Social Space, de Havilland

Planning, Design and Access Statement

MARCH 2017

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1.0 INTRODUCTION

This Planning, Design and Access Statement has been prepared by Sheppard Robson on behalf of the University of Hertfordshire. Additional input has been provided by Turner & Townsend, Couch Perry Wilkes, Aecom and Turnberry. It accompanies and supports the planning application for the Social Space, de Havilland. The statement explains how the proposed development is a suitable response to the site and its setting, and demonstrates that it can be adequately accessed by prospective users.

This document accompanies the planning application for de Havilland campus for the University of Hertfordshire. It is intended to supplement the information required by Welwyn Hatfield Local Authority by summarising the functional requirements of the brief, together with the architect's interpretation of the site context and the response to it.

Section 42 of 2004 Town and Country Planning Act substituted the Section 62 of the 1990 Act so as to provide a statement covering design concepts, principle and access issues submitted with an application for planning permission. It states that one statement should cover both design and access, allowing applicants to demonstrate an integrated design approach that would deliver exclusive design and address a full range of access requirements throughout the design process.

A key purpose of the Planning, Design and Access Statement is to achieve good design, supporting the role in the delivery of sustainable development through the planning system. This is a fundamental objective of the Planning Policy and as such is reflected in the National Planning Policy Framework.

1.1 Overview

In 2012 Welwyn Hatfield Borough Council (WHBC) endorsed the University of Hertfordshire's 2020 Estates Vision which set out the development strategy for the University over a 10 year period, covering both the de Havilland and College Lane campuses. Since receiving council endorsement a significant amount of development has taken place in accordance with the Masterplan including the new Student Residences, Science Building, Reception, Hub Building and Boulevard.

As well as identifying future development projects for the University, the 2020 Vision set out key issues and opportunities for each campus.

The £120 million de Havilland Campus was completed in 2003 and offers a high quality, contemporary teaching and learning environment being home to the Business School, School of Humanities, School of Education and School of Law, whilst also accommodating the Sport Village as well as student residences. As a relatively new campus, the 2020 Vision did not identify many requirements for improvement however it did highlight that outdoor spaces on campus are underused and that informal learning and social spaces are lacking.

Easily accessible indoor and outdoor social spaces are significant provisions within a campus setting, necessary to support and enhance the academic offering, delivering a comprehensive campus experience for staff and students. Many higher education institutions are now finding themselves having to retrofit such spaces into the campus to respond to the evolving needs of staff and students.

Club de Havilland currently provides the main indoor social space located on the de Havilland Campus situated in the south west corner of the campus. This building has long been considered a sub-optimal due to its peripheral location, size, layout and distance from other social and informal uses.

The relocation of Sports Science from CP Snow on College Lane to Club de Havilland has also strengthened the requirement for a new social space building on campus as this relocation will displace the existing social use within the building.

Based on the current deficiency of accessible social space on campus coupled with the fact that Sports Science will soon be relocating to Club de Havilland there is a requirement for a new, centrally located social space building at de Havilland which this planning proposal responds to.

Pre-Application Consultation

Two pre-application meetings have taken place with Welwyn Hatfield Borough Council to present the proposals; the first in August 2016 and the second in February 2017. Both meetings were positive with no significant issues being raised.

Objectives

The objectives of the new Social Space, de Havilland are as follows:

- Provide much needed, more accessible quality social space that is distinctly lacking at de Havilland
- Enhance the student experience by providing flexible social facilities
- Provision of well-designed flexible social facilities
- Provision of flexible space that could be used for exam or teaching space if required

Sustainability

The University's Environment and Sustainability Policy recognises the importance of embedding continuous environmental improvement and the principles of sustainability into all its activities. In terms of sustainable construction, the University considers it essential that sustainability is at the core of new build developments as this will not only improve environmental performance but also minimise operational costs and provide a good working environment for staff and students.

Furthermore, as part of the University's Sustainable Construction Guidance a key aspiration for all new builds is to achieve a minimum of 'Very Good' for the Post Construction BREEAM

In support of this aspiration the project will aim to:

- Incorporate energy efficient measures to reduce inherent energy demand of the building;
- Maximise the generation of its energy needs from Renewable or Low Carbon Sources; and
- Work with consultants, contractors and suppliers with demonstrable environmental credentials.

Programme

The key programme deadline is for start on site in October 2017 and for overall completion October 2018.

The purpose of this report is to support the planning application for the Social space and associated infrastructure.

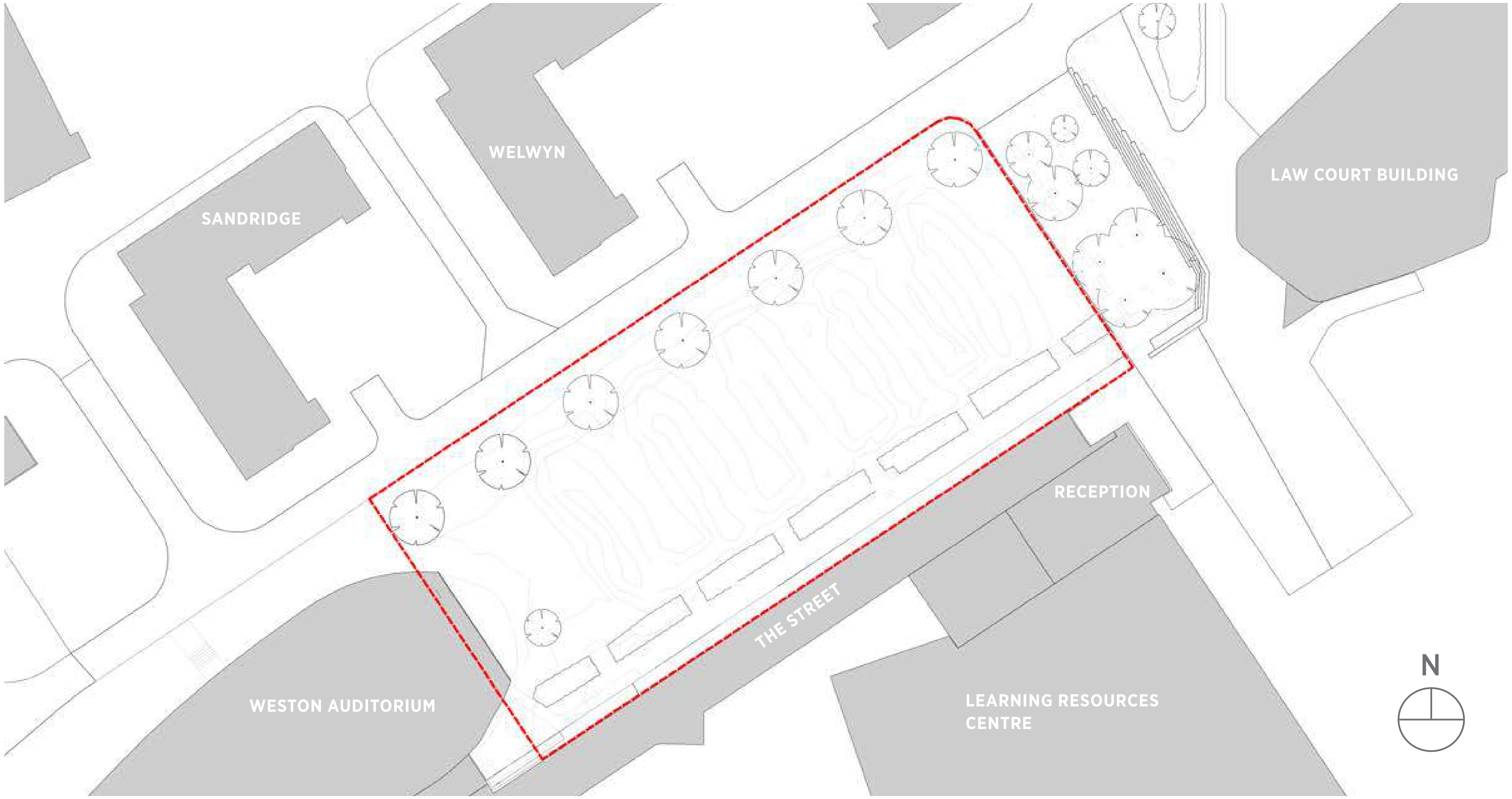
Social Space Key Programme Dates:

- Brief & Concept Design — January 2016 - Summer 2016
- Developed Design & Tender — Summer 2016 – Summer 2017
- Submit Planning — March 2017
- Secure Planning — June 2017
- Construction — October 2017 – October 2018

1.2 Project Team

The project team consists of the following:

University of Hertfordshire	Client
Turner & Townsend	Project Managers & Quantity Surveyors
Sheppard Robson	Architects
Couch Perry Wilkes	Services Engineering & IT
Aecom	Structural & Civil Engineering
Oculus Building Consultancy	Fire Engineering Consultant
Sharps Redmore	Acoustic Consultant
Turnberry Planning Ltd	Planning Consultant
Oculus Building Consultancy Ltd	Approved Inspector



Existing site plan, de Havilland Campus, University of Hertfordshire

2.0 DEVELOPMENT BRIEF

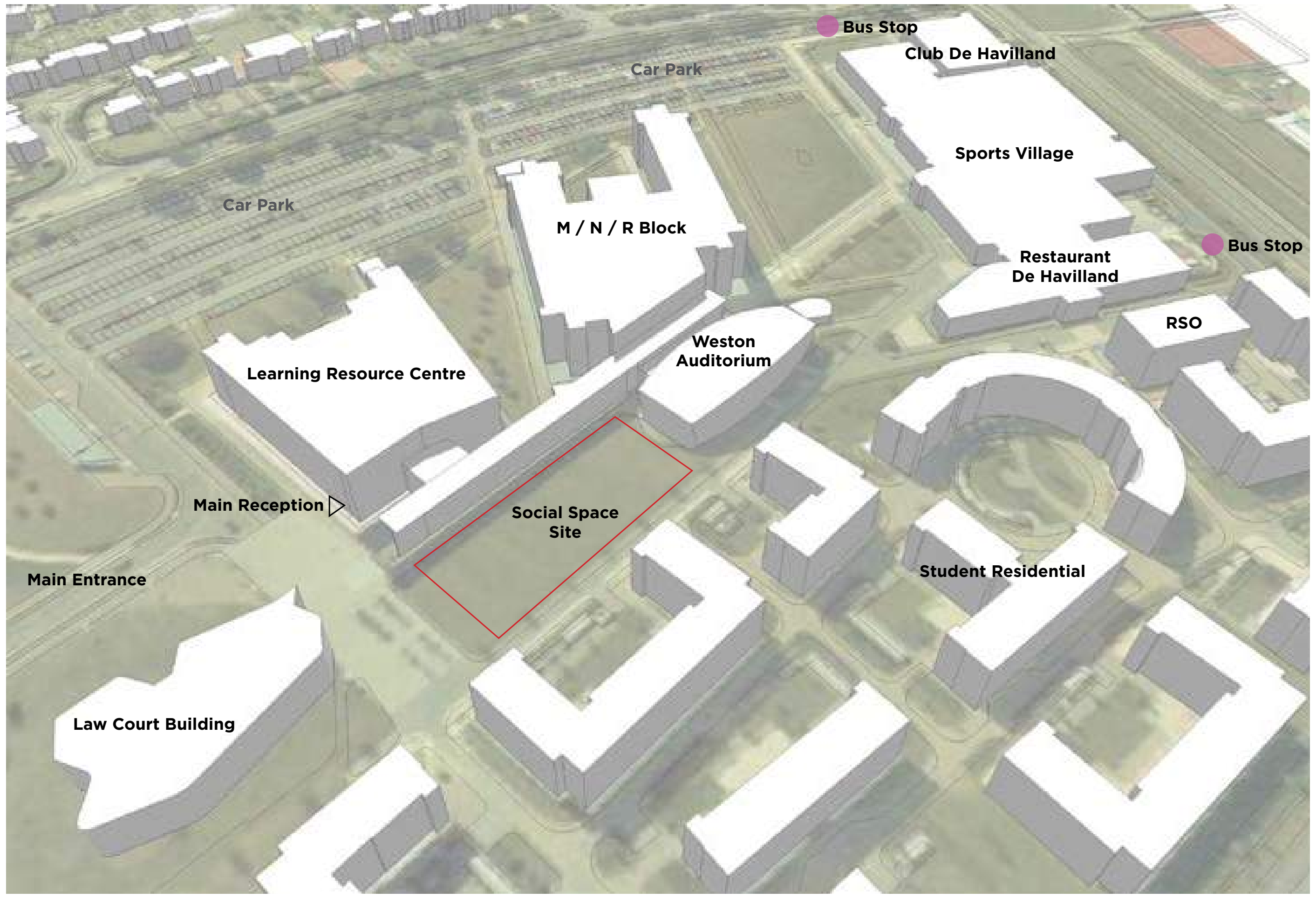
2.1 Project Brief

The new Social Space building will provide improved social facilities for students on de Havilland campus. The key drivers and project criteria are as follows:

- Construction target area – 975m² GIFA;
- Assumed as a single storey building + roof plant;
- A clear landscaped link between the rear of the Weston Auditorium and the Social Space building, to allow the social space to support the operation of the auditorium in providing bar and WC facilities;
- Function rooms capable of seating 140 students in exam conditions;
- Provide a mixture of social space: adjacent to the bar to be 'noisy' social space, away from the bar quieter social space;
- The potentially noisy bar area should be separated as far as possible from the noise sensitive student residential to the north west of the site;
- BREEAM 'Very Good'; and
- Improved architectural quality.

