

ASSESSMENT 02

ASSESS ENVIRONMENTAL IMPACT AND DESIGN OUT IMPACTS

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1.0 INTRODUCTION

The purpose of this report is to identify suggestions for improving the way in which the environment can be protected, by ‘designing out’ environmental impacts, from the pre-tender stage to the construction project completion of a chosen development project. The development project chosen is the Llanelli Wellness and Life Science Village.

1.1 Site Information

The development site is known as ‘Delta Lakes’ located south of Llanelli, it covers 23 hectares of existing vacant brown field land and existing waterbodies which historically formed Llanelli town’s dock and main industrial area. The site was previously cleared over 20 years ago and prepared for re-development, with the introduction of an access road, utilities and elements of landscape shielding along the southern perimeter (ARUP, 2017).

The site is situated on the edge of an urban setting, along the coast of the Loughor estuary. At the eastern boundary of the site, the Afon Dafen is culverted which feeds the New Dafen River, a standing waterbody located in the centre of the site. The River converges with the Afon Lleidi approximately 170m to the south west of the site before flowing into the Loughor Estuary. The site is bordered to the east, south by the road B4304 and to the north by Northumberland Road. The development site south of the New River Dafen is currently open derelict land, consisting of rough grass/scrub with a thin capping layer of limestone gravel in areas, whereas the area to the north is unmanaged brown field land that is currently grassed (ARUP,2018).

The surrounding area of the development site is a mixture of urban residential, industrial and managed rural areas. To the south west of the site are relatively new residential properties, whilst to the east are the residential areas of Morfa and Llanelli. Located to the south east corner of the site is the Delta Lakes Enterprise Centre which houses a small collection of industrial units (ARUP,2018).



Figure 1 – Site Location Plan (ARUP, 2017).

1.2 Development Principles

The concept for the whole development is based on a campus style village as the heart with supporting facilities located nearby all integrated by improved pedestrian and vehicle connections. The range of proposed buildings and amenities are focused around healthcare and promoting healthy lifestyles (ARUP,2018). The main elements of the Llanelli Wellness and Life Science Village are:

Community Health Hub – The Community Health Hub is intended to be utilised for community healthcare, business development, research, education and training. The building will have a total gross external area of 16,500m² would comprise three elements, all of which are interrelated. The three elements are:

- The Institute of Life Science.
- The Wellness Education Centre.
- The Clinical Delivery.

Life Science Business Centre – The Business Centre will comprise of a mixture of buildings with a total gross external area of 10,000m² being fully utilised for business expansion and health related research (ARUP,2018).

Wellness Hub – The Wellness Hub is to form the heart of the development, standing out as a centrepiece building. It would include a mixture of leisure and sporting facilities covering a wide sport provision and an international diving pool that would be available for public use. The building has a total gross external area of 11,000m² (ARUP,2018).

Assisted Living – It is envisioned that the site would house a wide range of assisted living dwellings, catering to a wide range of needs and medical conditions. The proposal is for up to 370 dwellings, which would comprise of a mixture of 2-4 storey apartments and 2-3 story houses alongside accompany rehabilitation and recovery facilities (ARUP,2018).

Outdoor Leisure and Public Realm – The New Dafen River waterbody is intended to be the focal point for the outdoor leisure activities. Walking and cycling routes are planned around the river, which will also provide additional opportunity for water-based leisure activities and visual amenity. A boating centre with a landing stage is proposed at the north side of the lake. Woodland areas are also proposed to the north of the of Delta Lake, as well as some wooden huts, which be utilised for yoga and meditation spaces (ARUP,2018).

1.3 Access and site movement

The proposed development intends to restrict most vehicle movement to the site boundary. A total of five vehicle accesses are proposed into the site. Around key buildings and attraction, pedestrian and cycle access will be focused to allow safe movement for the more vulnerable groups – focussing on a car free environment. The development also proposes a new pontoon bridge across the New Dafen River connecting the central hubs and two carparks. The two carparks are proposed to be situated north of the lake and at the southern access comprising of a long stay car park (150 spaces) and short stay carpark (350 spaces) (ARUP,2018).



