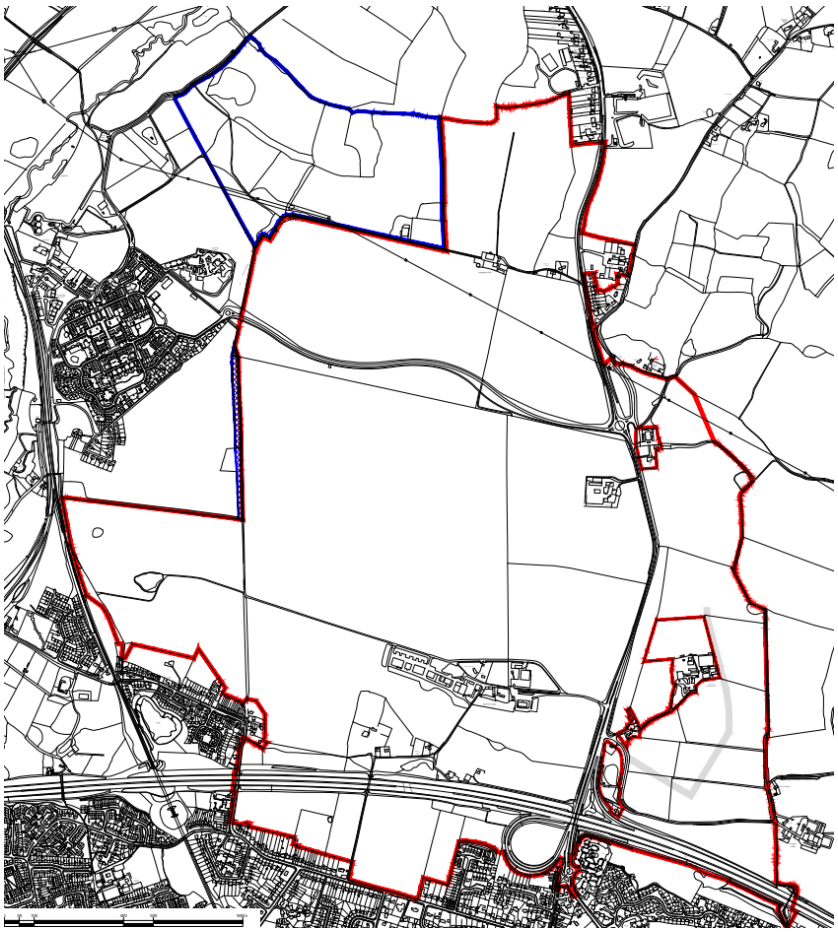
A new community of up to 6,000 dwellings (C3 and C2, including a care home of use class C2) together with a district centre [comprising up to 2,800m² food store retail (A1), up to 2,419m² of non-food retail (A1) and up to 2,571m² of other non-convenience/comparison retail use (A1 – A5)]; a village centre [comprising up to 400m² food store retail (A1), up to 1,081m² of non-food retail (A1), a public house (up to 390m² A4 use) and up to 339m² of other non-convenience/comparison retail use (A1 – A5)]; up to 30,000 m² of commercial and employment space (B1); up to 35,000 m² of general industrial use (B2); up to 40,000 m² of warehousing space (B8); a hotel (up to 1,030 m² C1 use); up to 2,480 m² of community uses (D1 and D2); up to 2,200 m² ancillary nursery (D1), health centre (D1) and veterinary services (D1); retention of Dean Farmhouse and Dean Farm Cottages; a secondary school and 3 primary schools; green infrastructure including - formal and informal open and amenity space; retention of some existing hedgerows, grassland, woodland areas, allotments, wildlife corridors; all supporting infrastructure; household waste recycling centre; requisite sub-stations; sustainable drainage systems including ponds and water courses; a remodelled M27 J10 including noise barrier(s); works to the A32 including the creation of three highway junctions and new crossing(s); distributor roads (accommodating a Bus Rapid Transit network) and connections to the surrounding cycleway and pedestrian network; car parking to support enhanced use of Dashwood; ground remodelling; any necessary demolition; with all matters reserved for future determination with the exception of the works to M27 J10 and the three highway junctions and related works to the A32.

Fareham Borough Council has clearly set out their vision for the new community by establishing a number of high level development policies and general design themes via the Welborne Plan. Our vision for Welborne will be implemented through our design principles which are informed by the Council's policies.

We are seeking to ensure Welborne is a sustainable development and that our application responds to the requirements of the Welborne Plan.

Figure 2-1 Aerial Photograph of the Proposed Site – note that this is indicative only and does not highlight excluded areas within the application boundary as illustrated in the figure below (credit: FBC)

Figure 2-2 Application Area (Application boundary within red line)



2.2 PURPOSE OF THIS REPORT

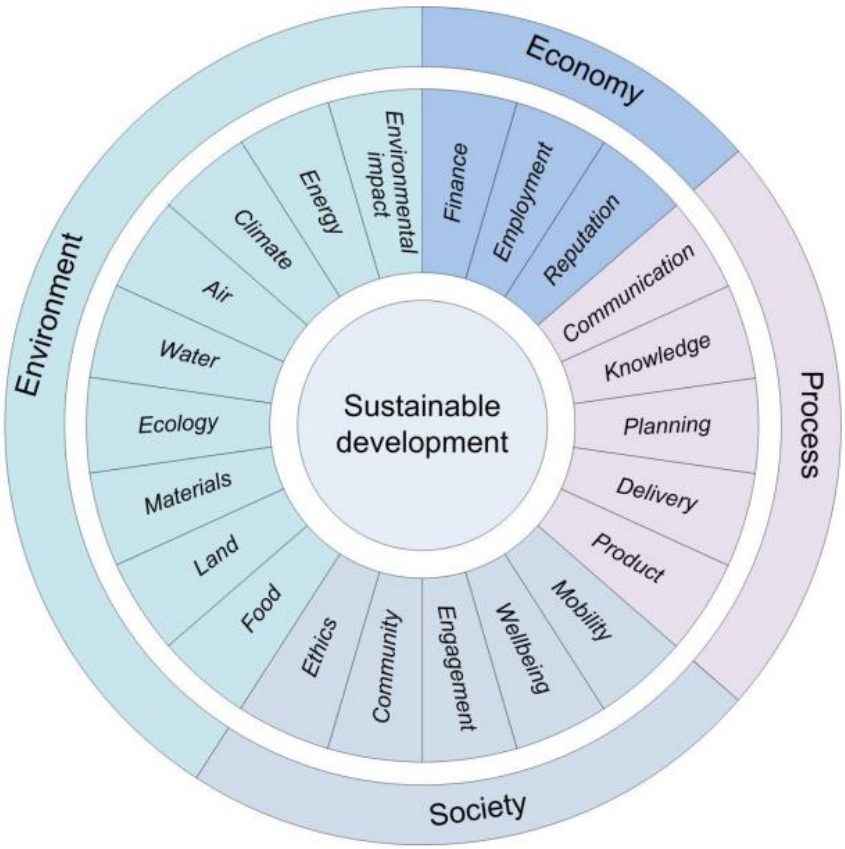
This Sustainability and Energy Statement explains how BDL seeks to address related issues in the Welborne Plan. To give clarity in the analysis and explanation the WSP|PB 'Orbis' tool has been used. 'Orbis' has been designed to provide a comprehensive framework for managing the large array of sustainability issues a project like this would face. It is a tool which can be used to quickly and easily to analyse sources of sustainability information (such as documents, workshops or discussions with the council or other stakeholders). The output is a visual chart highlighting individual topics and themes identified to be addressed. The aim of this is to develop a mechanism that gives a clear framework for assessment.

Orbis has been used to assess the Fareham Local Plan Part 3: The Welborne Plan (June 2015). From that it is has identified issues and categorised them under the following headings:

- Economy
- Environment
- Society
- Process

The image shown in the appendix outlines the full range of aspects we have considered as part of the sustainability analysis using Orbis; over 140 different aspects in total. Figure 2-3 below, shows a simplified version of this diagram.

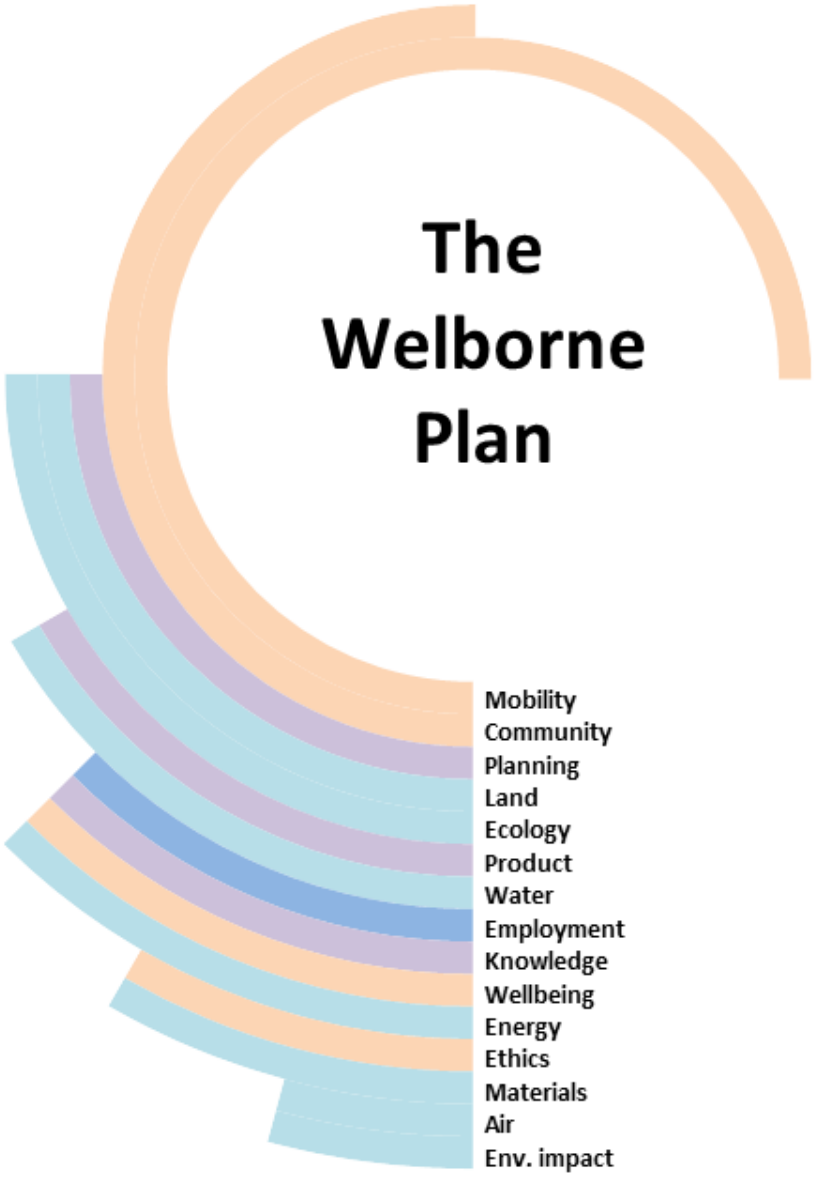
Figure 2-3 Orbis - major categories



This Orbis image allows for comparison of information sources as well as gap analysis. This Sustainability Statement addresses each of the sustainability topics mentioned in the Welborne Plan and also explain how the proposed development may seek to go beyond the minimum requirements.