The Objectives of the project are:

- Provide a new, diverse social space at de Havilland campus for students reducing the need to travel to College Lane campus
- Create function rooms for the University, which can also be hired out for commercial / non-academic purposes.
- Create a new central hub at de Havilland



Aerial sketch of de Havilland campus, University of Hertfordshire

3.0 SITE & CONTEXT

3.1 Location

The University of Hertfordshire de Havilland Campus, Hatfield sits to the north of the College Lane campus on the west side of the A1 (M). The campus is boarded by the A1057 St. Albans link road to the south, Albatross Way to the north & Mosquito Way to the east.

Within the Feasibility and Concept Options report several options were considered for the siting of the new social space building on the de Havilland campus. The chosen site is the grassed area that runs alongside 'the street' and is adjacent to the auditorium in the centre of the campus. This proposed site is considered to be the most suitable location for the new building due to its central location and proximity to supporting uses such as the Auditorium.

We have included in this section the following drawings to illustrate our understanding of the site, it's constraints and opportunities afforded.

3.2 Site description

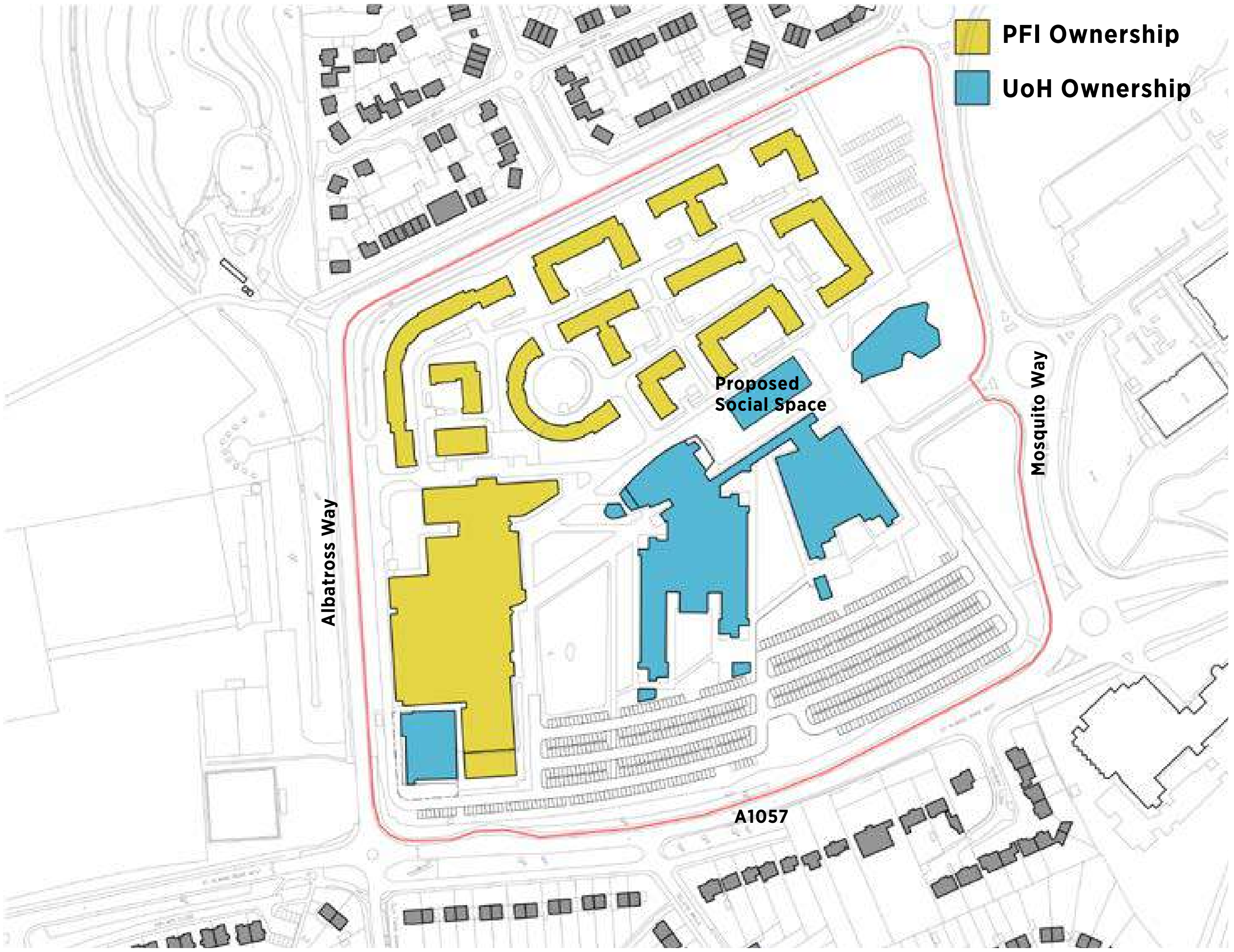
The site is currently well managed amenity grassland which incorporates landscape mounds.

Ornamental lime trees sit on the northern boundary and one isolated Norway spruce tree is located in the southwest corner of the site. No trees are subject to a Tree Preservation Order and are all ornamental. A well managed hedge also lies on the southern boundary.

The site is bounded by development on all sides with residential accommodation to the north, the Weston Auditorium to the west, the Learning Resources Centre and the Atrium to the south and the Law Court Building to the east.

3.3 Existing Buildings

The plan to the right outlines the existing buildings on site and identifies those owned by the University of Hertfordshire and those owned by the PFI company.



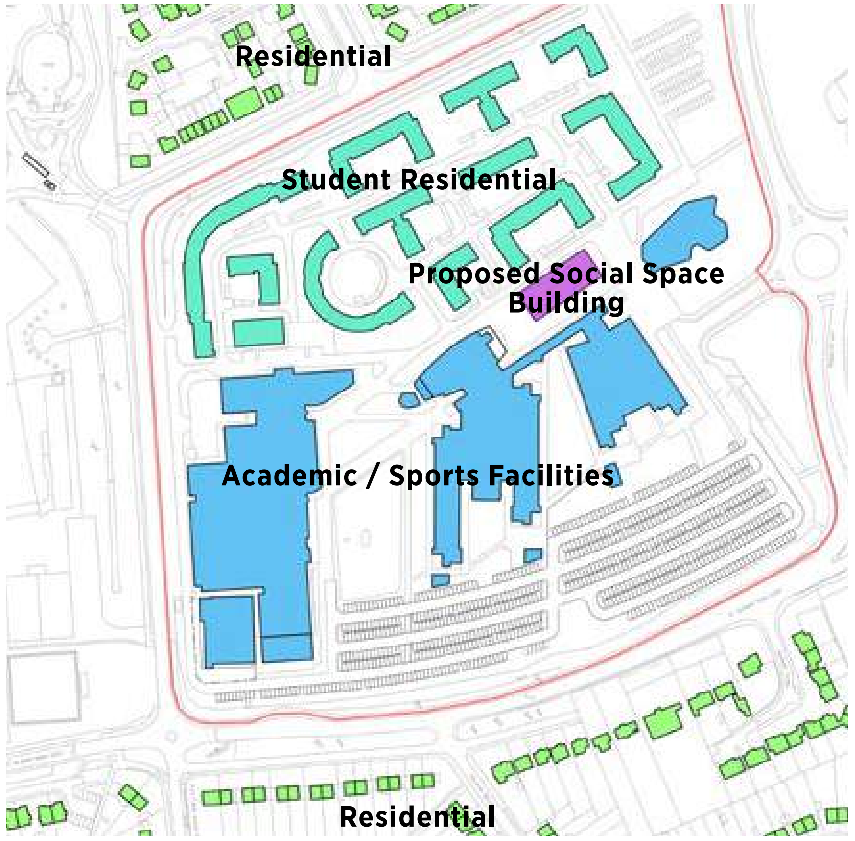
De Havilland Campus, Hatfield, Hertfordshire

View Across Site towards Weston Auditorium

View Across Site to Weston Auditorium and The Street

View of the street from the west corner of the site

View from the north eastern corner of the site towards the Weston Auditorium and The Street

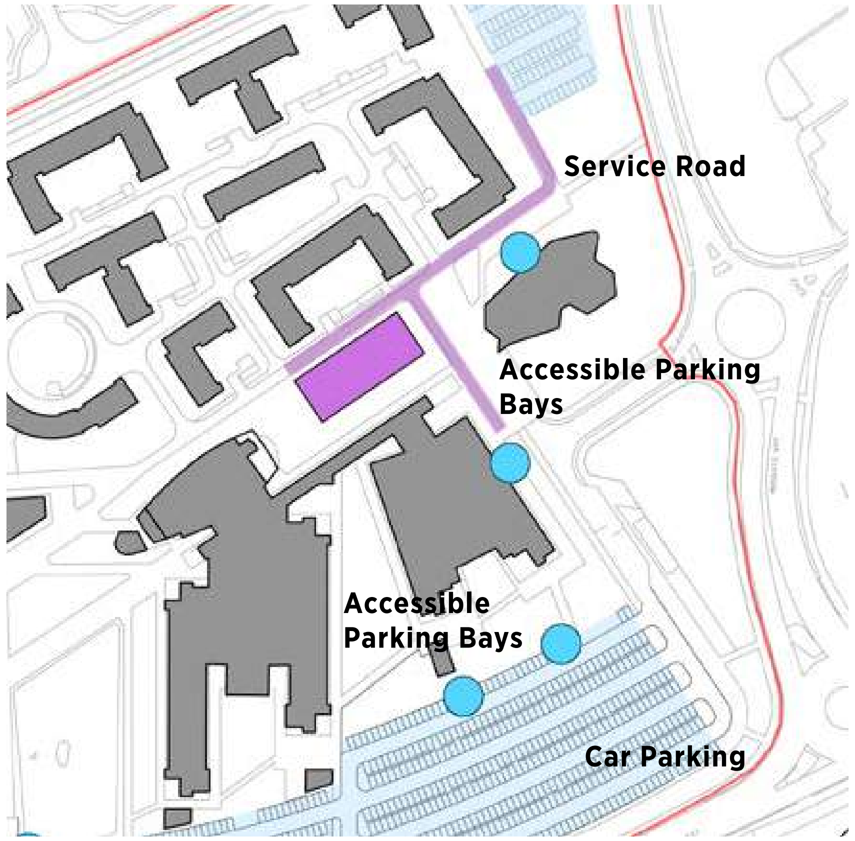


Building Uses

This plan indicates different building uses on the site.