Figure 2 – Indicative Site Plan (ARUP, 2017).

2.0 POTENTIAL DEVELOPMENT IMPACTS

The following section of this report will identify suggestions for improving the way in which the environment and community can be protected from the potential development impacts from the construction and operation of the Llanelli Wellness and Life Science Village. The structure for this chapter will consider the following aspects of the environment in accordance with the Environmental Impact assessment (EIA):

- Traffic
- Noise
- Water resources
- Ground Conditions
- Biodiversity
- Cultural heritage
- Landscape and Visual Impact
- Health and wellbeing
- Climate

2.1 Traffic

2.1.1 Potential impacts during construction

During the construction process there is undoubtedly going to be increased number of Heavy Goods Vehicles (HGV's) and development related traffic using the roads which surround the site. The EIA prepared by ARUP for this development states that on some of the surrounding roads, there may be an increase in HGV usage of between 10% and 55% (ARUP,2018). This will potentially have adverse impacts on the local community and environment. Impacts which may occur:

- Increased carbon emissions in the area.
- Increased congestion for road users.
- Increased chance of road traffic collisions occurring.
- Safety concerns for neighbouring residents.

2.1.2 Mitigation measures to minimise the impacts during construction

To minimise the impacts caused by the increased construction related traffic a Construction Traffic Management Plan (CTMP) should be produced and implemented. The CTMP should highlight the preferred construction routes for HGV's and site staff and appropriate delivery times outside of peak hours to minimise congestion and increase safety for the surrounding community (Wheeler, 2015).

The site should be managed so that vehicles do not have to wait to park safely, however in cases where vehicles should need to wait, they should be encouraged to turn off their engine and not idle. This will reduce emissions from the vehicles and fuel consumption (CLEC, n.d). To further reduce the carbon emission from construction related vehicles, utilise hybrid and electric vehicles.

2.1.3 Potential impacts during operation

When the development project is in operation, similarly to the impacts from construction, there will be an increase of vehicles using the surrounding roads. The EIA states that there is potential daily increase in vehicles of up to 21% (ARUP, 2018). Some of the potential impacts which may occur are:

- Increased congestion for road users.
- Increased carbon emissions in the area.
- Increased chance of road traffic collisions occurring.

2.1.4 Mitigation measures to minimise the impacts during operation

To minimise the impact to the environment and community due to the subsequent increase in vehicles which will utilise the surrounding road infrastructure when the proposed development is in use, a few mitigation measures which can be implemented into the design principles of the development project. These measures include:

- Implementation of a bus stop within the development, to promote public transport use to the site – This can be implemented into the design fairly easy, although the relevant provider for public transport would need to be contacted to make sure that it can be included in the bus routes.
- Improvements / introduction of pedestrian and cycle routes, to and from the site. – Typically, offsite improvements are made via a financial contribution from the developer to the local authority so these works can be carried out.
- Introduction of electric car charging points in the long and short stay car park – Designated car parking spaces with electric charging points can be easily introduced into both car parks.

2.2 Noise

2.2.1 Potential impacts during construction

During the construction process there are many different causes where excessive noise levels can become an issue for the surrounding community and environment. The EIA establishes the main causes of noise from this development may include:

- The use of compacting equipment (such as 3 tonne rollers and ‘whacker plates’) for earth works and sub-bases and paved areas.
- Heavy vehicle movements in and around the site.
- Use of powered mechanical equipment – typically used for site clearance, groundworks and foundation construction.

(ARUP,2018)

2.2.2 Mitigation measures to minimise the impacts during construction

There are many ways in which the noise impacts from construction can be minimised, such as:

- Where development occurs along sensitive edges of the site near potential receptors, opt to use hand tools where it's possible to do so instead of mechanical equipment.
- Make sure machinery and mechanical equipment is well maintained, as simple maintenance can reduce noise levels by as much as 50%.
- Where applicable use new equipment – new equipment is generally quieter than old equipment.
- Introduce barriers/enclosures around areas where noisy mechanical equipment is being used. This could be as simple as plywood with sound absorbing materials.
- Utilise the quietest possible process for a task, for instance pile driving is very loud, whereas the same work can be carried out by boring, which is much quieter (Lhsfna.org, n.d).
- Position the site compound away from sensitive receptors.