The analysis, detailed in Appendix B is summarised in Figure 2-4 which identifies the key headings. Issues around mobility (transport infrastructure, sustainable travel, travel management, transport infrastructure, accessible services and access for all) are the highest profile issues raised in the document, followed by community (regional heritage, social inclusion, diversity, quality of life, regional development and sustainable communities).

Figure 2-4 The Welborne Plan - Orbis Summary of Issues



3 SUSTAINABILITY STATEMENT

This Sustainability Statement provides a response to the Welborne Plan as interpreted by the Orbis tool, under the four main headings of Economy, Environment, Society and Process.

Below is a schedule of the policies in the Welborne Plan addressing sustainability. A brief response can be found in Section 4.

Table 3-1 Schedule of policies and locations

POLICY	DESCRIPTION	LOCATION
WEL17	Market Housing	p21
WEL18	Affordable Housing	p21
WEL20	Wheelchair Adapted Homes	p21
WEL21	Custom Build Homes	p21
WEL23	Transport Principles for Welborne	p17
WEL24	Strategic Road Access	p17
WEL25	Local Road Transport and Access	p17
WEL26	Public Transport	p17
WEL27	Encouraging Sustainable Choices	p17
WEL28	Walking and Cycling	p17
WEL29	On-site Green Infrastructure	p19
WEL30	Impact on Internationally Protected Sites and Off-Site Green Infrastructure	p16
WEL31	Conserving and Enhancing Biodiversity	p16
WEL32	Strategic Green Corridors and Connections	p11
WEL36	Energy	p12
WEL37	Water Efficiency, Supply and Disposal	p13
WEL38	Water Quality and Aquifer Protection	p13
WEL39	Flooding and Sustainable Drainage Systems	p13
WEL40	Household Waste Recycling Centre and Recycling	p14

3.1 ECONOMY

3.1.1 Employment and Finance

The Welborne development will create a significant boost to employment in the region; both in the long term (once the development is complete) but also during the long construction period (the projected completion date being 2036).

During the build-out there will be a range of construction and trade jobs which will be created along with apprenticeships. Currently this is estimated as being equivalent to 539 full time jobs.

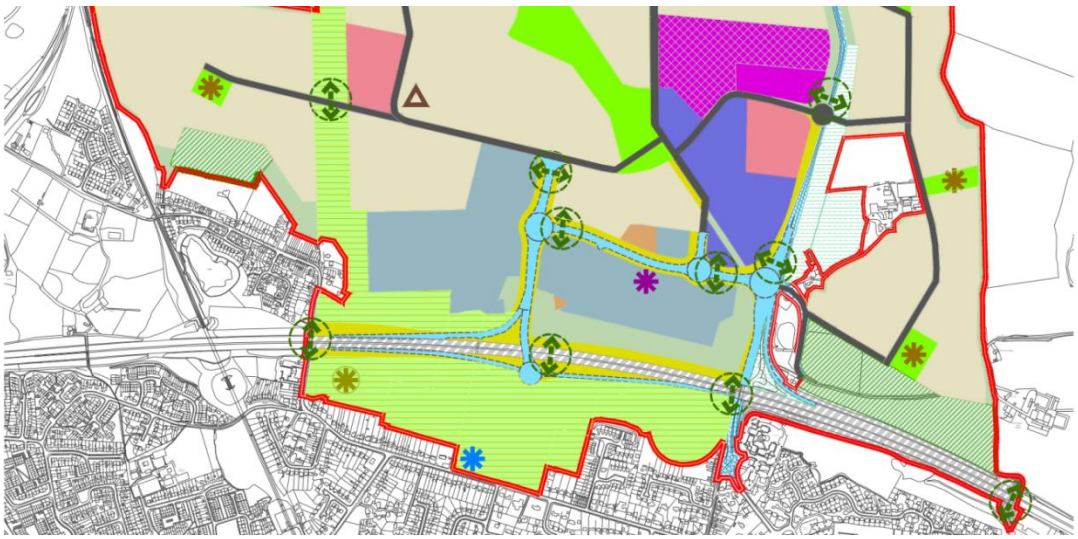
Over time, there will be a variety of permanent job types including retail, education, professional services (medical facilities, vets, etc.) and at the sporting facilities. This will build upon the aim to create an economically sustainable development at Welborne and create accessible new jobs for people of all abilities and meet the employment needs of this new community.

In line with the Welborne Plan, the area of the site close to the Motorway will provide over 100,000m^2 of employment space (commercial and employment, general industrial and warehousing). The employment area will provide a range of commercial building sizes, suitable to accommodate start-ups as well as established business. Internally, an emphasis will be made on future-proofing by creating flexible and adaptable spaces which can evolve with the needs of the tenants and market drivers. This means that the economic growth which is hoped to be realised by the commercial and business centres are retained providing long-term high quality jobs. Homes will also be designed to take into account home working and how this trend is predicted to increase in the future.

When considering the operational phase of the development, it is estimated that over 2,200 jobs will be created as a result of the employment area (Use classes B1, B2 & B8), retail (A1 to A5) and community facilities (D1 and D2). In addition to this, further employment may be generated due to the planned hotel and schools.

Further details can be found in the *Socio-Economic Statement* for the site.

Figure 3-1 Employment Areas (in pale blue)



3.2 ENVIRONMENT

3.2.1 Land

The development is designed to be sensitive to the local environment. It will create significant areas of green space, private gardens and public spaces interconnected through a network of green corridors (Figure 3-2 below). The Welborne Plan has identified four different character areas at Welborne and the BDL design follows these principles. Each of the character areas will have distinct design aspirations informed by the surrounding landscape. This will influence density, building heights and layout, which will in turn inform the architectural design in subsequent detailed applications.

The value of non-designated landscapes has been assessed considering a range of criteria including landscape condition, scenic quality, rarity, lighting, wildness / tranquillity etc. Likely significant effects have been identified, along with actions to provide mitigation (where possible) as well as identifying any residual effects. Mitigation effects include retention of woodland and listed buildings as well as the use of landscape buffers, a central park, reduced density housing along the eastern site boundary and use of tree-lined residential streets.

Work has been undertaken to also consider the long-term impacts, i.e. 15 years after completion. By this time landscape mitigation would become established, with the development becoming assimilated into the landscape and the built form softening.

Further details can be found in the *Visual Impact Assessment* for the site as well as the *Design and Access Statement*.

Figure 3-2 Left – Interconnected green spaces, Right – Green spaces near homes

3.2.3 Energy / Climate Change

Multiple layers of energy and carbon requirements apply to any development at a national, regional and local level, each of which requires different targets to be met. The development will be designed to meet those requirements applicable at each phase of development during the detailed applications.

All developments must meet the prevailing Building Regulations requirements. The current requirements are set out in Part L 2013 and this has been used as the basis of the E*nergy Strategy* appended to this document. Subsequent applications will adhere to the prevailing requirement which may be different.

The Welborne Plan aspires to 10% of the residential development being constructed to Passivhaus standard subject to viability being achieved and BDL proposals will seek to comply with this requirement. The Welborne development will meet the prevailing Building Regulation requirements with regards to energy use and efficiency using a fabric first approach and the appropriate use of renewable energy where applicable.

Further details can be found in the *Energy Strategy* for the site which can be found in Appendix A.

It should be noted that in 2013 we were actively involved in promoting a large solar park 5 mile east of Welborne. Planning permission was secured and connection completed in Spring 2015. Welborne Energy LLP has been established to own and operate the solar park which provides 40 megawatts of energy to the grid.

Figure 3-3 Left – Solar PV panels, Right – Heat pump

3.2.4 Water

One of the most pressing issues that all new developments must take into account is the management of water; ensuring a sustainable supply and efficient usage as well as surface water management. Our approach will follow best practice in this area to reduce water consumption where possible, in compliance with the prevailing building regulations. For example all new homes at Welborne will incorporate water meters; these are expected to reduce water use by between 5-15% compared to homes without according to the water supplier for the region.

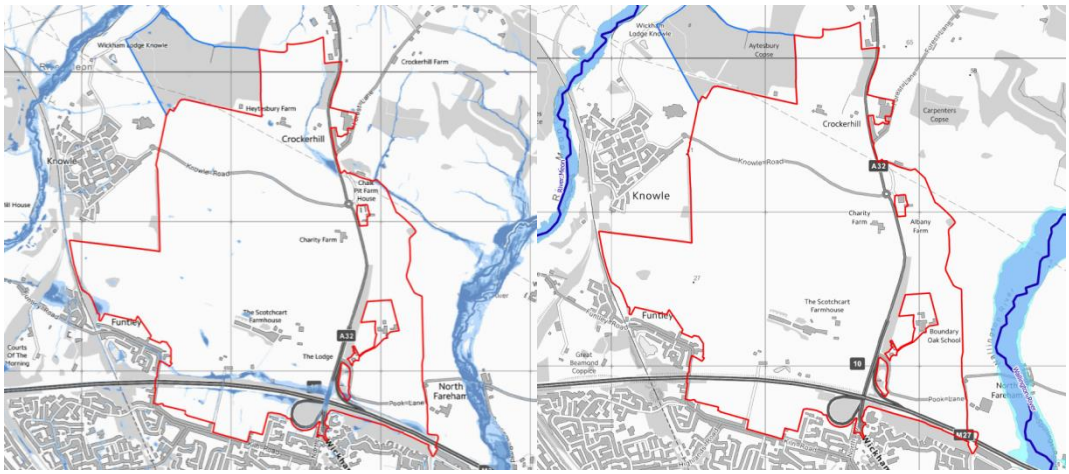
Current Building Regulations state that new dwellings must be designed for potable water consumption to not exceed 125 litres per person per day (l/p/d). This may be reduced in future reviews of building regulations and our approach will therefore need to be flexible to allow compliance with any changes to these during the build-out period. The Welborne Plan specifies a more ambitious target of 105 l/p/d; this will be targeted as part of these proposals and may be achieved through the installation of dual flush WCs, flow restricted taps or water efficient washing machines and dishwashers.