To the south and beyond the A1057 St Albans link is a residential zone comprising of predominantly inter and post war two storey semi-detached homes.

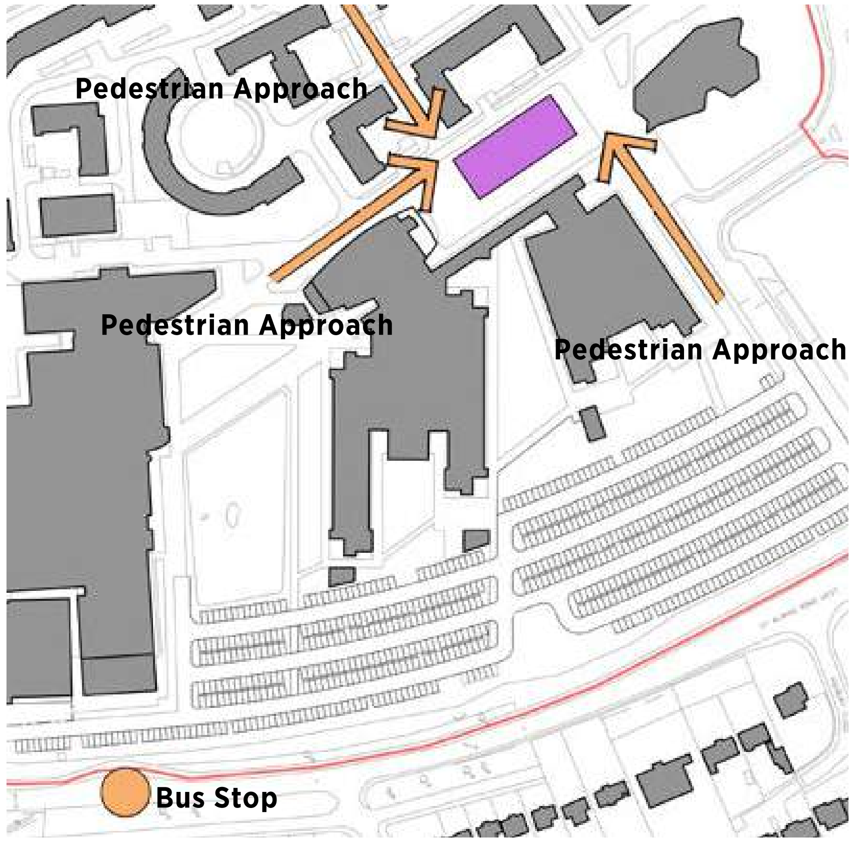
To the north, past the sports village, halls of residence and the university boundary, another, newer residential estate has been recently completed.



Vehicular Access

Located centrally on campus the site has good vehicular access: it is well served by the campus car parks, to the south and north; also there are existing accessible parking bays adjacent to the Law Court building and to the south next to the main reception.

The existing service road running along the north edge of the site can be utilised for servicing. The new building will require service vehicle access for deliveries to the kitchen and bar. A regular waste collection will also be required.



Pedestrian Access

The site is easily accessed by pedestrians as it is surrounded by level hard landscaping. It can be approached from the park and ride bus stop to the south west or past the Main Reception and Learning Resources Centre to the south east. The bulk of the Student Accommodation is located to the north and in close proximity to the proposed site.

Acoustic Design

Site plan indicating noise sensitive residential buildings on site

The Student Accommodation is located to the north of the site, the proposed plant on the roof will need to be designed to limit acoustic impact to these buildings. Acoustic treatment to the plant and plant screening may be required, a background noise survey should be carried out during the next stage to inform the detailed plant design.

4.0 ANALYSIS & PROCESS

4.1 Constraints & Opportunities

Site Analysis

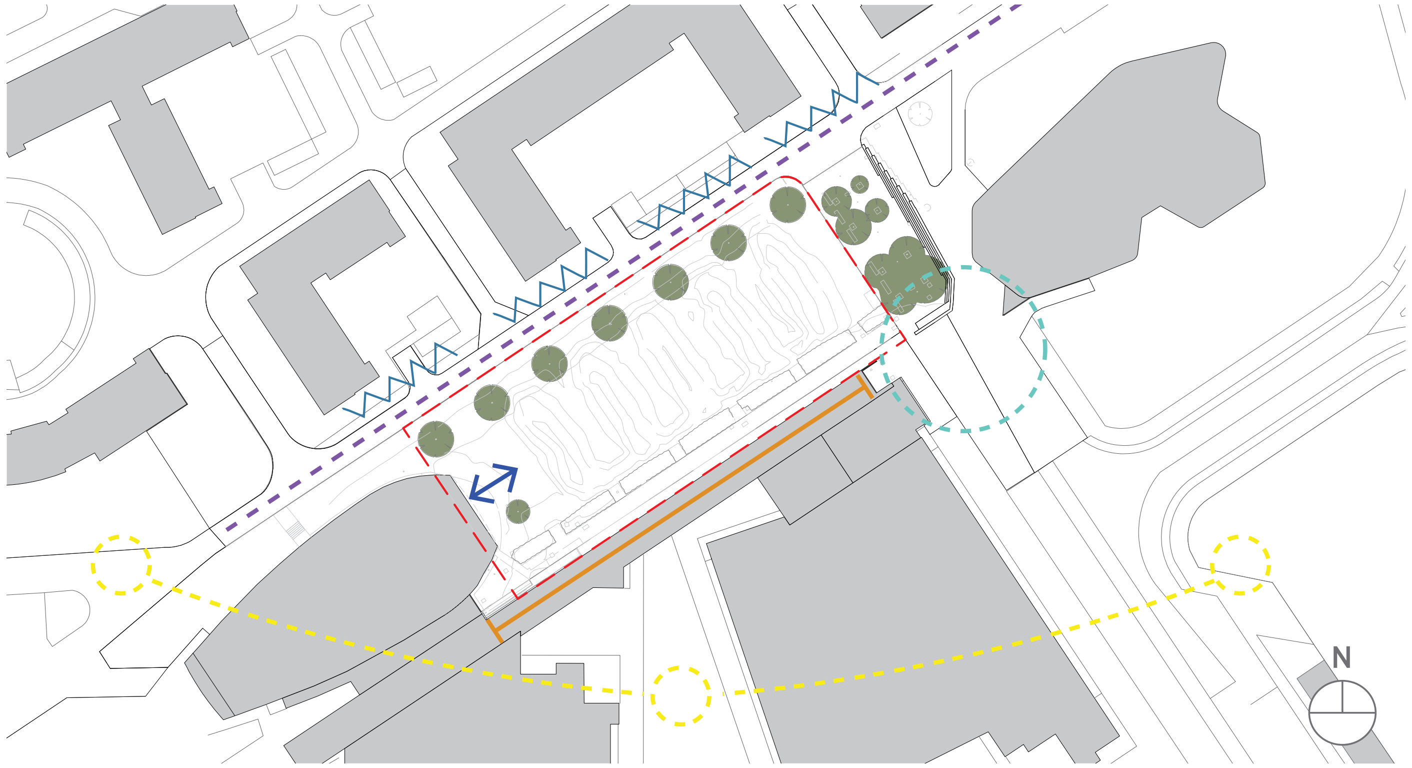
Initial site analysis had identified the following as key constraints and opportunities:

Constraints

- Can't connect into the Street
- Close to the student residences
- Maintaining existing service route to the north

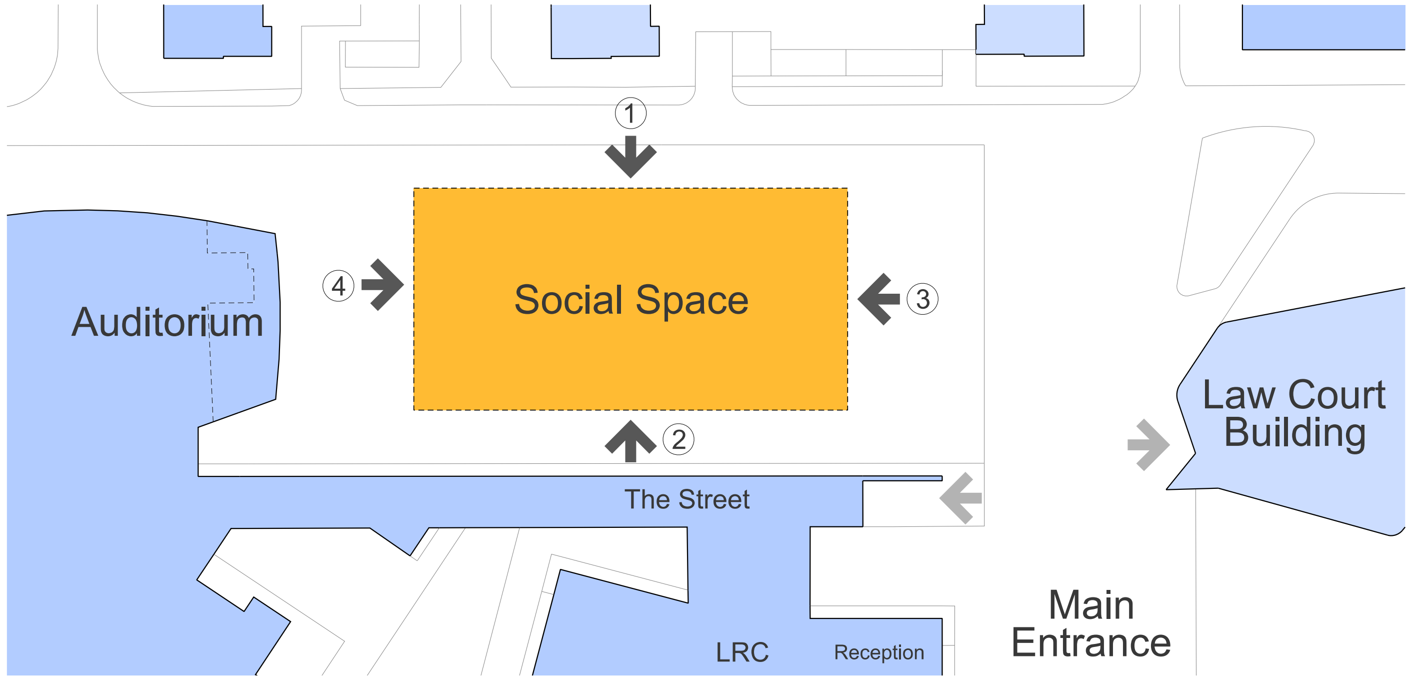
Opportunities

- Access to and support of the Weston Auditorium
- Improve the main entrance public square
- Re landscape the site to form external social space



Constraints plan

Social space site boundary
Existing service route
The Street
Noise sensitive student accommodation
Access to Weston Auditorium
Main entrance public square



Entrance options plan

5.0 DESIGN & ACCESS

5.1 Design Development

Entrance

The proposed site location on campus gives several options for the positioning of the main building entrance and these were explored during stage 2 concept design. The entrance options identified, as shown on the adjacent plan, were:

- Option 01 - From the service road to the North / Student residences.
- Option 02 - From the space between 'the street' and the new building.
- Option 03 - From the direction of the main campus entrance / law court building.
- Option 04 - From the direction of the Weston Auditorium.

Option 01 was discounted as late night activity around the entrance could negatively affect the student residences to the North. Option 02 was discounted as there is limited amount of space between the two buildings and this would have created a convoluted route to the building. This would also this would complicate the fire spread and fire escape issues identified.

Discounting the above options it was decided that providing two entrances would present the best solution: Option 03, an entrance from the law court direction; and Option 04, an entrance from the direction of the Weston Auditorium. This would give the building a presence from the main campus entrance, provide a good link to the auditorium, and also enable a relationship with the landscaped area created between the new building and the auditorium.