2.2.3 Potential impacts during operation

In the operational stage the main source of noise which may impact the community and environment is that coming from electrical and mechanical plant equipment serving the proposed development buildings. In addition, another source of noise may be road traffic noise due to the increased amounts of vehicular access to and from the site (ARUP,2018).

2.2.4 Mitigation measures to minimise the impacts during operation

Noise impacts from the building services should be designed to comply with the limits set by the local authority and in accordance with British Standard BS4142 (BSIGroup.co.uk, n.d) To minimise the impact of noise from increased road traffic during operation, traffic calming measures should be considered by the local authority to control the increases in noise. There are no measures within the control of the development which can be implemented to minimise such noise (ARUP,2018).

2.3 Water Resources

2.3.1 Potential impacts during construction

Outlined the EIA, the potential impacts to the surface water bodies on site may result from:

- Sediments generated from activities such as excavation, additional vehicle movements, material and earth stockpiling and through vegetation clearance may enter the surface water body on site. The increased level of sedimentation in the surface water bodies could reduce the potential for the river to support aquatic life.
- The storage and use of fuel and chemicals close to watercourses and other surface water bodies, may lead to a pollution incident, whereby a water body is contaminated.
- It's also been identified that the surface water bodies on site drain into rivers and estuary's, so any potential pollutants which enter the surface water bodies could affect the ecosystems downstream.

(ARUP,2018)

2.3.2 Mitigation measures to minimise the impacts during construction

In order to control silt, a good surface water management scheme is essential. Vegetation cover and soil stripping should be retained for as long as possible. Clearance should be phased with the development project, only areas necessary for construction should be disturbed (Rodriguez, 2020). Introduce silt control interventions such as silt mats around the surface water bodies on site, when performing earth moving, stockpiling exercises (frogenvironmental.co.uk, n.d.).

2.3.3 Potential impacts during operation

The proposed development consists of large areas of impermeable surfaces, including roads, car parking areas and buildings. Surface water runoff from the roads

and hard standings may become polluted with contaminants like fuels, oils, and various household chemicals (ARUP,2018).

2.4.4 Mitigation measures to minimise the impacts during operation

The introduction of SuDs such as filter drains, permeable paving and swales can be utilised with the development drainage network to reduce the risk of potential pollution in the surface water runoff (ARUP, 2018), which can then be discharged into the onsite New Dafen River. Discharging here is the best possible alternative to tying into the existing storm water drainage system.

2.4 Biodiversity

2.4.1 Potential impacts during construction

The EIA illustrates many ways in which the biodiversity on and around the site may be affected by construction activities, which include:

- Excavations created during construction could result in animals becoming trapped or injured when moving through the site at night.
- Potential for animals to collide with construction traffic within the site.
- Habitat loss and fragmentation affecting breeding birds, reptiles, amphibian, invertebrates, otters, badgers, water vole. Some may not currently be present on the site but have been identified near the site, so consideration for all is necessary.
- Potential acoustic, visual and vibration disturbances to overwintering bird species.

(ARUP, 2018)

2.4.2 Mitigation measures to minimise the impacts during construction

Through good design the development can aim to minimise its impacts during construction by:

- Enhance the overall ecological quality, capacity, structure and functioning of the site and surrounding ecological network by creating new habitats, buffer areas and landscape features that are of importance for wildlife.
- Avoid construction activities, where existing key habitats, important species buffer areas and other landscape features are located.
- Retain and Incorporate within the development existing habitats, important species, buffer areas and landscape features of major importance for wildlife.

2.4.3 Potential impacts during operation

The effects of the development when in operation are estimated to be limited to the effects of both air and water pollution and increase disturbance for the site use and effects of vehicle collisions with animals.