Sustainable Urban Drainage systems (SUDS) will be implemented across the site. They will be designed to efficiently and sustainably drain surface water, while minimising pollution, and seek to retain run-off on site i.e. no net increase in run-off into existing drainage infrastructure. The development will include SUDs to ensure flood risk from fluvial and pluvial sources does not increase the potential for flooding both on and off the site as a result of this new community. The specific features will vary across the site depending on the area, but could include permeable paving beneath driveways, soakaways, swales alongside roads and geocelluar storage tanks.

Overall the existing risk of flooding is considered low or negligible, (i.e. <1% annual probability) for most sources of flood risk, although risk from pluvial/overland which is considered to be between low and high. The risk of the proposed development exacerbating flood risk is considered low or negligible for all sources and will be mitigated through the proposed use of SUDS.

Further details can be found in the *Flood Risk Assessment, Drainage Strategy* and *Utilities Statement* for the site.

Figure 3-4 Left – Environment Agency risk of flooding from surface water, Right – Environment Agency flood zones



3.2.5 Materials

The use and selection of materials will be carefully considered. The materials will be sympathetic and respectful to the character of the surrounding villages and preference will be made to materials that are sustainable, preferring those performing well in the Green Guide to Specification, and contributing to the efficiency of the buildings.

Waste and recycling for this development from both the construction and 'in use' phases will be considered. A construction waste management plan will be prepared as part of the detailed applications for each subsequent phase.

Residential and commercial waste receptacles will be adequate to deal with the likely amount of waste produced and conveniently located for easy access. The waste and recycling provision will be in accordance with the requirements of the waste collection and disposal at time detailed applications are submitted. A Household Waste Recycling Centre will be located on-site (in the employment area). This will serve not only the new Welborne development, but the wider community as well.

Figure 3-5 Example of local building materials

3.2.6 Air

Generally Fareham has good air quality. Findings and recommendations from Fareham Borough Council regarding the improvement of air quality have been considered by them in the development of the Welborne Plan. Measures such as the introduction of the bus rapid transport (BRT), providing real time bus information at stops and the promotion of walking and cycling, could all reduce air pollution in the future.

During the construction phase there will be impacts to both local air quality and dust/particulate matter emissions. Therefore mitigation will be in place in the form of a dust management plan, daily inspections, the installation of barriers / screens, the covering and dampening of earthworks etc. These mitigation measures will ensure that the risk of adverse impact on air quality from dust will be negligible. Specific details will be provided at the detailed applications stage for each of the phases on the specific actions that will be put in place to limit the emissions of pollutants such as Particulate Matter and Nitrogen Oxides.

Further details can be found in the *Air Quality Assessment* for the site.

Figure 3-6 Left - Water suppression of a cut-off saw, Right – Example dust extraction unit

3.2.7 Ecology

A defining feature of Welborne will be its green character and use of Garden City principles to create a sustainable new community. It will feature a range of open spaces with the built environment structured around green spaces. This will provide health and social benefits to the residents while also enhancing the ecological and biodiversity value of the site.

Biodiversity plays an important role in achieving sustainable development. It includes all species of animals and plants and the natural systems that support them. As well as the environmental benefits of maintaining biodiversity, it also plays a vital role in the physical and mental health and wellbeing of people and provides a link to the natural environment.

The site is currently largely open arable farmland with some hedgerows, coppices and woodland at the periphery. We will seek to protect these areas and sensitive habitats through the provision of green infrastructure areas located to protect the most ecologically important parts of the site and grassland buffers for ancient woodland.

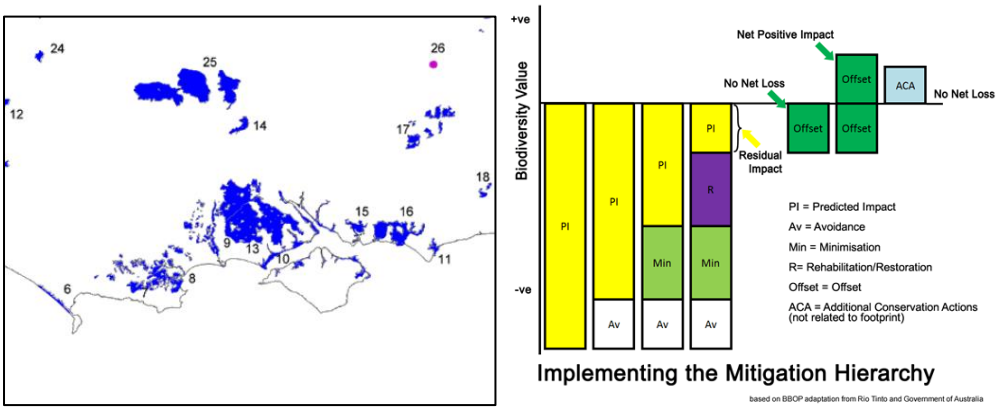
An assessment of the likely significant impacts for the construction and operational phases of the development has been undertaken. While three internationally important designated sites are located within 5km of Welborne, the impact during construction is designated as being negligible. While there is an impact due to increased visitor numbers during the operational phase, proposed methods have been identified to mitigate any negative effects.

The proportion of woodland within the redline boundary of the Site is small and the majority will be retained and protected during the construction phase. Similarly any hedges lost as a result of construction activities will be replaced on a like-for-like basis. Pond creation measures will benefit amphibians, while the two badger sets found on the site will be retained and protected. The large woodland of Dashwood is included in our proposals for Welborne but falls outside the application red line boundary.

By introducing a range of 'new' habitats - gardens, allotments, natural green spaces, parks, additional trees and enhanced woodland – we are expecting a biodiversity net gain.

Further details can be found in the *Ecology Assessment* for the site.

Figure 3-7 Left – Defra Distribution of Special Protection Areas in the south of England, Right – mitigation hierarchy



3.3 SOCIETY

3.3.1 Mobility

Transport and mobility play an important role in the design of Welborne, both in the physical sense of providing suitable infrastructure for the community to operate without congestion or safety issues, but also encouraging healthier and sustainable choices through well considered design and planning. Our approach to design has incorporated a high level of internalisation and walkable neighbourhoods, reducing the need for journeys via private transport.

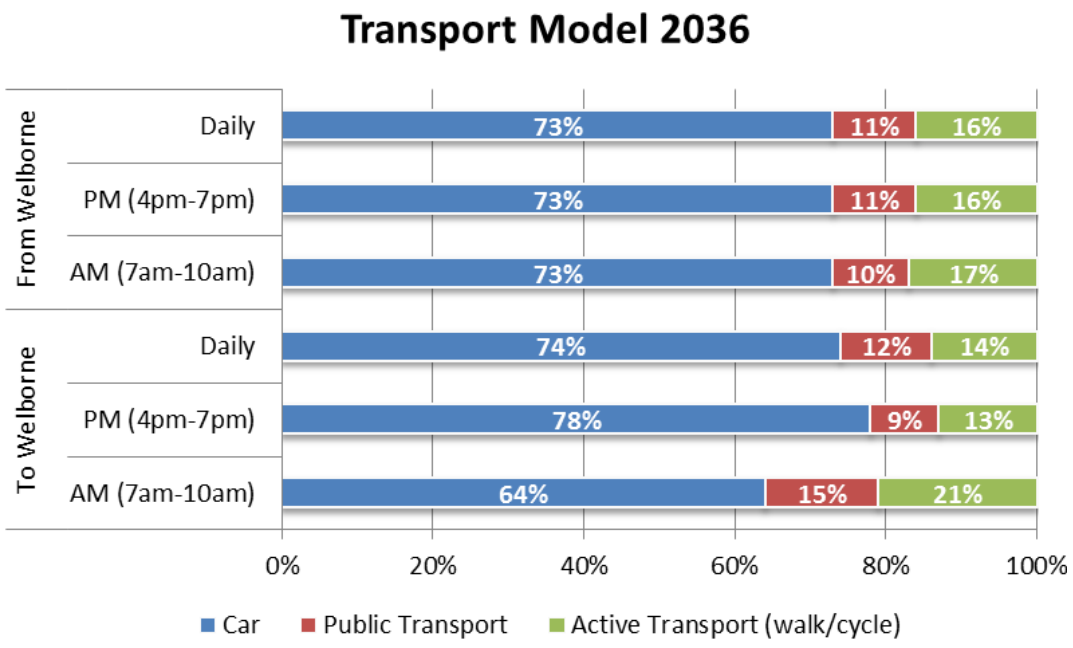
Welborne will be balanced in favour of sustainable forms of transport and where possible making neighbourhoods walkable, while also incorporating features such as Bus Rapid Transport (BRT) to provide an alternative to the car. Similarly we have designed for a green and safe community which will link the people to the environment and allow them to make short journeys by walking or cycling.

Space will be safeguarded for a potential rail station to serve Welborne, although the existing rail station at Fareham is located only 3km south of the site and can be accessed via a short bus or cycle journey. Later phases could anticipate increased electric vehicle charging provision (with initial focus on the feasibility of incorporating these into the detailed applications for the Village and or District Centres). In accordance with the Welborne Plan, the M27 Junction 10 will be improved to provide for all turning movements onto and off the motorway from the A32.

See *Welborne Transport Assessment, Public Transport Strategy, Travel Plan* and *Walking and Cycling Strategy* (submitted as part of this application) for further detail. Transport issues associated with the construction of the site will be covered in the *Construction Traffic Management Plan* associated with each phase.

Figure 3-8 below shows the forecast mode share for journeys to and from Welborne in the AM and PM peak periods in 2036.

Figure 3-8 Projected transport model at completion (2036)



3.3.2 Community

The green, walkable layout which links people to nature will help develop a sense of community at Welborne which is vibrant and serves a range of age groups and lifestyles.