Layout

Several layouts were considered for the layout of the main spaces within the building as shown in the diagrams to the right.

Each option had the principal that the social space should not 'face' the student residences and must accommodate the main entrances at either end of the proposal and services access along the north west facade.

Option 01

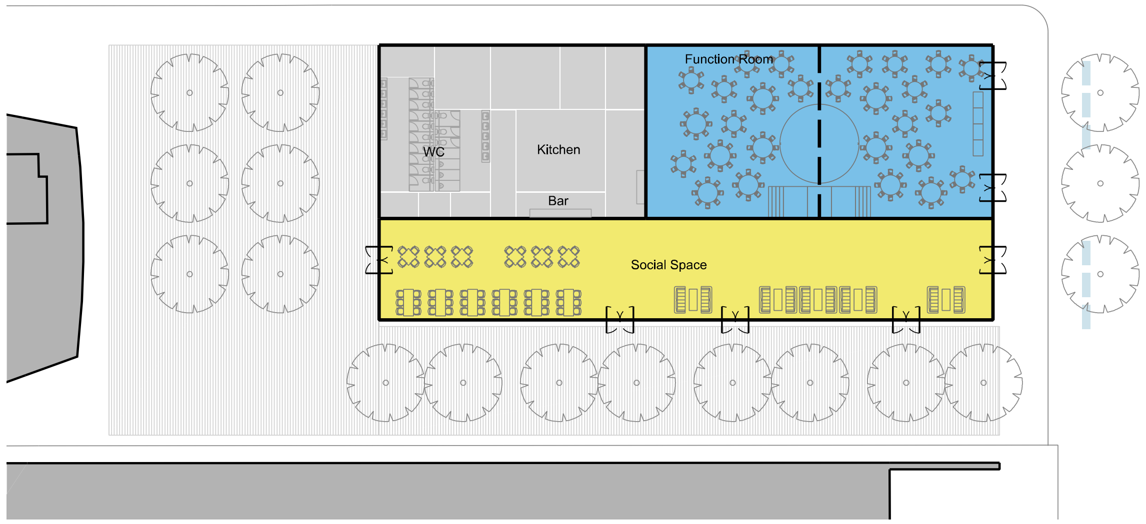
Function Room placed on law court side of the site, social space faces the street.

- Good connection between social and auditorium;
- Function room has presence on main campus entrance;
- Social space has clear dual access from east and west approaches; and
- Function room and support create 'buffer' between social space bar and residential.

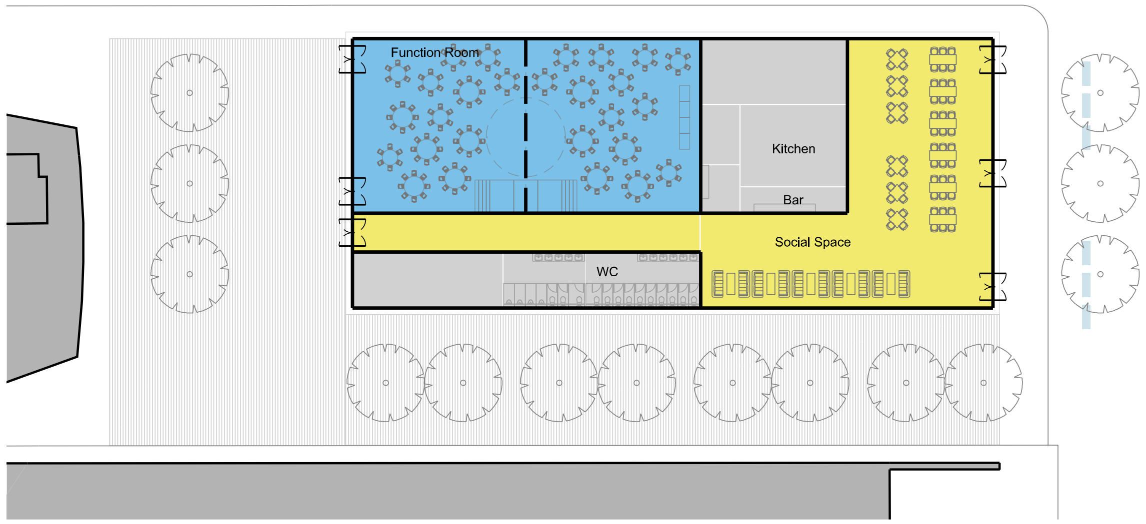
Option 02

- Function Room placed near to Weston auditorium and social space faces law court building;
- Social Space address the main entrance;

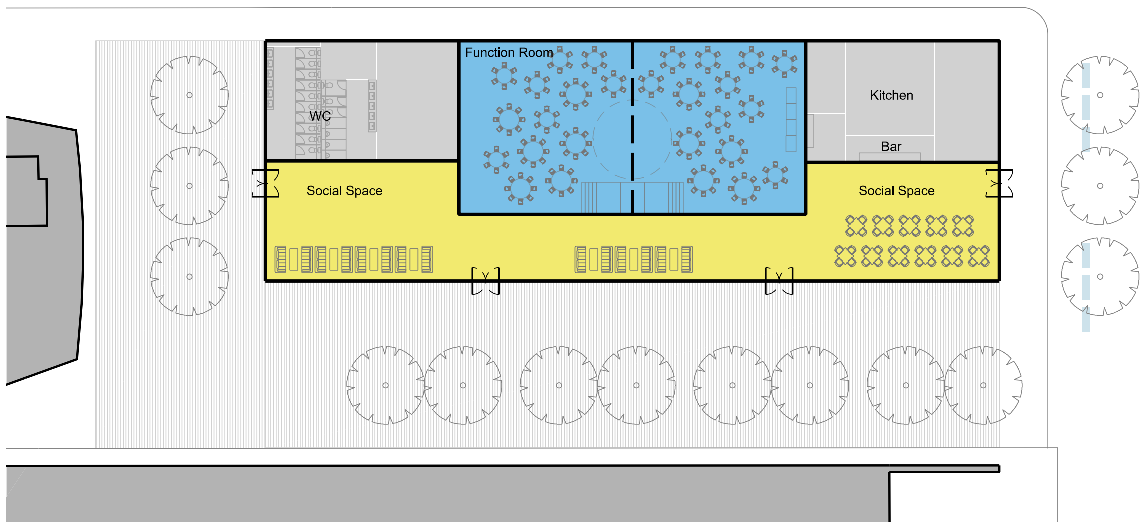
Option 01



Option 02



Option 03



- Entrance from auditorium through corridor feels secondary; and
- Social Space may impact on student residential.

Option 03

Function Room sits centrally with support spaces either side and social space facing the street

- Good connection between social and auditorium;
- Social space has access from east and west approaches; and
- Social Space too long and difficult to service from split kitchen and service space.

It was felt on balance that broadly the arrangement of option 01 provided the best arrangement of social, function and support spaces and this option was taken forward for further development.

Architectural Design Response / Concept

The concept for the social space building was for a flexible, transparent facility forming a new hub for the students at de Havilland campus. To provide this, the base of the building is largely glazed allowing for views in, to the social areas and at both entrances, and out over the landscaped areas and towards the Street. This helps to draw people into the building from both ends. The glazing also allows the social space to become a beacon at night on the campus.

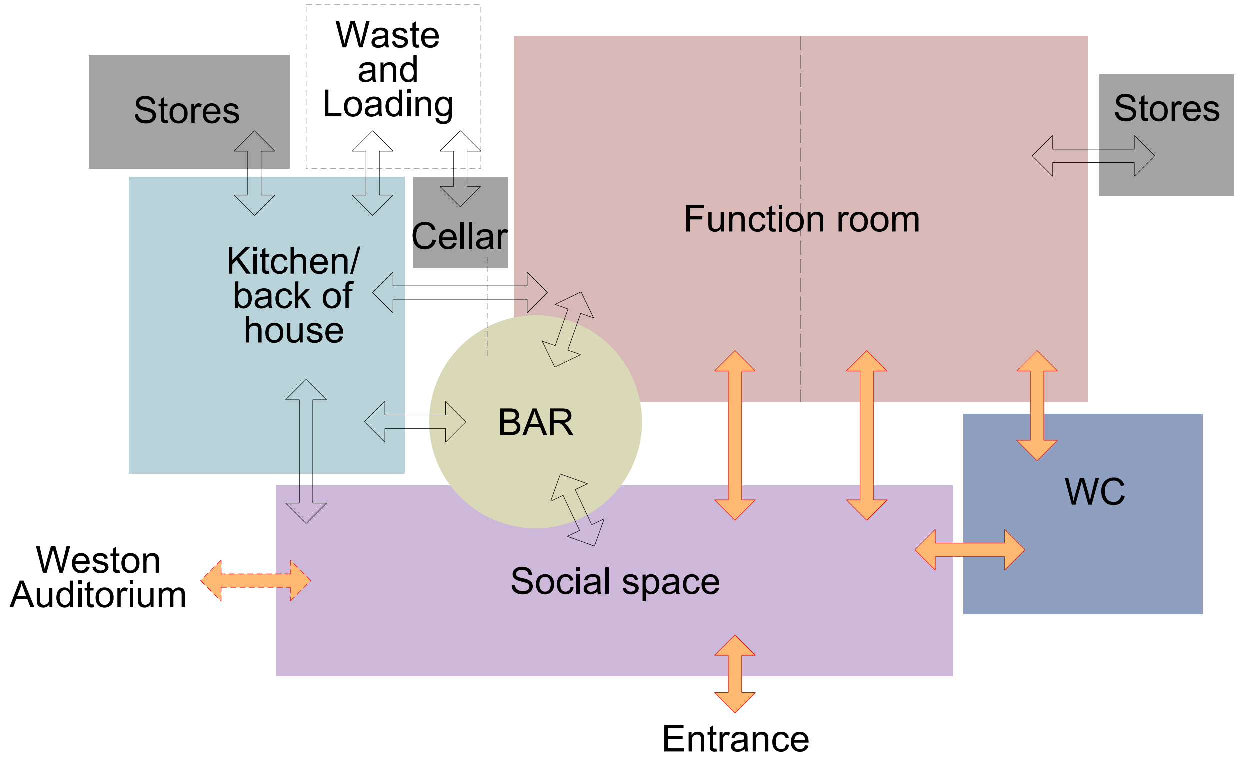
Building Content & Organisation Strategy

The overall Population of the building (maximum occupancy) is 500 occupants, as noted below:

OCCUPANCY TYPE	QUANTITY
Students (Social Spaces)	180
Students (Function Rooms)	300
Staff	20
TOTAL	**500**

The breakdown of this net space by type is shown below (excluding circulation):

Social Space / Bar	217m^2
Kitchen	62m^2
Kitchen Stores	10m^2
Cellar	10m^2
Function Rooms	332m^2
Function Room Bar	8m^2
Function Room Stores	25m^2
Comms Room	7m^2
WCs	53m^2
Staff Office	6m^2
Staff Room	16m^2
Plant	43m^2
TOTAL	**789m^2**



Adjacencies diagram

Ground floor plan

Social Space
Function Rooms
Back of House
WCs

Final Proposals

The final proposal is arranged within a single storey, double height building. Externally the facade is divided into upper and lower, with the upper forming a continuous 'sawtooth' cladding ring and the lower a mix of curtain glazing and sawtooth cladding.

Internally, the spaces form a number of zones: social spaces, function rooms and back of house. The location of the back of house areas allows for bars which serve both the social spaces and the function rooms. The function rooms, located to the north of the plan, are divided by a sliding folding partition. This enables them to have a greater flexibility of uses.

The social spaces wrap around the south east of the building and are divided into three sections: lounge, quiet and refreshment. Each space being distinguished through its loose furniture and finishes. The WCs are positioned so that they can easily serve both the function rooms and the social spaces.