2.4.4 Mitigation measures to minimise the impacts during operation

The introduction of SuDs such as filter drains, permeable paving and swales can be utilised with the development drainage network to reduce the risk of potential pollution in the surface water runoff (ARUP, 2018). Promote sustainable travel through the introduction of bus stops, cycle and pedestrian routes and electric car charging points.

2.5 Cultural Heritage

2.5.1 Potential impacts during construction

The development site historically formed Llanelli town's dock and main industrial area and may house structural and archaeological remains of a known and potential

historic assets (ARUP, 2018). Construction activities which may remove, disturb or damage potential remains include:

- Groundworks for services.
- Landscaping.
- Excavation for building foundations.

2.5.2 Mitigation measures to minimise the impacts during construction

The potential effects arising from construction activities can be mitigated by a programme of archaeological investigations prior to and during construction activities in accordance with industry guidelines and professional standards (ARUP, 2018).

2.6 Landscape and Visual Impact

2.6.1 Potential impacts during construction

During the construction of the proposed development, construction effects would increasingly become part of the landscape and visual impact. As outlined in the EIA the source of effects may include:

- Temporary construction compounds.
- Temporary haul roads.
- Stock piling and storage of materials.
- Excavation and handling of materials.
- Site Plant, such as dump trucks, cranes and scaffolding.
- Task lighting at structure locations during winter months.

2.6.2 Mitigation measures to minimise the impacts during construction

Effective site setup management can be utilised to minimise a lot of effects to the landscape and visual impact. Methods for minimising the construction process effects on landscape and visual impact:

- Introduction of fencing around working areas. This could be standard 'heras' security fencing, fitted with green netting. This would minimise its visual prominence and heavily filter view into the low-level construction activities (ARUP, 2018).
- Stockpiles of topsoil can be strategically placed in the form of mounding to hide construction activity and create new landscape features during construction (Northumberland.gov.uk, n.d).
- Introduce perimeter planting around the boundary of the site of native species which can act as visual screening and potentially have a biodiversity benefit.

2.6.3 Potential impacts during operation

Currently the site is an open brown field, and as outlined in the EIA the development is expected to have effects which will exist from the opening year until the fifteenth operational year, whilst the proposed landscape mitigation is establishing itself (ARUP, 2018). In addition, the development consists of a series of buildings ranging from 1-6 storey, these will have a permanent effect on landscape and visual impact.

2.6.4 Mitigation measures to minimise the impacts during operation

Measures which can be introduced into the development design to minimise landscape and visual impact:

- Introduction of green roof and soft landscaping onto the roofs of buildings within the development. This will have two benefits to the scheme. It will assist with sustainable rainwater drainage and reduce the effects from the development from short and long distant view receptors.
- Enhanced buffer and structural planting around the perimeter of the development. This will minimise the impact for receptors looking onto the site and also reduce the impact for people utilising the developments facilities by shielding the visual impact of the roads which border the site.

2.7 Climate

2.7.1 Potential impacts from construction

During the construction phase it is anticipated in the EIA that the proposed development will result in 57.0 kilotonne CO₂-equivalent of greenhouse gas emissions per year (ARUP, 2018)

2.7.2 Mitigation measures to minimise the impacts from construction

The following measures can be implemented to mitigate the impact of greenhouse gas emissions from the construction phase of the development:

- Employ a local workforce where possible and choose local material suppliers, to reduce the transport distances.
- Efficient building design can be implemented to reduce the quantity of materials needed.
- Choose alternative materials which have a lower emissions intensity, such as recycled materials and concrete substitutes.

The site should be managed so that vehicles do not have to wait to park safely, however in cases where vehicles should need to wait, they should be encouraged to turn off their engine and not idle. This will reduce emissions from the vehicles and fuel consumption (CLEC, n.d). To further reduce the carbon emission from construction related vehicles, utilise hybrid and electric vehicles.