The vision for Welborne is to create a sustainable community providing homes, jobs, community facilities and infrastructure. The needs of the entire community will be catered for by providing a range of housing types; this includes starter homes, family homes, retirement homes and homes for the less-abled and affordable. This is also addressed though the proposed provision of Lifetime Homes (15% of dwellings subject to viability), wheelchair accessible homes (2% of dwellings subject to viability) and affordable housing (30% of dwellings subject to viability).

Green spaces, commons, parks and SANGS will help bring the community together as will the choice of housing types; a preference of low-rise, detached and semi-detached over high-rise buildings. Community halls will be provided at the Village and District Centres for use by local groups as hubs, as will the numerous sporting facilities and educational facilities at the site.

The scheme design will also be sensitive to existing heritage assets including the 'long barrow' at the south of the site. This will be incorporated into the Central Park and will act as a feature with appropriate signage and information.

Figure 3-9 Examples of Community facilities

3.3.3 Wellbeing

The “Garden City” (and “Garden Village”) principles we have adopted support the health and wellbeing of Welborne’s future residents and visitors. Urban parks will be conveniently located to be accessible and meet the recreational needs of the community and will be present at the heart of each of the four character areas, (i.e. Woodland, Downland, Meadow and Parkland as described by the Welborne Plan). This will provide residents a space to exercise as well as relax in quiet and tranquil surroundings. These parks will contain a variety of sports pitches for outdoor games.

Away from these dedicated areas, civic spaces within the Village and District centre will have a mix of hard and soft public landscaping. Allotments are proposed; these provide a variety of benefits including encouraging healthy eating, providing light exercise. Lastly private front and rear gardens within homes and residential development blocks provide safe space for children’s play, gardening, relaxation and a healthy lifestyle.

Figure 3-10 Example of Recreational facilities

3.3.4 Ethics

The vision is for Welborne to be a place which is enduringly popular with its residents and visitors; BDL intends to retain its stewardship and long term management as a sign of its commitment to creating a sustainable place.

A sustainable community will hinge upon engagement with residents and their ongoing involvement in management, governance, and development proposals. The balance of activity will change over time. Initially there will be a focus on infrastructure delivery and design quality. However the emphasis will subtly shift to focus more on management and maintenance, particularly of communal facilities. A flexible approach to delivery is required with a range of management structures.

Some of the Development Management Principles that this development will follow include design quality (ensuring high standards), self-sufficiency (green infrastructure, community services and education needs are met at each phase), flexibility (to respond to the changing needs of Welborne) and community engagement.

Further details are provided in the *Delivery Management Strategy* included as a separate document as part of this application.

3.3.5 Engagement

Through the development of our latest proposals we have engaged with the people of Fareham and neighbouring villages to ensure their specific concerns are noted. To date this has been in the form of workshops, public information events (held recently in July and November 2016) and website feedback forms.

A total of 116 responses were received following the first event with an additional 48 at the second. Feedback from the first public information event was used to inform the information provided in the second one; 82% of attendees at the first event found it 'very' or 'somewhat' informative, while this percentage increased to 92% for the second event.

The feedback from these events showed that the biggest concern was obtaining further clarity around roads and transport; especially how the additional vehicles would be accommodated, with many requesting further information on this topic. In general, across the two events there was broad support for the approach taken around parks, green spaces and landscaping.

Further details are provided in the *Statement of Community Involvement* included as a separate document as part of the application

Figure 3-11 Welborne proposal exhibition

3.4 PROCESS

3.4.1 Planning / Product

The development has been designed in a consistent and coherent manner. It is proposed to deliver significant infrastructure upgrades such as an 'all moves' M27 Junction 10, bus rapid transit, cycle and pedestrian routes and non-residential and community functions. The scheme has been developed to provide homes, jobs, community facilities and infrastructure of the right size and type, located in the optimum locations.

Our approach aims to meet requirements set out in the Welborne Plan and our vision. 15% of the dwellings are proposed to be built according to the Lifetime Homes standard, subject to viability, making them adaptable to residents' changing needs; this will be specified on a phase by phase basis. Approximately 2% of the dwellings are proposed to be wheelchair adapted and specialist care facilities have been allowed for.

Alongside this Lifetime Homes standard, Welborne is proposed to feature a provision for affordable homes in accordance with the Welborne Plan requirements (Policy WEL18). 30% of the affordable homes will be produced for 'intermediate housing' (such as shared ownership schemes) with the rest being produced for affordable or social housing renting – all subject to viability.

In line with the requirements, the proposals also allow for the provision of 10% of the dwellings to meet Passivhaus standard, subject to viability. These set out an exemplar standard in energy efficiency, CO_2 emissions and running costs. Further details on this can be found in the *Energy Strategy*, in the appendix.

3.4.2 Knowledge

Welborne will have provision for 3 primary, and 1 secondary school; this will be in addition to nurseries and pre-schools. It is proposed that these facilities and their associated sports fields could be a resource available to the community.

The long term nature of the development phases allows for opportunities to offer a substantial range of apprenticeships and training programmes in construction related and other trades.

4 WELBORNE POLICY RESPONSE

Table 4-1 Schedule of policies

POLICY	DESCRIPTION	SUMMARY
WEL17	Market Housing	A mix of good quality market homes to be provided for a range of household types. 15% of all market homes, subject to viability, to meet Lifetime Homes standard,
WEL18	Affordable Housing	The development will provide affordable housing in accordance with Welborne Plan.
WEL20	Wheelchair Adapted Homes	Approximately 2% of the homes in the initial phases are proposed to be wheelchair adapted.
WEL21	Custom Build Homes	Approximately 1% of the homes in the initial phases are proposed to be delivered as custom build plots.
WEL23	Transport Principles for Welborne	A high quality public transport system is proposed, including extending the BRT and encouraging sustainable forms of transport. Routes are provided to encourage a walkable neighbourhoods and cycling where possible.
WEL24	Strategic Road Access	An 'all moves' Junction 10 of the M27 is to be provided, designed in accordance with the HCC and HE requirements.
WEL25	Local Road Transport and Access	Improvements are to be made to accommodate the increase in traffic and funding provided for off-site works, if required.
WEL26	Public Transport	The development will propose to extend the BRT system and other bus routes and safeguard space for a new train station.
WEL27	Encouraging Sustainable Choices	The Travel Plan has been provided separately as part of this application; modal shares of transport have been described and how sustainable forms are encouraged.
WEL28	Walking and Cycling	The development has been designed to ensure walkable neighbourhoods with walking and cycling encouraged through a network of green spaces and streets. The development will include good pedestrian and cycle links to key destinations.
WEL29	On-site Green Infrastructure	Open spaces will meet minimum standards, with sports provision provided and green infrastructure and play areas close to dwellings.
WEL30	Internationally Protected Sites and Off-Site Green Infrastructure	An Ecology Assessment has been undertaken detailing the potential impacts on habitats and biodiversity on national and internationally important sites. Onsite and offsite measures have been identified in order to avoid and mitigate impacts.
WEL31	Conserving and Enhancing Biodiversity	An Ecology Assessment has been undertaken with priority habitats and species identified along with mitigation. Over the project we aim to achieve a biodiversity net gain.
WEL32	Strategic Green Corridors and Connections	The majority of residential dwellings will be located within 200m of the green infrastructure network. It is anticipated that the number of residential dwellings beyond this distance will be close to connected by green links and other green spaces
WEL36	Energy	The Energy Strategy is provided to demonstrate how the site will comply with

POLICY	DESCRIPTION	SUMMARY
		requirements.
WEL37	Water Efficiency, Supply and Disposal	Water fittings are to be designed to good practice to reduce water use
WEL38	Water Quality and Aquifer Protection	All runoff from the various land uses will discharge through SUDS features with adequate pollution mitigation indices to protect the receiving groundwater from potential contamination.
WEL39	Flooding and Sustainable Drainage Systems	A Flood Risk Assessment has been provided. The SUDS will be used to manage surface water, control run off, be integrated with the green infrastructure and built to appropriate standards.
WEL40	Household Waste Recycling Centre and Recycling	A new Household Waste Recycling Centre is proposed in the employment area as per the Welborne Plan recommendation. Storage space for domestic waste and recyclable materials awaiting collection will be provided for at all domestic and non-domestic buildings in compliance with local authority requirements.

APPENDIX A – ENERGY STRATEGY

A. POLICY CONTEXT

I. FAREHAM CORE STRATEGY

The Fareham Core Strategy was adopted in August 2011. This documents sets out a number of requirements for the Fareham area as well as some general aims and objectives for the proposed Welborne development. Policy CS15 sets out the requirements for the development with regards to sustainable development. The minimum building standards required under this policy is replicated in the table below.

Table A-1 Proposed Development Use classes

RESIDENTIAL CODE FOR SUSTAINABLE HOMES TARGETS		NON-RESIDENTIAL WITH A FLOOR SPACE OF OVER 500 M^2 AT LEAST FOLLOWING BREEAM STANDARDS
Until the end of 2011	3	BREEAM 'Very Good'
from 2012	4	BREEAM 'Excellent'
from 2016	6	BREEAM 'Excellent'

The proposed development will be required to meet a BREEAM rating of at least 'excellent'. However since the production of the core strategy, the Code for Sustainable Homes standard is now defunct, along with the planned 'zero-carbon' homes and these targets are no longer applicable.

The document does however promote the construction of energy efficiency buildings 'fabric first' approach and use of renewable technologies where viable and appropriate to Design Principles. Strategic Objective "SO12" of the Fareham Core Strategy aims to "increase energy and water efficiency and encourage and promote the use of renewable energy sources to help adapt to climate change". Specifically on the new development, it states that "It will be an exemplar of energy efficient design" and "It will aim to meet its own renewable energy needs in a viable fashion".

II. THE WELBORNE PLAN

The Local Plan Part 3: The Welborne Plan was adopted in June 2015 and follows on from the Core Strategy. On the topic of energy, it requires that planning applications for Welborne be supported by an Energy Strategy demonstrating the development will:

- Optimise energy efficiency by minimising the use of energy through design, layout, orientation, landscaping and materials;
- Achieve high energy efficiency standards for all buildings, including meeting the Passivhaus Standard subject to viability; and
- Secure energy supply, maximising the use of low or zero carbon technologies including district energy networks.

In addition, proposals for residential development shall incorporate 10% of dwellings built to Passivhaus Standard, unless it can be demonstrated to be unviable by means of a financial assessment which clearly demonstrates the maximum proportion of dwellings built to Passivhaus Standard which can be achieved.