The internal plant room is located to the north west so that it can be serviced by the adjacent shared surface road.

5.2 Form & Massing

The building form is rectangular with cut outs at either end to emphasise the two entrances. The plan is prescribed by the internal accommodation, to allow for open social and function room areas enabling them to be as flexible as possible.

The building is arranged over a single, double height storey. The roof height has been dropped above the back of house areas to allow for a sunken external plant. The upper ring of sawtooth cladding over hangs the lower level and forms a canopy above both entrances.

The proposed social space building is located to the north west of the site. This allows for adequate spacing between both the Street to the south east and the Weston Auditorium to the south west.

5.3 Elevations & Materials

The architectural design for the building envelope is driven by several key factors:

- Emphasise the key elements of the building including the entrances
- Provide maximum daylight to the social space areas
- Avoid excess solar gains
- Combine with the service strategy to deliver a building to meet the requirements of part L21 of the building regulations
- To give flexibility for internal space planning
- Utilise materials that are appropriate and robust to avoid the need for onerous cleaning regimes and excessive maintenance

View from main entrance

View from Weston Auditorium

Cladding Systems

The elevations are divided horizontally with an unbroken ring of sawtooth cladding panels forming the upper section. The sawtooth cladding is made up of a linear grooved Cement Fibre board abutting an anodised aluminium strip. The Fibre Cement Board panels are cut and rotated within each sawtooth segment, to alternate the linear grooves horizontally and vertically. The upper level overhangs the lower, providing some solar shading and a canopy over the entrances.

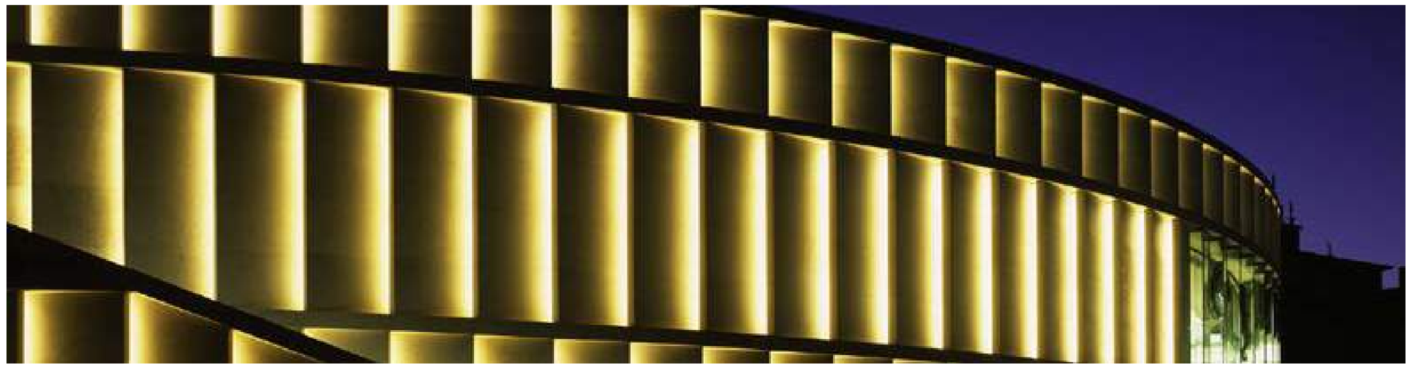
At lower level the facade is a mixture of curtain glazing, around the social spaces, and Fibre Cement Board around the back of house and WCs. On the north west elevation adjacent to the function rooms a mixture of glazing and flat Fibre Cement Board has been used, allowing some natural light into the function rooms, whilst limiting views towards the shared surface and student accommodation to the north.

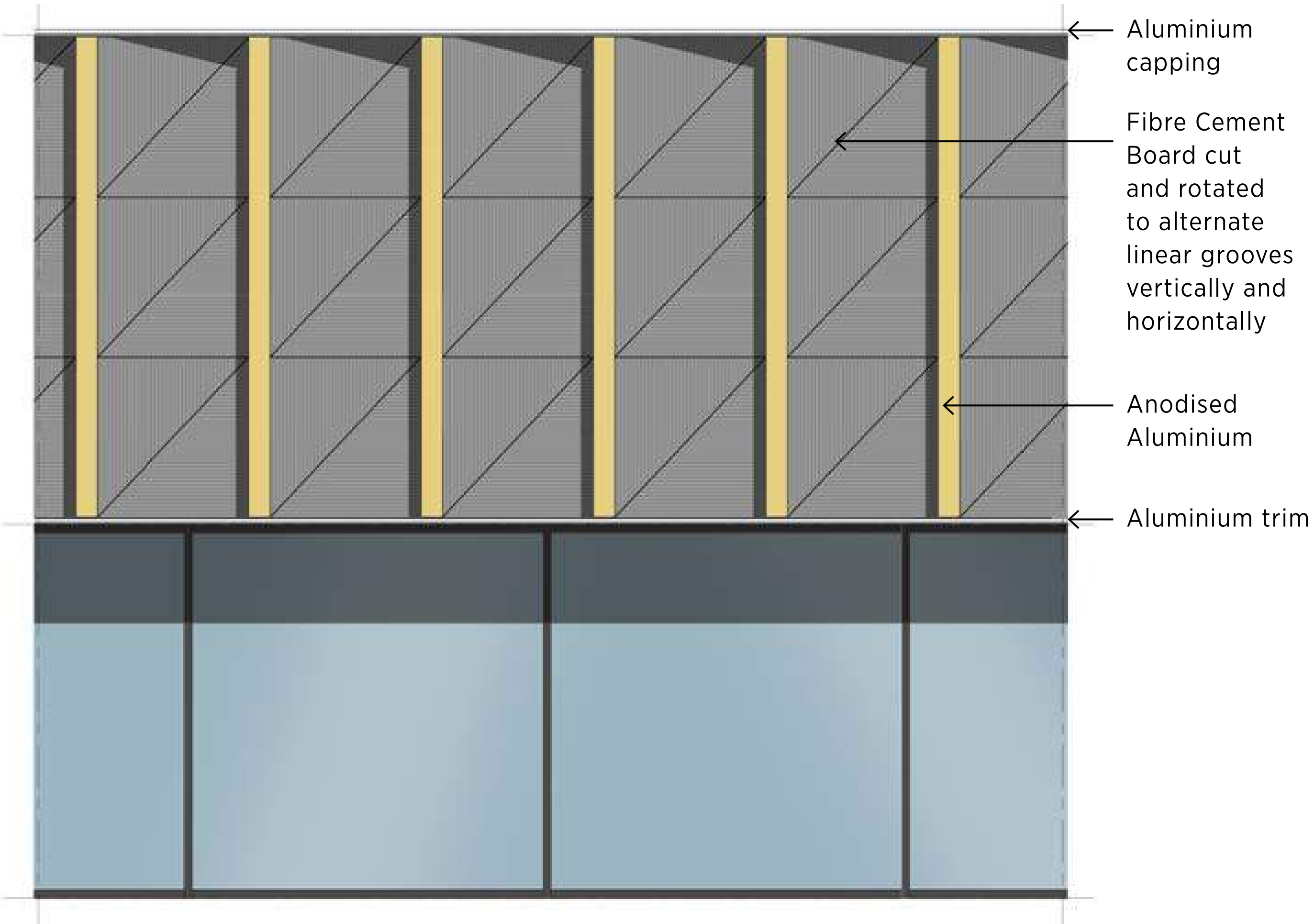
Below is a summary external envelope material table - please read in conjunction with the elevation drawings:

External Envelope Material Schedule	
Item	**Description**
1	Saw tooth panels: Fibre Cement board with linear grooves & Anodised Aluminium sheet
2	Aluminium capping to top and bottom of high level saw tooth panels
3	Capped curtain walling system with clear double glazed units
4	Back painted glass panels
5	Flat Fibre Cement board
6	Aluminium battens to loading bay
7	Brick plinth

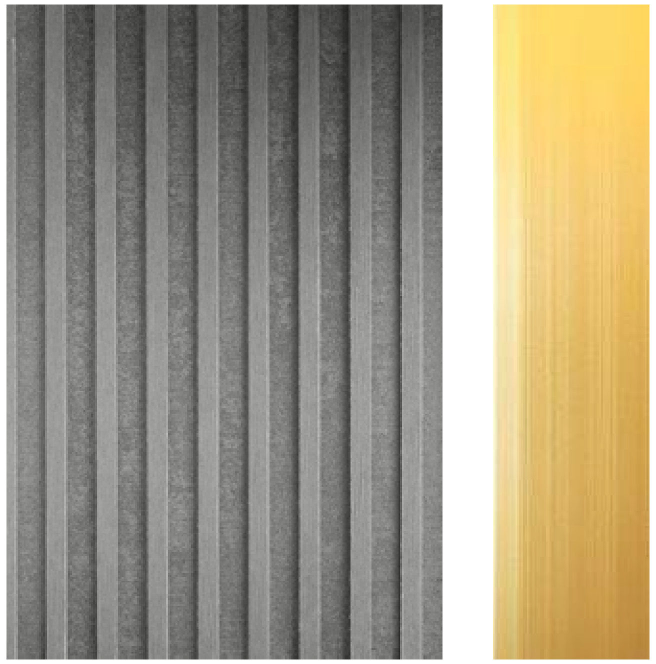
External lighting

External lighting will be integrated into the sawtooth panels at high level on the south west and north east elevations. Strip lights will be recessed into the aluminium so that the light washes the adjacent cement board, subtly lighting the facade at either end of the building and highlighting the entrances. Similar to the example below:



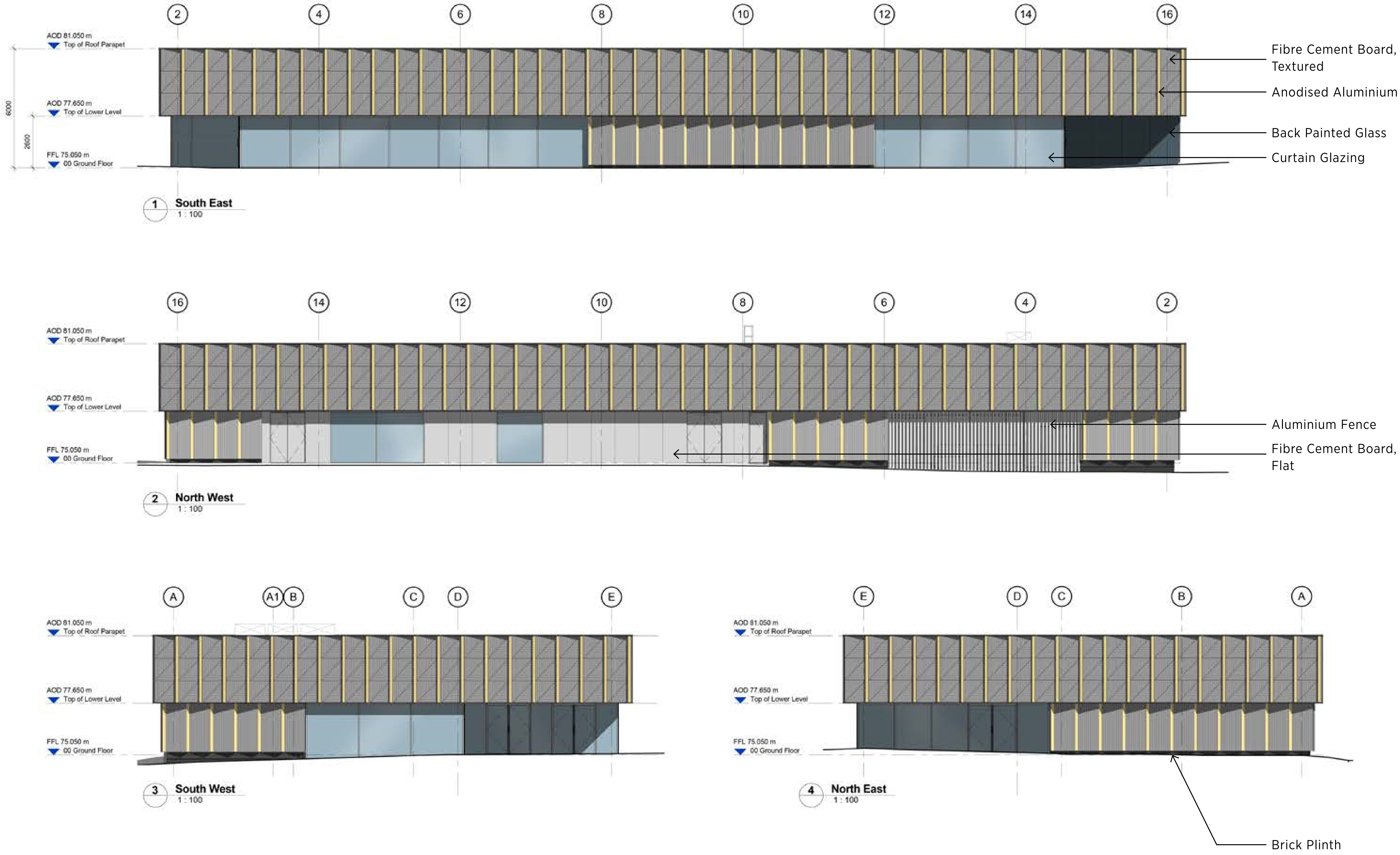


Typical bay study



Textured Fibre Cement Board and Anodised Aluminium making up the sawtooth cladding panels