2.7.3 Potential impacts from operation

The EIA outlines the operation phase of the development's contribution to greenhouse gas emissions. Over the 60-year appraisal period it's expected that the development will generate 442.1 kilotonne CO₂-equivalent of greenhouse gas emissions per year (ARUP, 2018). This comprises of:

- 404.2 ktCO₂e from the annual energy consumption and transport emissions during operation.
- 37.8 ktCO₂e from embodied emissions due to maintenance and refurbishment activities over the 60-year period.

(ARUP, 2018)

2.7.4 Mitigation measures to minimise the impacts from operation

The following measures can be utilised to mitigate the impact of greenhouse gas emissions from the operation of the proposed development:

- Reduce the buildings energy use by adopting the design methodology of 'Fabric First'. This method of designing buildings provides a comfortable environment and makes very few demands of the building occupants. Key characteristics of a 'Fabric First' approach is:
 - High performance and high quantities of insulation.
 - Maximum levels of air tightness.
 - Optimisation of natural ventilation.
 - Optimisation of solar gain through appropriately located windows.
- Utilise mechanical ventilation with heat recovery (MVHR). When adopting a 'Fabric First' MVHR is needed as a suitable source of fresh air to permeate through the building. Opening a window does provide a certain level of ventilation but the buildings heat is quickly lost (Heat Recovery Ventilation or MVHR for Passive House, 2020).
- Select durable materials with low requirements for maintenance and replacement of the operational life of the proposed development, with consideration based on the design life of the buildings (ARUP, 2018).
- Implementation of a bus stop within the development, to promote public transport use to the site.
- Improvements / introduction of pedestrian and cycle routes, to and from the site.

- Introduction of electric car charging points in the long and short stay car park to promote the use of low carbon transport.

3.0 REFERENCES

ARUP, (2017). *Llanelli Wellness and Life Science Village - Design & Access Statement*. pp.6-82.

ARUP, (2018). *Llanelli Wellness and Life Science Village - Environmental Assessment*. pp.13-432.

Bsigroup.com. (n.d.) *BS 4142*. [online] Available at: <<https://www.bsigroup.com/en-GB/standards/bs-4142/>> [Accessed 30 April 2020].

CLEC. (n.d.). *Reducing Emissions From Vehicles*. [online] Available at: <http://www.clec.uk/advice/dust-and-emission-control-measures/reducing-emissions-vehicles> [Accessed 30 April 2020].

frogonvironmental.co.uk. (n.d.) *Managing Silt On Construction Sites*. [online] Available at: <https://frogonvironmental.co.uk/pollution-avoidance-and-mitigation/managing-silt-construction-sites/> [Accessed 1 May 2020].

Lhsfna.org. (n.d.) *Controlling Noise On Construction Sites*. [online] Available at: <https://www.lhsfna.org/LHSFNA/assets/File/bpguide%202014.pdf> [Accessed 30 April 2020].

MBC Timber Frame. (2020). *Heat Recovery Ventilation Or MVHR For Passive House*. [online] Available at: <https://www.mbctimberframe.co.uk/heat-recovery-ventilation-or-mvhr/> [Accessed 16 April 2020].