III. BUILDING REGULATIONS (PART L)

All new buildings constructed in the UK must meet the requirements of the UK Building Regulations. Specifically with regards to energy and carbon compliance, all buildings must meet the building regulations Part L 'Target Emission Rate' (TER) requirements for the Part L revision which is current at the time of initial construction works for each particular developmental phase. The requirements of

Part L 2013 currently apply to the Site. This includes the requirement for the dwellings to meet the new Target Fabric Energy Efficiency standards (TFEEs) introduced set out in AD L1A 2013. Similarly the new non-residential elements of the development will be subject to AD L2A 2013.

IV. PROPOSED DEVELOPMENT AMBITIONS

In light of the above, our approach to this development is to meet the national guidelines as set out in the Approved Documents in terms of fabric standards and overall CO_2 emissions. The aim of the development is to meet these requirements. This will be achieved through specifying a combination of improved building fabric, air tightness, clean or green technologies.

Listed properties on the site will be retained and protected.

BDL is committed to ensuring a long term responsibly designed site which actively contributes to sustainable development.

Figure A-1 Approved documents Part L 2013

Table A-2 Proposed Development Use classes

LAND USE	DESCRIPTION	YIELD (NET AREA)
RESIDENTIAL		6,011 DWELLINGS
EMPLOYMENT	B1A OFFICE	30,000 SQM
	B1C/B2 LIGHT INDUSTRIAL	35,000 SQM
	B8 WAREHOUSE	40,000 SQM
DISTRICT CENTRE	SUPERMARKET	2,800 SQM
	GENERAL A1-A5	5,090 SQM
	COMMUNITY CENTRE	1,480 SQM
VILLAGE CENTRE	CONVENIENCE STORE	400 SQM
	GENERAL A1-A5	1,810 SQM
NURSERIES	7 SITES	2,200 SQM
SCHOOLS	3 PRIMARY	2,000 SQM
	1 SECONDARY	2,000 SQM
HOTEL	1 HOTEL	1,030 SQM

As per good industry practice, this Energy Strategy will calculate the baseline emissions and then utilise the 'Be Lean', 'Be Clean' and 'Be Green' hierarchy to improving energy efficiency.

B. BASELINE CARBON EMISSIONS

I. CALCULATION METHODOLOGY AND RESULTS

For the residential properties (NHER Plan Assessor) SAP software was used to establish the baseline regulated carbon emissions and unregulated carbon emissions from the development. The results for a representative sample of properties (11 in total) were then pro-rated to calculate the baseline carbon emissions and energy demand for the dwellings across the whole development. This was calculated using the SAP 2012 reference values (which sets out a reasonable baseline standard).

The exact floor areas for the domestic units will vary depending on the final design and as such mid values for the proposed ranges have been used in the calculations. The current accommodation schedule has been provided below.

Table B-1 Indicative housing mix and floor areas

HOUSE TYPE	SIZE RANGE (SQ. FT.)	ASSUMED SIZE (SQ. FT.)	HOUSE	FLAT	TOTAL	%
1 Bed Flat	450-550	500		107	733	12%
	500-600	550		626		
2 Bed Flat	600-800	700		118	568	9%
	750-850	800		450		
2 Bed House	600-700	650	143		1,249	21%
	650-850	750	300			
	700-800	750	356			
	750-850	800	4501			
3 Bed House	800-1,000	900	547		1,957	33%
	800-900	850	558			
	900-1,000	950	645			
	900-1,200	1,050	207			
4 Bed House	1,000-1,200	1,100	398		1,048	17%
	1,200-1,400	1,300	180			
	1,400-1,550	1,475	367			
	2,000-2,400	2,200	36			
	1,100-1,300	1,200	67			
5 Bed House	1,550-1,700	1,625	233		447	7%
	1,700-2,000	1,850	136			
	2,000-2,400	2,200	78			
Sum			**4,701**	**1,301**	**6,002**	**100%**

Energy modelling was undertaken based on the National Calculation Methodology (NCM) in order to establish the baseline carbon emissions for the four warehouse units which make up the commercial detailed application. Any building services assumed have complied with the limiting values listed in the relevant Non-Domestic Building Services Compliance Guide. We utilised a dynamic simulation software package, the Virtual Environment (VE) suite from Integrated Environmental Solutions (IES). This is a fully validated commercially available software package that is available for the purpose of demonstrating compliance with the Building Regulations. IES <VE> is an integrated suite of applications based around a 3D geometrical model.

As layouts or elevations of the non-domestic buildings are not as yet available, representative buildings have been modelled to represent each of the use types. This allows for a representative notional Building Emissions Rate to be obtained for use in calculating the total energy use and carbon emissions.

Figure B-1 SBEM models of typical warehouse/ light industrial units using IES VE

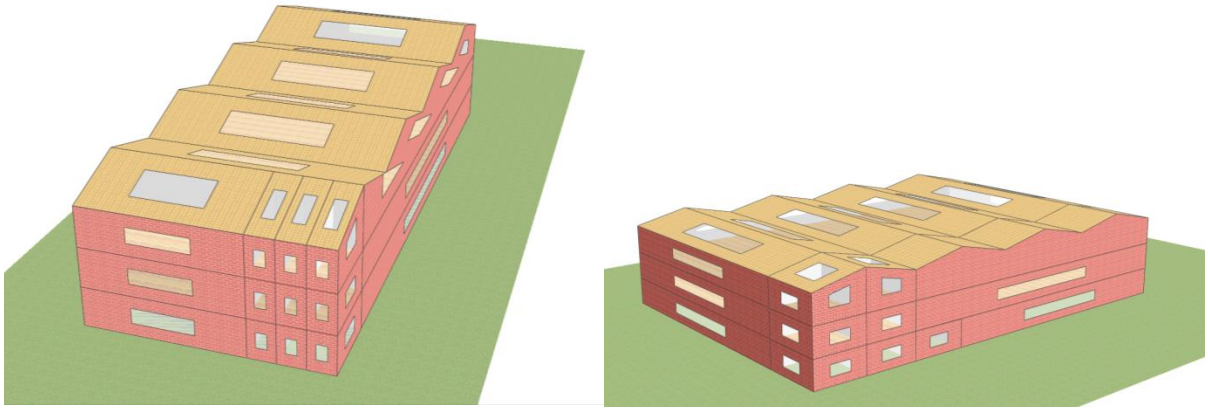


Table B-2 summarises the baseline fabric performance of the new residential buildings (compared to the backstop limiting values), while Table B-3 summarises the baseline fabric performance for the new commercial buildings. Table B-4 summarises the baseline carbon emissions for the whole development.

As drawings showing the elevations for the new domestic properties are not yet available, appropriate glazing percentages were provided on the facades so that a good balance between favouring daylight levels and beneficial heat gains in winter and avoiding excessive heat gains in summer could be achieved.

- For the domestic units, 25% of the floor area was estimated for the windows (guidance from SAP 2012)
- For the commercial models the glazed areas were estimated as per the NCM modelling guide for buildings other than dwellings in England and Wales 2008

Table B-2 Baseline fabric performance – New Domestic

ELEMENT	BASELINE FABRIC PERFORMANCE	LIMITING FABRIC PERFORMANCE
Windows overall U-value (W/m^2K)	1.4	2.0
Party wall U-value (W/m^2K)	0.00	0.20
External wall U-value (W/m^2K)	0.18	0.30
Floor U-value (W/m^2K)	0.13	0.25
Roof U-value (W/m^2K)	0.13	0.20
Air permeability ($m^3/hr.m^2$ @ 50 Pa)	5.0	10

Table B-3 Baseline fabric performance – New Commercial

ELEMENT	BASELINE FABRIC PERFORMANCE	LIMITING FABRIC PERFORMANCE
Windows overall U-value (W/m^2K)	1.6	2.2
Party wall U-value (W/m^2K)	0.00	0.00
External wall U-value (W/m^2K)	0.26	0.35
Floor U-value (W/m^2K)	0.22	0.25
Roof U-value (W/m^2K)	0.18	0.25
Air permeability ($m^3/hr.m^2$ @ 50 Pa)	5.0	10.0

Through the use of the building fabric as summarised in Table B-2 and Table B-3, the modelled emissions from the residential element of the development is projected to show a reduction in regulated carbon emissions below Building Regulation requirements. Although the notional baseline fabric values already shows how minimum compliance may be attained. The detailed applications for the phase may show some variance in the fabric standards whilst ensuring overall compliance.

Table B-4 Overall baseline regulated and unregulated carbon emissions

BUILDING REGULATIONS PART L 2013 COMPLIANT DEVELOPMENT	REGULATED EMISSIONS (TCO_2)	UNREGULATED EMISSIONS (TCO_2)
Domestic (using baseline fabric value)	8,467	4,474
Domestic (Part L target)	8,488	4,474
Commercial (Part L target)	2,874	N/A

The calculations above however, do not take into account for any of the properties achieving Passivhaus status. These would have energy use which is roughly a third of other similar buildings and therefore the emissions associated with the development are expected to be much less than those shown in the above table.

II. PASSIVHAUS HOMES

The term “Passivhaus” refers to a standard for energy efficiency and occupant comfort in buildings that was developed in Germany in the 1990s. The standard can be applied not only to residential dwellings but also to commercial, industrial and public buildings. It can be applied to new buildings as well as refurbishments. The key principles that the Passivhaus Standard is based on are shown in Table B-5.

In the UK, a number of organisations are licensed to certify Passivhaus buildings, including the Association for Environment Conscious Building (AECB) and the Building Research Establishment (BRE).

"A Passivhaus is a building, for which thermal comfort can be achieved solely by post-heating or post-cooling of the fresh air mass, which is required to achieve sufficient indoor air quality conditions – without the need for additional recirculation of air."