Flat Fibre Cement Board



Proposed Elevations

5.4 Maintenance Strategy

The enclosed external roof plant is accessible via a dedicated internal stair which, at ground level, opens onto the shared surface to the north of the building. The PV panels and guttering on the roof outside of the enclosed plant area are maintained via an Anchor line system.

A strategy has been developed with the University for safe access to the building fabric externally and internally for the effective cleaning of the building and long term maintenance access considerations of replacement, inspection and minor repair works.

The following design considerations were assessed:

- Building Regulations
- CDM requirements
- M&E strategy
- Fire strategy requirements
- Acoustic Strategy
- Cost
- Planning

The following access methods for cleaning and maintenance have been proposed as preferred where possible:

- Reach and Wash
- Edge protected mobile podium step

These principals will be developed in detail as the project progresses.

5.5 Access Statement

Introduction

Our design approach has been guided by the following documents:

- Approved document Part M of the Building Regulations
- Equality Act 2010
- British Standards (where relevant to accessibility)
- University of Hertfordshire Equality & Diversity Policy UPR EQ03

The University have prepared the following statement:

'The university of Hertfordshire is committed to maintaining and further developing a fair and inclusive culture and an environment that is accessible and welcoming, in which everyone is valued, respected and enabled to excel(red UH Equality & Diversity Policy UPR EQ03)

The design has been developed with various user groups within the university and the following consideration have been made in relation to the design:

- Level access at both entrances and throughout the building
- Landscaping routes step free
- Fully accessible unisex WC centrally located to minimise travel distances
- Induction loops in both function rooms and around bar areas

External Environment

The application site benefits from good connectivity to the existing pedestrian infrastructure throughout the de Havilland Campus.

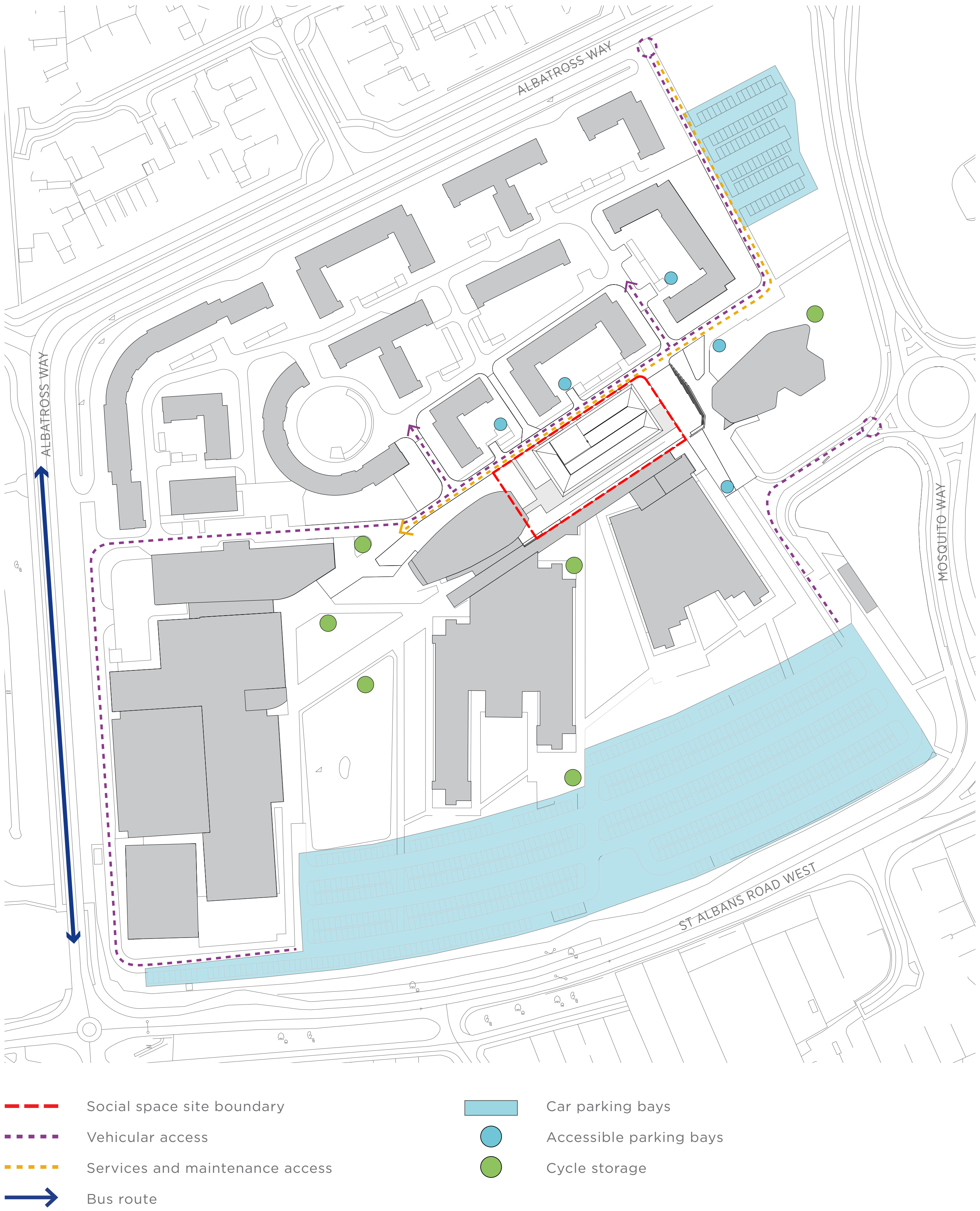
Bus Services are available from Albatross Road to the west of the campus and Mosquito Way to the east. Both of which accommodate the University's UNO bus services.

There is ample parking a short walk to the south of the campus and a number of accessible spaces in close proximity to the site.

Cycle stores are located around the campus which will facilitate those cycling to the new social space.

The two main entrances to the building will utilise power assisted doors for easy access.

The main entrance to the building is located to the north east, close to the campus access from mosquito way, the care park and drop of point. The proposed central location on campus allows the building to benefit from a number of transport links and easy pedestrian access.



Internal Environment

The two entrances are accessed via sets of double doors that will provide a clear width of at least 1000mm with flush threshold.

Signage will be designed to current recommended standards and be easily usable by all people. This may include the use of colour contrast, Braille (where required) pictograms and clear font types. Signs will be well lit and prominently located whilst distinctions will be made for signs indicating directions for destination arrival points.

The WC block has been designed to provide fully accessible, ambulant and enlarged cubicles for both male and female occupants.

Parking

The new Social Building is providing a new facility to accommodate the social aspect of Club de Havilland and enhance the social offer on campus. The development is therefore providing a facility for the existing university population and is not delivering a new building which will increase the number of people traveling to the campus.

On the basis that the building is catering for an existing demand no additional parking is proposed as part of this development given the adequate current parking supply on campus.

5.6 Landscape

The proposed position of the building is to the north east edge of the site, with the north east elevation aligned with the end of 'The Street' next to the existing paved seating area in front of the law court building. There is a requirement for a gap between the street building and the social space to address fire spread issues.

There are opportunities to provide landscaping in two locations: a landscaped strip between the street and the new building and a landscaped square between the new building and the auditorium.

The landscaped square provides an opportunity to provide a sheltered public space and seating area. The entrance to the social space will be across this square and it can be utilised by the social space as a spill out area from the bar. The landscape design should also de-mark the route between the Weston auditorium and the new building.

Proposed landscaping plan

Soft landscaping

Existing trees

Hard landscaping

Hard landscaping

Soft landscaping

Light bollards

6.0 DRAINAGE STRATEGY

6.1 Surface Water

The site is currently a greenfield area within the wider University of Hertfordshire De Haviland campus. Thames Water, Hertfordshire County Council and the CIRIA SuDS Manual C753 therefore require that surface water flows from the site do not exceed greenfield runoff rate.

The proposed development of a new Social Hub building and hardstanding will increase the impermeable area of the site to 0.152ha. This area will be drained by rainwater pipes, channel drains and gullys before being discharged into the wider University of Hertfordshire network which ultimately drains into Thames Water public sewers. For this site, greenfield runoff has been calculated at 1.2l/s, therefore it will be necessary to retain storm water runoff up to and including the 1in100 year plus 40% climate change event in below ground geocellular storage tanks as well as other forms of SuDS.

The drainage will be designed to accommodate for a 1:100 year return period plus and 30% allowance for climate change. However, in order to comply with the revised environment agency requirement, a test for 40% allowance for climate change will be carried out and any flooding for this additional climate change must be contained on site without causing flooding to buildings.

The geotechnical site investigation states that ‘the ground conditions do not appear suitable, from a geotechnical viewpoint for the use of pit soakaways to discharge surface run-off water into the Lowestoft Formation.’

The normal precautions regarding water quality will be observed by the provision of deep silt trapped gullies and silt boxes to all channel drains.

6.2 Sustainable Urban Drainage Systems

Regulations and Guidance

National Planning Policy Framework (NPPF)

The National Planning Policy Framework states the following:

“The National Planning Policy Framework (NPPF) set out the Government’s planning policies for England and how these are expected to be applied. The purpose of the planning system is to contribute to the achievement of sustainable development. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Local planning authorities should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk and demand considerations. When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere.”

Lead Local Flood Authority (LLFA)

Since April 2015, Local Planning Authorities have been responsible for the approval of sustainable drainage designs for all planning applications in consultation with the Lead Local Flood Authority (LLFA) as a statutory consultee. This development falls within Hertfordshire County Council.

The Hertfordshire County Council Interim SuDS Policy Statement States that:

‘The introduction of impermeable area from development will lead to an increase in frequency, rate and volume of runoff. Significant changes to greenfield runoff characteristics as a result of development will not be acceptable.’

The Environment Agency

As of April 2016, The Environment Agency has increased the percentage of additional allowance for climate change. Table 1 below indicated the desired climate change as 40% for a development such as the University of Hertfordshire. For further details on the Environment Agency changes to climate change, please refer to the Government website link as follows: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Table 1: Peak rainfall intensity allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for the ‘2020s’ (2015 to 2019)	Total potential change anticipated for the ‘2050s’ (2040 to 2069)	Total potential change anticipated for the ‘2080s’ (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

The SuDS Manual (Ciria 753)

The new Ciria C753 Guidance has been in circulation since November 2015 and is the most comprehensive industry SuDS guidance available in the UK. This guidance focuses on the cost-effective planning, design, construction, operation and maintenance of SuDS.