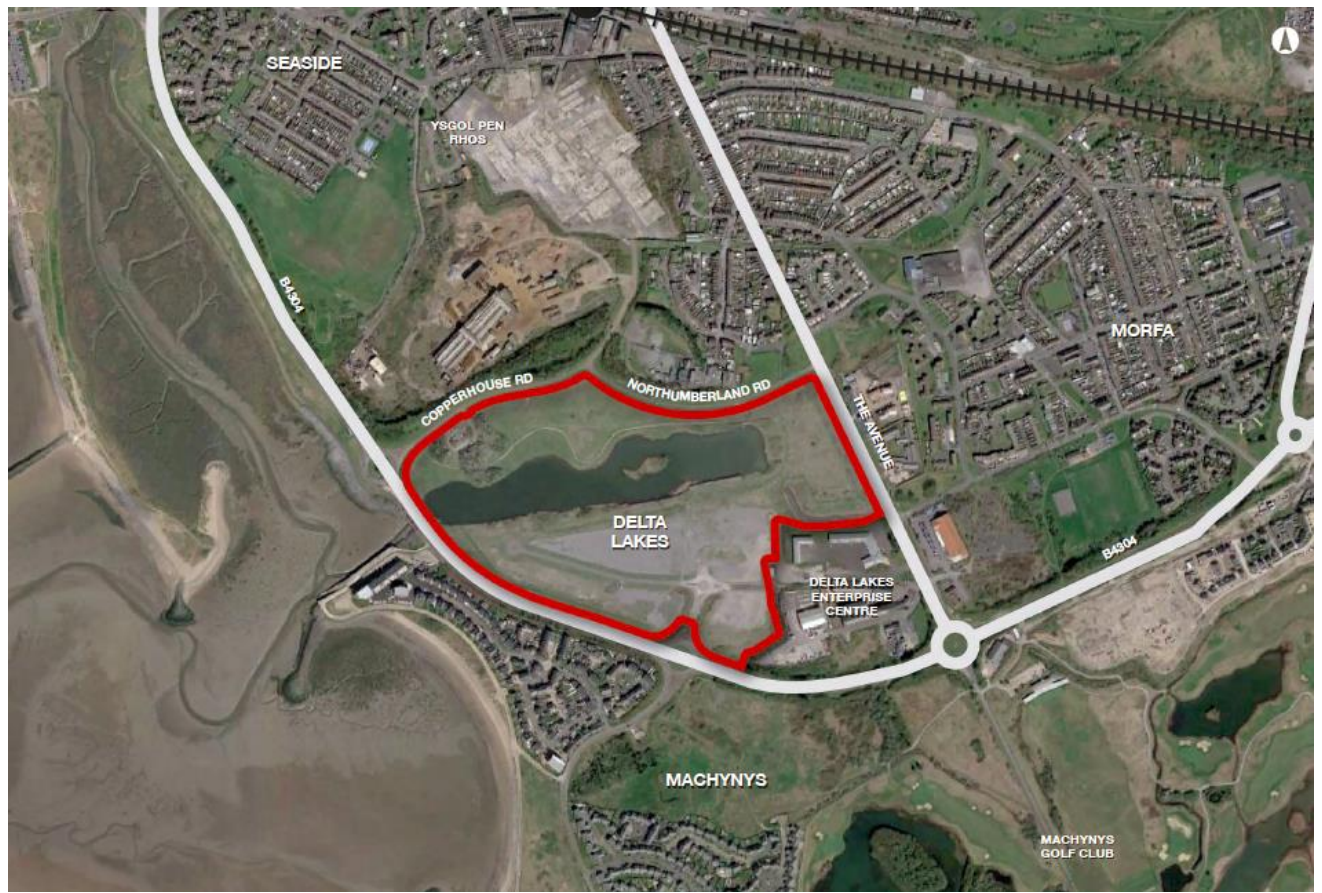
Northumberland.gov.uk. (n.d.) *Revised Chapter 8 Landscape And Visual Impacts*. [online] Available at: <https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Roads-streets-and-transport/transport%20policy/morpeth%20northern%20bypass/Chapter-8-Landscape-and-Visual-Impacts.pdf> [Accessed 1 May 2020].

Patience, S. and Kirkman, W., (n.d.) *Sustainable, Healthy Building, Are We Getting It Right?*. [online] Eco Merchant. Available at:
<https://www.ecomerchant.co.uk/blog/tag/natural-building-materials/>
[Accessed 15 April 2020].

Rodriguez, J., (2020). *How To Control Silt And Water Pollution From Construction Sites*. [online] The Balance Small Business. Available at:
<https://www.thebalancesmb.com/tips-controlling-sediment-and-erosion-problems-844637> [Accessed 1 May 2020].

Wheeler, F., (2015). *Construction Traffic Management Plan*. [online] Infrastructure.planninginspectorate.gov.uk. Available at:
https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN020016/EN020016-000390-BFC_Vol_08.7_Construction%20Traffic%20Management%20Plan.pdf
[Accessed 30 April 2020].