– Passivhaus definition

Figure B-2 Passivhaus Principles

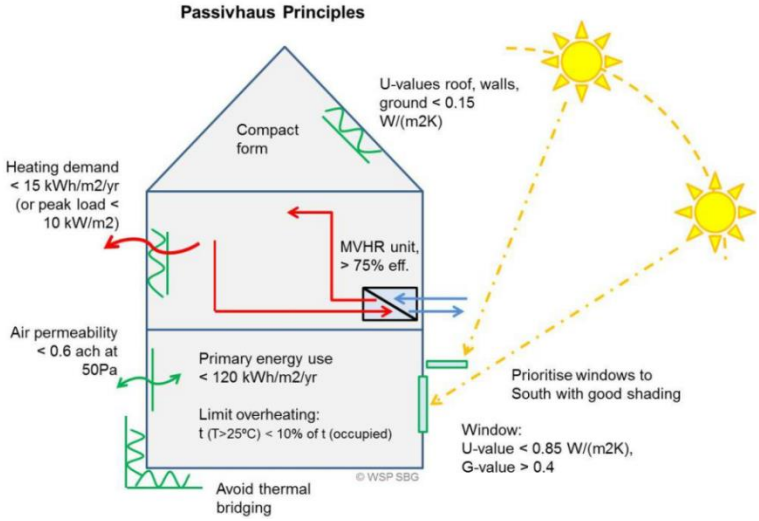


Table B-5 Passivhaus – Energy Targets

CRITERIA	LIMIT
Specific Heat Demand	<15 kWh/m^2 per year
Specific Cooling Demand	<15 kWh/m^2 per year
Specific Heat Load	<10 W/m^2
Specific Primary Energy Demand	<120 kWh/m^2 per year
Air Changes Per Hour	<0.6 @n50

In order to achieve the above, a Passivhaus design should consider using the fabric values outlined in Table B-6 as a starting point. In addition to this, the building should have a compact form (to minimise heat loss), maximise solar gain from the South, use shading or natural elements to minimise the risk of overheating, avoid thermal bridging and ensure all appliances (such as fridges, cookers, washers etc.) are of a high efficiency.

Table B-6 Baseline fabric performance – New Domestic (Passivhaus)

ELEMENT	TYPICAL FABRIC PERFORMANCE
Windows overall U-value (W/m^{2}K)	≤0.80
Party wall U-value (W/m^{2}K)	0.00
External wall U-value (W/m^{2}K)	≤0.13
Floor U-value (W/m^{2}K)	≤0.13
Roof U-value (W/m^{2}K)	≤0.13
Air permeability (m^3/hr.m^2 @ 50 Pa)	≤1.0

C. BE LEAN: REDUCE ENERGY DEMAND

The Proposed Development will incorporate a number of relevant energy conservation measures; the benefits of which are discussed below. In summary the following measures are expected to be included:

- High levels of air tightness
- High performance building fabric
- High performance glazing
- 100% low energy lighting

I. BUILDING FABRIC

The building fabric in all the properties will meet the prevailing minimum requirements in order to meet Part L of the building requirements. In order to surpass these current requirements there are three options open:

1. The use of improved building fabric and high efficiency building services only (Demand side) with renewable energy providing the full reduction in carbon dioxide emissions (Supply side).
2. A combination of supply and demand side improvements

It is intended that the exact combination of energy efficiency and low carbon technologies, if required, will be confirmed at the detailed application stages; the most suitable solution may vary through the course of the different construction phases. Therefore the options shown here are indicative of likely solutions based on site issues.

The current proposals for the building fabric performance for the Proposed Development alongside indicative fabric improvements which are required to provide different levels of savings are summarised in Table C-1. Table C-2 shows the recommended commercial building fabric values. This is unchanged from the recommended values as research suggests that increasing the performance of the building fabric can often lead to increases in cooling load and overall higher CO_2 emissions. This will however depend on the specific building type and use.

II. BUILDING SERVICES

A M&E building services Specification, in line with Building Regulations, is proposed for the entire residential scheme as well as the commercial scheme.

Table C-3 lists the general specification for the heating system, lighting and ventilation strategy for the proposed commercial and residential properties.

Table C-1 Fabric performance targets – New Domestic

ELEMENT	BASELINE FABRIC VALUES	~ 5% DER REDUCTION	~ 10% DER REDUCTION
Windows overall U-value (W/m^{2}K)	1.4	1.2	1.2
Party wall U-value (W/m^{2}K)	0.00	0.00	0.00
External wall U-value (W/m^{2}K)	0.18	0.16	0.13
Floor U-value (W/m^{2}K)	0.13	0.11	0.10
Roof U-value (W/m^{2}K)	0.13	0.13	0.09
Air permeability (m^3/hr.m^2 @ 50 Pa)	5.0	5.0	3.0

Table C-2 Fabric performance targets – New Commercial

ELEMENT	FABRIC PERFORMANCE TARGET
Windows overall U-value (W/m^{2}K)	1.6
Party wall U-value (W/m^{2}K)	0.00
External wall U-value (W/m^{2}K)	0.26
Floor U-value (W/m^{2}K)	0.22
Roof U-value (W/m^{2}K)	0.18
Roof Light U-value (W/m^{2}K)	2.2
Air permeability (m^3/hr.m^2 @ 50 Pa)	1.6

Table C-3 General heating, cooling, ventilation and lighting specification

ELEMENT	GENERAL SPECIFICATION
Ventilation	Natural ventilation
Internal lighting	100% low energy
Primary heat source	100% of the heat to the housing units be supplied by individual condensing gas boilers with a minimum 89.5% seasonal efficiency 100% of the heat to the commercial units be supplied by individual condensing gas boilers with a minimum 91% seasonal efficiency
Heating controls	Programmer, Thermostats, TRVs including weather compensation and modulating burner controls
Heat emitters	Radiators throughout
Cooling	None (may be required for certain non-residential building types such as offices)

Again, the specifications for the Passivhaus homes are expected to be different. As these will be extremely air tight, (mechanical ventilation with heat recovery) MVHR units will likely be used to ensure air quality and reduce energy use. As these properties have such a low energy use, a typical heat distribution system (such as having radiators or underfloor heating throughout) is often not needed but instead a small heating element in the air supply itself is sufficient to warm the entire property.

Table C-4 General heating, cooling, ventilation and lighting specification

ELEMENT	GENERAL SPECIFICATION
Ventilation	Mechanical Ventilation Heat Recovery (MVHR), >75% efficiency
Internal lighting	100% low energy
Primary heat source	Not required, secondary heating through heating element in MVHR, or bathroom towel radiator/under floor radiator
Primary DHW source	Solar thermal, resistance or heat pump
Heating controls	Optimal
Heat emitters	N/A
Cooling	None

Glossary

TER – The Target Emissions Rate is the minimum energy performance requirement for new dwellings and non-dwellings. This is expressed in annual kg of CO_2 per m^2

DER – The Dwelling Emissions Rate is the predicted energy performance calculated using the SAP methodology

BER - The Building Emissions Rate is the predicted energy performance calculated for non-domestic buildings

Regulated Energy – Energy use related to building quality such as space heating, domestic hot water, pumps/fans and non-communal lighting

Unregulated Energy – Energy use related to occupancy in particular through cooking and use of appliances.

D. BE CLEAN: SUPPLY ENERGY EFFICIENTLY

After energy demand has been reduced through the application of energy efficiency measures, the next step is to consider low carbon technologies in order to provide further reduction in carbon dioxide emissions.

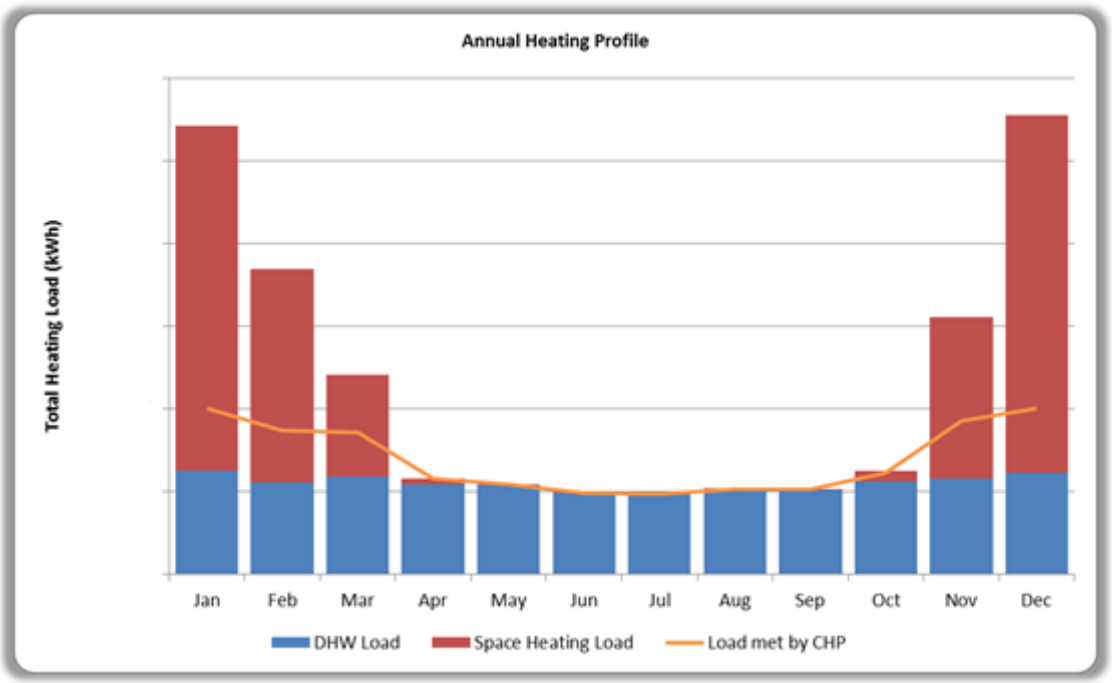
The following low carbon technologies have been investigated for the Proposed Development.

- Combined Heat and Power (CHP)
- District heating network

I. COMBINED HEAT AND POWER (CHP)

On the basis that the development cannot be supplied directly from a district heating network (see below), in line with the requirements of the Welborne Design Guidance document we have investigated the feasibility of a centralised CHP led LTHW heating system. If a district heat network was viable, then a CHP unit would have been a potential source of low carbon heat. As this is not the case, the CHP can only be considered for individual buildings. The most likely buildings for the installation of a CHP engine are potentially the schools. However schools do not have a consistent level of domestic water demand which is required for an effective CHP unit. The example graph below shows the typical annual hotel heating profile for a hotel (and the heat contribution from CHP engines) which does have a consistent level of domestic water demand and is suitable for a CHP unit. Therefore a CHP unit is not currently recommended for any of the buildings at the development or for the site wide development.

Figure D-1 Typical Annual heating profile showing provision from a CHP led heating system



II. DISTRICT HEATING NETWORK

As part of the proposed new development at Welborne, the feasibility of a district heating network across the site utilising a centralised energy centre has been considered. This work builds upon the outline feasibility study produced in October 2013 by Hampshire County Council, while also taking to account more recent information on the development as well as industry best practice.