Thames Water Hydraulic Modelling Guidelines

The design of this development will, as far as practicable, comply with the hydraulic modelling guidelines as set out by Thames Water. These guidelines set out requirements for calculating the allowable surface water discharge to the public sewers.

SuDS Treatment Requirements

The updated SuDS Manual (C753) suggests an alternate approach to SuDS selection as compared to the preceding SuDS Manual (C697). The new guidance suggests a risk based approach based on land use type and specific contaminants as opposed to the method of treatment levels based on receiving watercourses laid out in the preceding SuDS Manual (C697).

The SuDS Manual (C753), Table 26.1 suggests a Simple Index Approach (SIA) for low risk developments.

The SIA follows a three step process, namely:

- Allocate suitable pollution hazard indices for the proposed land use categories

- Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.
- Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach.

6.3 Foul Water

The current site is greenfield with no foul water provision. The proposal is to discharge the foul water into the campus foul water drainage system. There is no net increase in student numbers as a result of construction of the new Social Hub on the campus. As a result there will be no net increase of foul water discharge.

6.4 Statutory Authority Approval

A Pre-Development application has been carried out with Thames Water for the site, we are currently awaiting confirmation of the available capacity. Prior to installing any drainage on site, a Section 106 application will need to be carried out.

7.0 SUSTAINABLE DESIGN STRATEGY

7.1 Executive Summary

Couch Perry Wilkes (CPW) has produced an Energy Strategy to support a planning application for the proposed Social Space development located at The DeHavilland Campus, University of Hertfordshire, in accordance with the Welwyn Hatfield District Plan. The proposed development contains a combination of social space, function rooms, kitchen and bar areas, totalling c. 967 m2 Gross Internal Area (GIA).

This strategy will demonstrate how the scheme will:

- Incorporate energy efficient measures to reduce inherent energy demand of the building.
- Maximise the generation of its energy needs from Renewable or Low Carbon Sources.

Estimated energy consumptions have been derived from the information currently available and are as follows:

- The total predicted notional energy consumption of the development is: 53,815 KWh/year.
- The total predicted notional CO2 emissions of the development is: 21,085 kg CO2/year.

Couch Perry Wilkes have carried out an energy appraisal of the development and have adopted the following strategies to satisfy planning requirements and (2013 Edition) Part L Building Regulations:

- Introducing 25m2 of Solar Photovoltaic installation providing 3.75KW peak output will contribute to a 8.9% reduction in CO2 emissions and a 6.7% reduction in the predicted building's energy consumption. This could potentially be increased in size depending on the Client's requirements.
- Introducing an onsite Air Source Heat Pump system to Function Rooms and Social Space that could allow a 12.6% reduction in CO2 emissions and a 41% energy contribution.

7.2 Introduction

Couch Perry Wilkes has been appointed to appraise the renewable and low carbon technology energy options currently available for the proposed new Social Space at University of Hertfordshire. The client is keen to target a BREEAM 'Very Good' rating for the building.

In accordance with the Welwyn Hatfield District Plan, Couch Perry Wilkes (CPW) has produced an Energy Strategy to support a planning application for the proposed development containing a combination of social space, function rooms, kitchen and bar areas, totalling c. 967 m2 Gross Internal Area (GIA).

This strategy will demonstrate how the scheme intends to:

- Incorporate energy efficient measures to reduce inherent energy demand of the building.
- Maximise the generation of its energy needs from Renewable or Low Carbon Sources.

With the current emphasis placed on energy conservation, the client is keen to enhance the site's sustainability credentials, by delivering an environmentally responsible development. To this end, the proposed design will incorporate passive design and best-practice measures, so as to exceed the requirements of the current (2013 Edition) Part L Building Regulations.

The scheme will be developed as a Sustainable, Low Carbon design, in line with the Welwyn Hatfield District Plan, which will consider:

- Community safety and security.
- Design to improve environmental performance, energy efficiency and adaption to changes of use and climate.
- Maximising the use of solar gain, passive heating and natural light using site layout and building design.
- Maximising Water Efficiency.
- Maximising the generation of its energy from on site renewable and low carbon technologies.

7.3 Building Regulations

The general construction design standards to be adopted must exceed the requirements of the current (2013 Edition) Part L Building Regulations which stipulate an improvement on the CO2 emissions of an aggregated 6% against 2010 standards.

Part L2A sets out the minimum requirements for building envelope thermal performance for new commercial buildings, which can be seen in column two of Table 1. However, it is recommended that new buildings be designed to a higher criterion as shown in column three. In light of this, the Social Space building design shall incorporate materials to achieve thermal performance significantly better than the minimum requirements, in line with those listed in column four, Target Criteria Value.

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7.4 Building Design - Energy Efficiency

High levels of natural daylight will be provided, wherever possible, through effective window design and the perimeter rooms will benefit from a large amount of full height glazing. The glazing specifications for the new building will be optimised to ensure that the glazed elements provide excellent thermal performance and optimum solar reflectance. This will allow summer solar heat gains to be minimised whilst providing improved daylight transmittance to give optimal daylight factors.

Encouraging the correct quality and quantity of daylight to penetrate the building is key to reducing the amount of light required from artificial sources and hence energy requirements. It is imperative that the lighting design philosophy provides the correct quality of lighting using minimum energy to hence reduce internal heat gains. In the building, luminaires using fluorescent and compact fluorescent lamps will utilise high frequency control gear, and lighting schemes within occupied areas will be appropriately zoned to allow control of luminaires via manual/automatic switching solutions, and daylight sensors where appropriate.

The latest lighting technology, including LED's, will be employed where appropriate. Any external lighting must receive consent from local planners and will be designed with consideration to security requirements, whilst minimising glare and light pollution to the surrounding area.

The development will be split into 4 main zones. Each zone will be served by mechanical ventilation from dedicated air handling units, utilising high efficiency heat recovery, in order to provide each space with a continuous supply of fresh air, whilst retaining the heat from the extracted air. This will help improve the efficiency of the building, reducing the heating demand, whilst providing a healthy internal environment. These air handling units will be roof-mounted and incorporate integral heat pumps.

As well as reducing the development's energy demand through improved envelope design and proficient use of services, the duty and energy consumption of the heating system shall also be minimised. It is proposed that heating will be delivered to the building using a combination of high efficiency gas-fired condensing boilers with thermal storage and high efficiency heat pumps. The Function Rooms will be heated and cooled by the air supplied to them and controlled locally by temperature/CO2 sensors. The Social Space will be predominantly heated and cooled via VRF air source heat pump systems. The VRF system will be controlled via local wall mounted temperature controllers. The remaining rooms will be heated by wet radiators via Thermostatic Radiator Valves (TRVs). The system will be designed with a lower heating return water temperature which will increase the seasonal efficiency of the heating plant.

Water demand will be reduced by utilising waterless urinals, dual flush toilets, flow limiting valves and sensor taps.

Variable speed pumps and fans will be used to promote lower operating costs and help match energy usage with the operating profile and occupancy of the building.

Sub-metering will be provided to each main area such that approximately 90% of the input energy from each utility service may be accounted for at end use.

7.5 Energy Benchmarking

In order to benchmark the proposed new development, estimated energy demands and CO2 emissions data have been calculated. These estimated energy consumptions are indicative only at this stage. They will, however, be used as a guideline to assess the percentage of the development's total energy consumption and CO2 emissions that could be reduced or offset by applying suitable renewable and/or Low Zero Carbon Technologies (LZCs).

For the purposes of BREEAM, it is prudent for this report to reflect the benchmark data derived from approved Dynamic Simulation Model (DSM) software which uses government and industry agreed National Calculation Method (NCM) room templates containing standard operating conditions. This is due to the fact that BRE Global will only accept results from the approved models when verifying the percentage reduction in CO2 emissions from the building for energy credits.

The estimated energy consumption and CO2 emissions for the development derived from the approved DSM software (IES), before considering renewables and LZC technologies, are shown below:

The total predicted regulated notional energy consumption for the development is: **53,815 kWh per year**

The total predicted notional CO2 emissions for the development are: **21,085 kgCO2 per year**
[CO2 emissions: 19 kgCO2/m2 per year]

Note 1. CO_2 emission factors of 0.216 for Gas and 0.519 for Electricity have been used to calculate the above and are taken from Building Regulations Approved Documents.

7.6 Appraisal of Renewable and Low Carbon Technology Energy Options

The technical feasibility of installing each LZC technology at the Social Space at University of Hertfordshire have been assessed in order to discount any unsuitable options at an early stage. A summary of the feasibility process is tabulated below and an overview of each technology is given subsequently.

Technology	Brief Description	Benefits	Issues/Limitation	Feasible for Site
Solar Photovoltaic	Solar photovoltaic panels convert solar radiation into electrical energy through semiconductor cells. They are not to be confused with solar panels which use the sun's energy to heat water (or air) for water and space heating.	Low maintenance/no moving parts Easily integrated into building design No ongoing costs Income generated from Feed-in Tariff (FIT)	Any overshadowing reduces panel performance Panels ideally inclined at 30º to the horizontal facing a southerly direction	Yes but limited to available roof space
Solar Thermal	Solar thermal energy can be used to contribute towards space heating and hot water requirements. The two most common forms of collector are panel and evacuated tube.	Low maintenance Little/no ongoing costs Income generated from Renewable Heat Incentive (RHI) scheme	Must be sized for the building hot water requirements Panels ideally inclined at 30º to the horizontal facing a southerly direction	Yes but not sufficient hot water bade load for building
Ground Source Heat Pump (GSHP	GSHP systems tap into the earth's considerable energy store to provide both heating and cooling to buildings. A number of installation methods are possible including horizontal trench, vertical boreholes, piled foundations (energy piles) or plates/pipe work submerged in a large body of water. The design, installation and operation of GSHPs is well established.	Minimal maintenance Unobtrusive technology Flexible installation options to meet available site footprint Income generated from Renewable Heat Incentive (RHI) scheme	Large area required for horizontal pipes Full ground survey required to determine geology More beneficial to the development if cooling is required Integration with piled foundations must be done at an early stage	No, prohibitively expensive installation cost and lead time for geological survey
Air Source Heat Pump	Electric or gas driven air source heat pumps extract thermal energy from the surrounding air and transfer it to the working fluid (air or water).	Efficient use of fuel Relatively low capital costs Income generated from Renewable Heat Incentive (RHI) scheme	Specialist maintenance Boost heating required for hot water More beneficial to the development if cooling is required Requires defrost cycle in extreme conditions Some additional plant space required	Yes
Wind Turbine *(Stand-alone column mounted)*	Wind generation equipment operates on the basis of wind turning a propeller, which is used to drive an alternator to generate electricity. Small scale (1kW – 15kW) wind turbines can be pole or roof mounted.	Low maintenance/ ongoing costs Minimum wind speed available (www.bwea.com) Excess electricity can be exported to the grid Income generated from Feed-in Tariff (FIT)	Planning issues Aesthetic impact and background noise Space limitations on site Wind survey to be undertaken to verify 'local' viability	No, not suitable for this site
Wind Turbine *(Roof mounted)*	As above	Low maintenance/ ongoing costs Minimum wind speed available (www.bwea.com) Excess electricity can be exported to the grid Income generated from Feed-in Tariff (FIT)	Planning issues Aesthetic impact and background noise Structural/vibration impact on building to be assessed Proximity of other buildings raises issues with downstream turbulence Wind survey to be undertaken to verify 'local' viability	No, not suitable for this site