No existing district heating systems were identified in the local area for the proposed development to which it could connect. The closest heat network is located at Queen Alexandria Hospital in Cosham, Portsmouth approximately 6 miles away. This system is made up of two 1.633MWe gas-fired CHP units producing 1.2 MWth of low temperature hot water and 1.5MWth of steam. However the distance between this system and Welborne makes this option unrealistic for extension

After considering the thermal demand density of the certain representative residential elements of the development, it has been judged that a district heat network would not be viable for this site given the nature of the planned development at this stage in time and its low thermal demand due to the efficiency.

Based on the anticipated low thermal density on the sit a site-wide district heating network will not be viable or efficient. An exception to this may be commercial centres where small centralised boiler plant serving a multi-occupancy building could be considered.

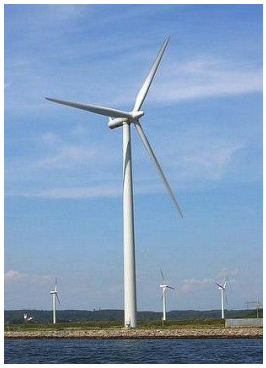
E. BE GREEN: RENEWABLE ENERGY TECHNOLOGIES

Renewable Energy Technologies are those listed below which can provide a source of energy on-site that is not primarily based on the consumption of fossil fuels or grid electricity and/or utilises a heat source that is renewable such as ground source and solar thermal systems.

- Wind Power
- Biomass Heating
- Air / Ground Source Heating and/or Cooling
- Solar Thermal Hot Water Heating
- Photovoltaic Panels

In accordance with the best practice, a number of renewable energy technologies have been evaluated with regard to how they may be applied to the development.

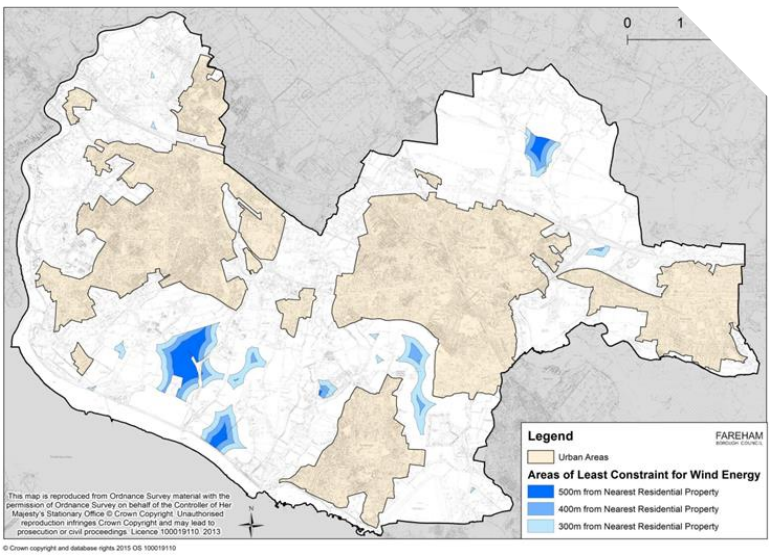
I. WIND POWER



Harnessing the kinetic energy of wind can provide a renewable source of onsite electricity generation. Wind turbines need to be positioned where a frequent and steady source of wind is available that is not too turbulent or uneven in direction. In urban areas wind turbines are typically positioned on the roof of buildings that are significantly higher than their surroundings and or located in open areas where there is minimum disruption to prevailing winds.

Built up areas are not conducive to most types of wind turbines, while they also bring planning issues such as visual impact, noise and conservation. The Fareham Local Plan outlines areas in which there are the least planning constraints for wind energy; differentiating from both urban and rural areas and taking into account the distance from the nearest residential property, National Designations, areas of special landscape character, conservation areas, transmission lines etc. This plan does not indicate that the site would be suitable for large scale wind turbines.

The Fareham Renewable and Low Carbon Capacity Study (Parsons Brinckerhoff 2013) indicates that the theoretical wind resource is fairly good across the site, generally more favourable across the west of the borough and towards the south. Regarding this site in particular, the increase in the number of sensitive receptors due to the Welborne development will eliminate the potential for any large standalone wind turbines primarily due to noise and aesthetics (visual impact). Also of concern is the effect on the visually sensitive ridge line.



Therefore Standalone wind turbines are not considered suitable for this development. The built up nature of the proposed Welborne development, both in terms of the number of buildings and trees, also means that building integrated wind turbines are also judged to be not recommended.

II. BIOMASS HEATING

Biomass boilers burn sustainably sourced wood in the form of pellets and chips to provide low temperature hot water (LTHW). These types of heating plant can work alongside conventional gas or oil boilers to provide a low carbon heating system. Although CO_2 is emitted during the burning of the wood, this is balanced during the growing of the plant where it absorbs CO_2 from the atmosphere reducing net CO_2 emissions to a very low level. It is not typically practical on individual dwellings due to their low thermal demand and so typically serves a communal heating scheme or commercial/industrial end uses. Biomass fuel has pollution impacts from transport and fuel combustion which makes it less desirable in Air Quality Management Areas (AQMAs).

A review of the potential impact on air quality from increased wood fuelled biomass use in London has been carried out by AEA Energy & Environment, and was published in December 2007. The assessment indicates that potentially increasing the contribution from small-scale wood fuelled biomass combustion may lead to a substantial increase in nitrogen dioxide and particulate matter concentrations. The scheme is not located in an AQMA area.

A site wide communal system has also been discounted at this stage, although may be viable for the proposed schools or other community buildings. This technology may be viable upon detailed analysis for a small minority of non-residential buildings, to be considered at detailed planning.

III. HEAT PUMPS

Heat pumps use electricity to turn low grade heat to a higher temperature suitable typically for LTHW applications. They work most effectively when the source temperature (whether that is the external air, the ground, or a large body of water) is at a relatively high temperature while the required output temperature is relatively low i.e. between 35ºC and 45ºC. Some heat pumps can also be reversed to provide cooling.

Heat pumps produce no emissions at point of use and so do not have an impact on air quality in the local area. An added benefit is that their carbon emissions reduce as the electrical grid has and will decarbonise.

Heat pumps are measured by their coefficient of performance (CoP); that is the ratio of input electricity to the output of heat. Air source heat pumps (ASHPs) generally operate between a CoP of 2.5 and 3, while a good ground or water source heat pump (GSHP / WSHP) may operate between 3.5 – 4.5. These CoPs vary considerably depending on the local source temperatures and the building heat distribution system.

This technology operates most effectively when used to provide space heating via a very low temperature heating system such as underfloor heating or low temperature radiators. If higher temperatures are required, the CoP reduces.

As ground temperatures are stable year round, GSHPs provide a consistent level of performance year round. Whereas the coefficient of performance of air source heat pumps is directly related to the air temperature. This means the CoP of an ASHP drops in the winter, when demand is greatest but rises in the summer when heating is not normally required. Examination of borehole records around the site indicate that much of the geology up to 100m below the ground is made up of mainly ‘upper chalk’ which has a thermal conductivity in the region of 1.7 W/mK.

WSHPs can be open loop systems, where the source water is passed directly through the heat pump, or a closed loop system where a plate heat exchanger maintains hydraulic separation between the source water and water passing through the heat pump. Systems can be more flexible than ground source heat pump systems, but have other restrictions such as a limit on the temperature of water being rejected or may become inoperable if the body of water freezes. The CoP of a WSHP can vary with the source temperature but is generally comparable to GSHPs while having a far smaller space requirement for an equivalent heat output.

The British Geological Society heat pump screening tool describes the area as being favourable, with most of the site over a good aquifer with a capacity of over 6l/s and at a depth of less than 50m below the ground. The former Hospital in Knowle used to have its own water supply though a well, at a depth of 120ft, again supporting the potential of a water source heat pump.

Similarly the Wallington River has been assessed using the National Heat Map and suggests a capacity of over 500kW may be accessible for developments in that area. Similarly the River Meon has a capacity of almost 2MW.

On this basis, heat pumps of all types (air, water ground) are all potentially suitable for this development on an individual building basis and will be considered at a detailed stage of design.

IV. SOLAR THERMAL

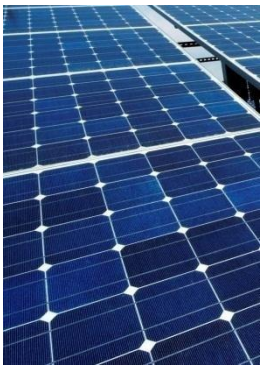
Solar thermal (STH) generation involves capturing solar radiant heat to preheat or heat domestic hot water.

Correctly located and orientated, solar thermal systems can meet a proportion of a building's domestic hot water, typically around 50%, dependent on the expected demand profile and available space for locating STH collectors.

Although STH normally only takes up a small proportion of roof space, it will be competing for roof space against solar PV which can provide a larger carbon saving for the amount of capital employed, making it the preferred choice for most buildings.

STH collectors do have an aesthetic impact and this may militate against their use, at least on pitched roofs where they cannot be hidden.

Solar thermal systems are most effective during the summer and provide reduced benefit in the winter. As all buildings will have hot water demand STH is a potentially suitable technology and will be considered at a detailed design stage taking account of viability and proposed Design Code.



V. PHOTOVOLTAIC PANELS

Photovoltaic panels (PV) generate electricity from sunlight which can either be consumed on site, or exported to the grid.

The feasibility of providing photovoltaic (PV) panels has been assessed based upon estimated energy production (kWh) from the installed location along with manufacturers cost data to enable a life cycle cost analysis to be undertaken. Panels correctly oriented, maintained and not obscured by shading can be expected to provide in the region of 1,100kWh/kWp in Fareham; the south coast is one of the best locations in the UK for solar generation potential.

There is an aesthetic impact of installing solar panels in a location such as this and it is likely there will be a preference for integrated solar solutions such as solar tiles, (see below) although these are more expensive and slightly less efficient.

On this basis PV may be a suitable technology for some of the buildings and this will be considered at the detailed design stage taking account of viability and proposed Design Code.

Figure E-1 Examples of building integrated solar PV panels

VI. SUITABILITY APPRAISAL

All renewable energy technologies which may be considered feasible for the scheme have been assessed, though none a suggested for inclusion at this point in time, the outcomes of which are summarised below:

Table E-1 Renewable technology suitability appraisal

TECHNOLOGY	APPRAISAL
Wind	Not suitable at this site
Biomass	Potentially suitable for buildings with larger thermal demands, but not dwellings
Heat Pumps	Potentially suitable for a range of building types
Solar Thermal	Potentially suitable for a range of building types, particularly those with flat roofs
Photovoltaic Panels	Potentially suitable for a range of building types,

F. RESULTS

The three principal steps taken; Be Lean (Use Less Energy), Be Clean (Supply Energy Efficiently) and finally Be Green (Renewable Technology measures) are summarised below.

I. ENERGY CONSERVATION AND ENERGY EFFICIENCY (BE LEAN)

Through the application of the measures identified in Section C, the regulated carbon emissions are shown to be 8,488 TCO_2 per annum for the domestic scheme and 2,572 TCO_2 per annum for the commercial elements.

II. SUPPLY ENERGY EFFICIENTLY (BE CLEAN)

The application of low carbon technologies has been explored.

There are no district heating networks in the immediate area, and the installation of one for the housing development is not considered technically or commercially viable. Similarly the use of CHP doesn't not provide a viable solution for the residential or commercial units examined here and is likely to increase CO_2 emissions, but may be suitable for a particular building, depending on function.

III. RENEWABLE TECHNOLOGY (BE GREEN)

The feasibility of a range of renewable technologies has been assessed. Although a number of renewable energy generating technologies may be viable, integrated Solar PV is the preferred option at this point in time.

The proposals for the Site outlined within this energy strategy are considered to maximise the potential carbon savings which can be achieved on site through the provision of:

- Building fabric and building services plant which are at a minimum compliant to Building Regulations.
- 100% low energy lighting to dwellings and maximised use of LED and low energy fixtures elsewhere.
- Potential use of a Solar PV system to offset carbon.

Overall, the Proposed Development is expected to meet to the Part L 2013 requirements. This is to be used as indicative for the entire site, although the ways in which each phase will reach this requirement may change and the combination of building fabric improvements and energy efficiency measures will vary as designs are developed.

APPENDIX B – ORBIS ANALYSIS

I. OVERVIEW

The image below shows the full range of aspects considered as part of the sustainability analysis using the Orbis framework; over 140 different aspects in total. Having broken sustainability down into the four categories of Environment, Economy, Society and Process, we can further subdivide them different ‘areas’, ‘themes’ and ‘aspects’.

The inner ring of the Orbis diagram describes the various areas examined. These include Energy, Climate, Air, Water, Knowledge, Planning and Mobility

The outer ring of the Orbis diagram subdivides these areas into different themes. For example Air can be divided into Noise and Air Quality, while Water is divided into Flooding, Water Resource and Water Quality as different themes.

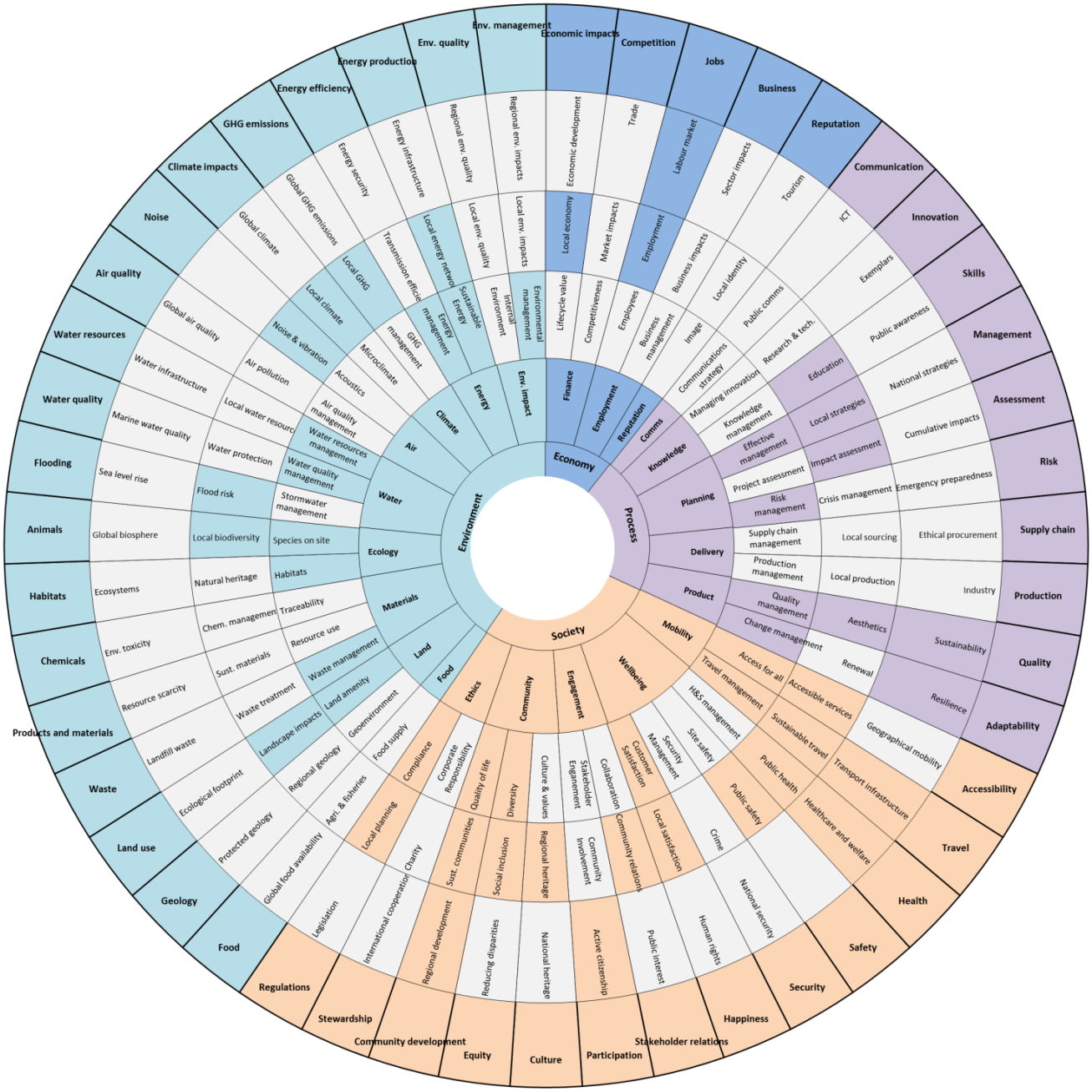
The circles in-between the Areas and Themes describe the various Aspects; from a project level toward the centre, to a local and then wider level the further out. Again, on the Theme of Air Quality, aspects such as air quality management, air pollution and lastly global air quality can be considered.

When undertaking sustainability research, be it in the form of policy and strategy documents (e.g. The Welborne Plan), legislation and planning regulations (e.g. Local Plan), assessment methods, (e.g. sustainability standards), best practice guidance, workshops, meetings etc. we can map these against the Aspects covered in the Orbis diagram in order to provide a simple visual output which allows for easy comparison.

Where Aspects are mentioned, the segment is coloured in, otherwise they are greyed out. The aim of this is not to colour in the entire diagram, but to promote discussion and ensure all Aspects have been considered and a decision on them actively made. There are many items for the new development which may be irrelevant for this particular project (for example sea level rise) and therefore can be disregarded further in this study. However it is useful to at least consider each of these Aspects and form a response.

During the analysis, the number of mentions of each Aspect is also noted, this allows for a crude bar chart to be constructed which can be used as an indicator of relative importance.

The image shows the result of this exercise of analysis against the Fareham Local Plan Part 3: The Welborne Plan (June 2015)


Environment
Economy
Society
Process
Env. impact
Energy
Climate
Air
Water
Materials
Land
Food
Ecology
Finance
Employment
Reputation
Comms
Knowledge
Planning
Delivery
Product
Wellbeing
Engagement
Community
Ethics
Mobility
Env. management
Env. quality
Energy production
Energy efficiency
GHG emissions
Climate impacts
Noise
Air quality
Water resources
Water quality
Flooding
Animals
Habitats
Chemicals
Products and materials
Waste
Land use
Geology
Food
Economic impacts
Competition
Jobs
Business
Reputation
Communication
Innovation
Skills
Management
Assessment
Risk
Supply chain
Production
Quality
Adaptability
Accessibility
Travel
Health
Safety
Security
Happiness
Stakeholder relations
Participation
Culture
Equity
Community development
Stewardship
Regulations
Regional env. impacts
Local env. impacts
Economic development
Trade
Labour market
Sector impacts
Tourism
ICT
Exemplars
Public awareness
National strategies
Cumulative impacts
Emergency preparedness
Ethical procurement
Industry
Sustainability
Resilience
Geographical mobility
Transport infrastructure
Healthcare and welfare
National security
Human rights
Public interest
Active citizenship
National heritage
Reducing disparities
Regional development
Charity
Legislation
Global food availability
Protected geology
Ecological footprint
Landfill waste
Resource scarcity
Env. toxicity
Ecosystems
Global biosphere
Sea level rise
Marine water quality
Water infrastructure
Global air quality
Global climate
Global GHG emissions
Energy security
Energy infrastructure
Regional env. quality
Local env. quality
Local economy
Market impacts
Employment
Business impacts
Local identity
Public comms
Research & tech.
Education
Local strategies
Impact assessment
Crisis management
Local sourcing
Local production
Aesthetics
Renewal
Accessible services
Sustainable travel
Public health
Public safety
Crime
Local satisfaction
Community relations
Community involvement
Regional heritage
Social inclusion
Sust. communities
Quality of life
Diversity
Culture & values
Stakeholder Engagement
Collaboration
Customer Satisfaction
Security Management
H&S management
Site safety
Access for all
Travel management
Corporate Responsibility
Compliance
Local planning
Agri. & fisheries
Food supply
Geoenvironment
Land amenity
Waste management
Resource use
Traceability
Habitats
Species on site
Local biodiversity
Natural heritage
Chem. management
Sust. materials
Waste treatment
Landscape impacts
Regional geology
Flood risk
Stormwater management
Water quality management
Water resources management
Water protection
Local water resources
Air pollution
Noise & vibration
Air quality management
Acoustics
Microclimate
GHG management
Energy management
Transmission efficie
Local energy netwo
Local GHG
Local climate
Sustainable Energy
Environment
Internal
Environmental management
Lifecycle value
Competitiveness
Employees
Business management
Image
Communications strategy
Managing innovation
Knowledge management
Effective management
Project assessment
Risk management
Supply chain management
Production management
Quality management
Change management