Gas Fired Combined Heat and Power	A Combined Heat and Power (CHP) installation is effectively a mini on-site power plant providing both electrical power and thermal heat. CHP is strictly an energy efficiency measure rather than a renewable energy technology.	Potential high CO2 saving available Efficient use of fuel Excess electricity can be exported to the grid Benefits from being part of an energy centre/district heating scheme Income generated from Renewable Obligation Certificated (ROC) and Renewable Heat Incentive (RHI) scheme	Maintenance intensive Sufficient base thermal and electrical demand required Some additional plant space required Reliable biomass fuel supply chain required	No, not sufficient hot water base load for building
Bio-fuel Fired Combined Heat and Power	As above	Potential high CO2 saving available Efficient use of fuel Excess electricity can be exported back to the grid Benefits from being part of an energy centre/district heating scheme	Maintenance intensive Sufficient base thermal and electrical demand required Significant plant space required Large area needed for fuel delivery and storage	No, not suitable on this site
Bio-Renewable Energy Sources *(Automated feed - wood-fuel boiler plant)*	Modern wood-fuel boilers are highly efficient, clean and almost carbon neutral (the tree growing process effectively absorbs the CO2 that is emitted during combustion). Automated systems require mechanical fuel handling and a large storage silo.	Stable long term running costs Potential good CO2 saving Income generated from Renewable Heat Incentive (RHI) scheme	Large area needed for fuel delivery and storage Reliable fuel supply chain required Regular maintenance required Significant plant space required	No, not suitable on this site
Fuel Cells and Fuel Cell Combined Heat and Power	Fuel cells convert the energy of a controlled chemical reaction, typically involving hydrogen and oxygen, into electricity, heat and water vapour. Fuel cell stacks operate in the temperature range 65°C – 800°C providing co-generation opportunities in the form of Combined Heat and Power (CHP) solutions.	Zero CO2 emissions if fired on pure hydrogen and low CO2 emissions if fired on other hydrocarbon fuels Virtually silent operation since no moving parts High electrical efficiency Excess electricity can be exported back to the grid Benefits from being part of an energy centre/district heating scheme	Expensive Pure hydrogen fuel supply and distribution infrastructure limited in the UK Sufficient base thermal and electrical demand required Some additional plant space required Reforming process, used to extract hydrogen from alternative fuels, requires energy; lowering overall system efficiency	No, expensive, emerging technology

Table 2 - Summary of Renewable and Low Carbon Technology Energy Options

To summarise the technology proposed in the table above, Photovoltaic Arrays (PVs) and Air Source Heat Pumps shall be considered in more detail.

7.7 Solar Photovoltaic (PV) Panels

Solar photovoltaic panels convert solar radiation into electrical energy through semiconductor cells. They are not to be confused with solar panels which use the sun's energy to heat water (or air) for water and space heating.

Photovoltaic panels are available in a number of forms including mono-crystalline, polycrystalline, amorphous silicon (thin film) or hybrid panels (discussed later). They are fixed or integrated into a building's un-shaded south facing façade or pitched roof ideally at an incline of 30º to the horizontal for maximum energy yield.

It is essential that the panels remain un-shaded, as even a small shadow can significantly reduce output. The individual modules are connected to an inverter to convert their direct current (DC) into alternating current (AC) which can then be used in buildings. Although sloping rooftops provide an ideal site for fixing PV panels using traditional mounting frames, there are a number of alternative solutions whereby PV panels can be incorporated into the actual building fabric of the development.

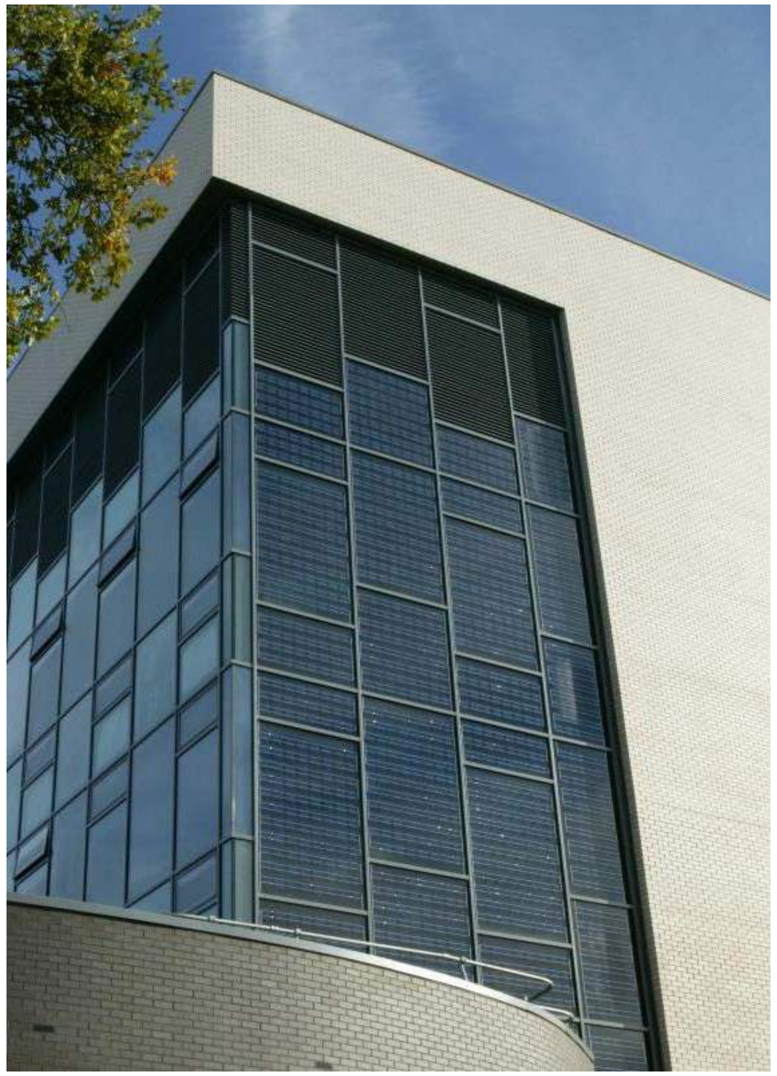
Solar louvres use PV panels to provide solar shading on the south façade of buildings as part of the brise soleil (see left), which can be a highly effective way to controlling overheating and help reduce glare.

Photovoltaic Installations: Project Epic (BREEAM Excellent Office)

Castle Wood (BREEAM Excellent School

Solar PV Louvres on the South Facade

CPW Solar Glazing Installation, University of Warwick



Materials and Analytical Sciences Building

Solar glazing uses a combination of solar PV and glass, where the PV cells are laminated between two panes of specialised glazing (see left). The resulting glass laminate serves the dual function of creating energy and shade at the same time, reducing the risk of overheating.

Solar glazing can be used wherever conventional glass would be specified, especially in atria. Bespoke designs allow for varying light penetration by changing the spacing between individual cells. Typically, a combination of 50% PV and 50% translucent glazing is used.

Vertical solar facades can be used to directly replace conventional rain screen cladding materials providing a smooth, flat facade surface for the building. Where circumstances allow, the PV panels can be tilted towards the sun to maximize the energy yield.

As mentioned earlier, there are a number of types of PV cell:

Mono-crystalline Silicon Cells: These are made using cells saw–cut from a single cylindrical crystal of silicon. The principle advantage of mono-crystalline cells is their high efficiency, typically around 15 – 20%, although the manufacturing process required to produce mono-crystalline silicon is complicated, resulting in slightly higher costs than other competing technologies.

Polycrystalline Silicon Cells: These are made from cells cut from an ingot of melted and re-crystallised silicon. In the manufacturing process, molten silicon is cast into ingots of polycrystalline silicon. The ingots are then saw-cut into very thin wafers and assembled into complete cells giving a granular textured finish. Polycrystalline cells are cheaper to produce than mono-crystalline types, due to the simpler manufacturing process but tend to be slightly less efficient, with average efficiencies of circa 12 – 15%.

Thick-Film Silicon: This is another polycrystalline technology where the silicon is deposited in a continuous process onto a base material giving a fine grained, sparkling appearance. Like all crystalline PV, this is encapsulated in a transparent insulating polymer with a tempered glass cover and usually bound into a strong aluminium frame.

Thin-Film Amorphous Silicon: Amorphous silicon cells are composed of silicon atoms in a thin homogenous layer rather than a crystalline structure. Amorphous silicon absorbs light more effectively than crystalline silicon, so the cells can be thinner. For this reason, amorphous silicon is also known as a ‘thin film’ PV technology. Amorphous silicon can be deposited on a wide range of substrates, both rigid and flexible, which makes it ideal for curved surfaces and ‘fold-away’ modules. Amorphous cells are, however, less efficient than crystalline based cells, with typical efficiencies of around 6%, but they are easier and, therefore, cheaper to produce.

Other Thin Films: A number of other promising materials such as cadmium telluride (CdTe) and copper indium diselenide (CIS) are now being used for PV modules. The attraction of these technologies is that they can be manufactured by relatively inexpensive industrial processes, certainly in comparison to crystalline silicon technologies, yet they typically offer higher module efficiencies than amorphous silicon. New technologies based on the photosynthesis process are at early stages of commercialisation.

Photovoltaic technology may be feasibly incorporated into the building design with little/no maintenance or on-going costs. Installations are scalable in terms of active area; size being restricted only by available façade and/or roof space.

A particular advantage of solar PV, even over other types of LZC technology, is that running costs are very low (requires no fossil fuel for operation) and, since there are no moving parts, very little maintenance is required.

For this study the installation of 25m2 of roof mounted mono-crystalline PV panels with a peak output of 3.75kW will have the following savings:

- Energy saving: circa 3,598kWh/yr
- % Energy saving: 6.7%
- CO2 saving: 1,876kgCO2/yr
- % CO2 saving: 8.9%

7.8 Air Source Heat Pumps

Electric driven air source heat pumps extract thermal energy from the surrounding air and transfer it to the working fluid in the system. Like GSHPs they can provide both heating and cooling to buildings and their ability to do this effectively is indicated by their associated Coefficient of Performance (COP), which is typically around 3 to 4 for Variable Refrigerant Flow (VRF) heat pumps. With VRF technology there is an opportunity to heat and cool separate spaces simultaneously by recovering and redirecting the heat within the system using a BC controller.

Care should be taken when mounting the units to avoid any acoustic problems associated with operating the fans. The outdoor units normally operate with sound levels typically in the range 55 - 60dB(A).

A downside of electric driven air source heat pumps is that they require a defrost cycle in extreme conditions which impacts on the system efficiency. Heating capacity also falls off as the ambient temperature drops below 5ºC but still maintains 80% capacity at -5ºC.

Air Source Heat Pumps

Air source heat pump systems are scalable to meet the specific demands of the development, which for this comparative study is to satisfy cooling requirements within function rooms, lounge and refreshment spaces. For this application they have the potential to provide the following savings:

- CO2 saving approx. 2,652kgCO2/yr
- % CO2 saving 12.6%
- Energy Contribution approx. 22,246kwh/yr
- % Energy Contribution 41%

7.9 Summary and Conclusion

An Energy Strategy has been produced for the proposed social development for University of Hertfordshire to address the requirements outlined by the Welwyn Hatfield District Plan.

In order to deliver an environmentally responsible development, an exemplar approach is being proposed based on low energy design principles. In summary, this approach involves minimising energy demand through effective building form and orientation, good envelope design and proficient use of services before considering the use of appropriate renewable technologies to decarbonise the energy supply.

It is worthy of note, that long term energy benefits are best realised by reducing the inherent energy demand of the building in the first instance. This is the approach adopted by the Design Team.

To conclude, having taken into account the impact of each solution; its cost, complexity, benefits and drawbacks, the following LZC technologies are recommended for inclusion on the University of Hertfordshire Social Building:

- 25m2 Solar Photovoltaic Panel installation (c. 8.9% CO2 reduction and 6.7% energy reduction).
- Air Source Heat Pump systems (c. 12.6% CO2 reduction and 41% energy contribution).

Other LZC technology solutions have been discounted on the grounds that they are not technically feasible or economically viable for the development, as described in Table 2 of this report.