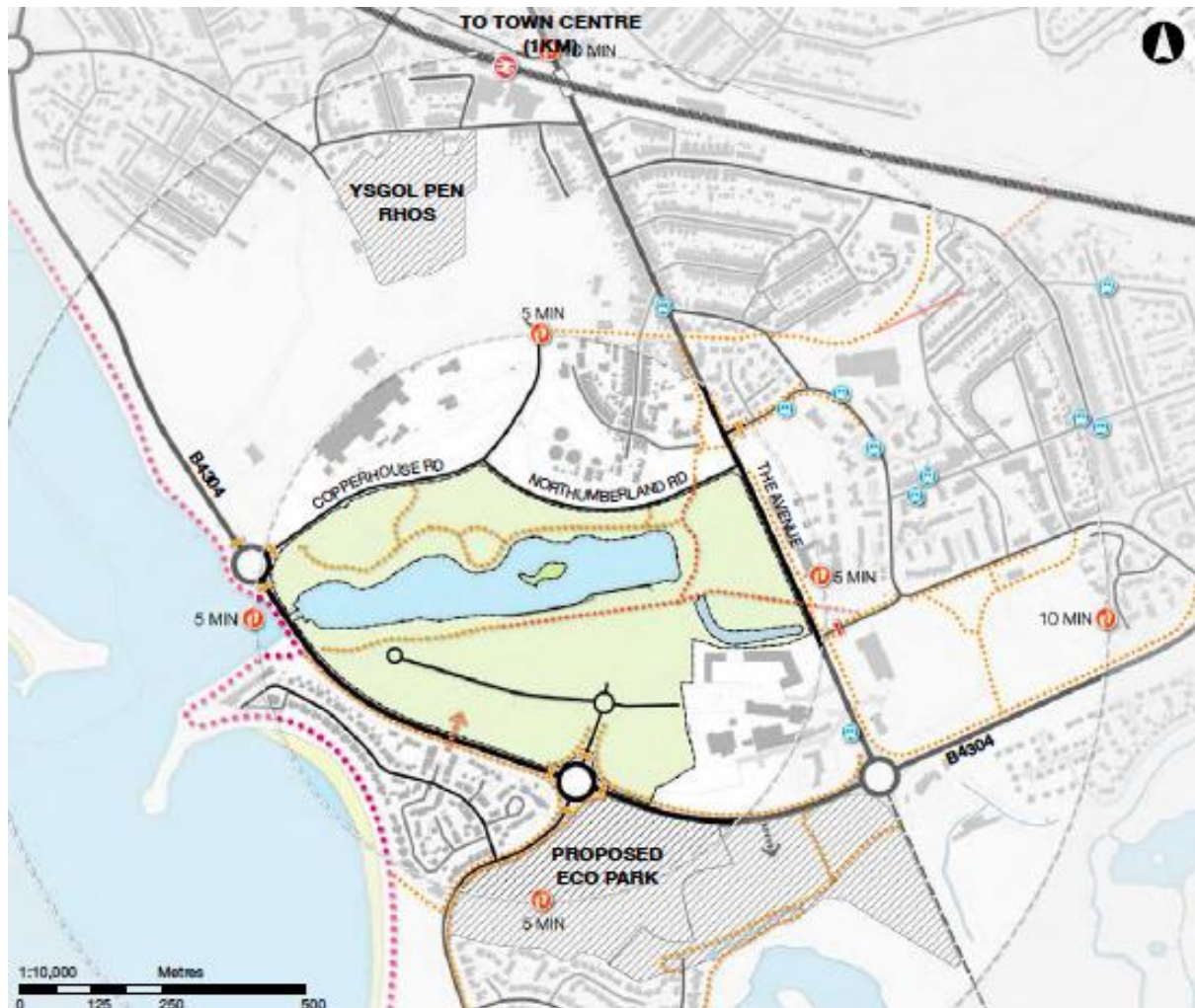
4.0 APPENDICIES



Appendix 1 – Site Location Plan



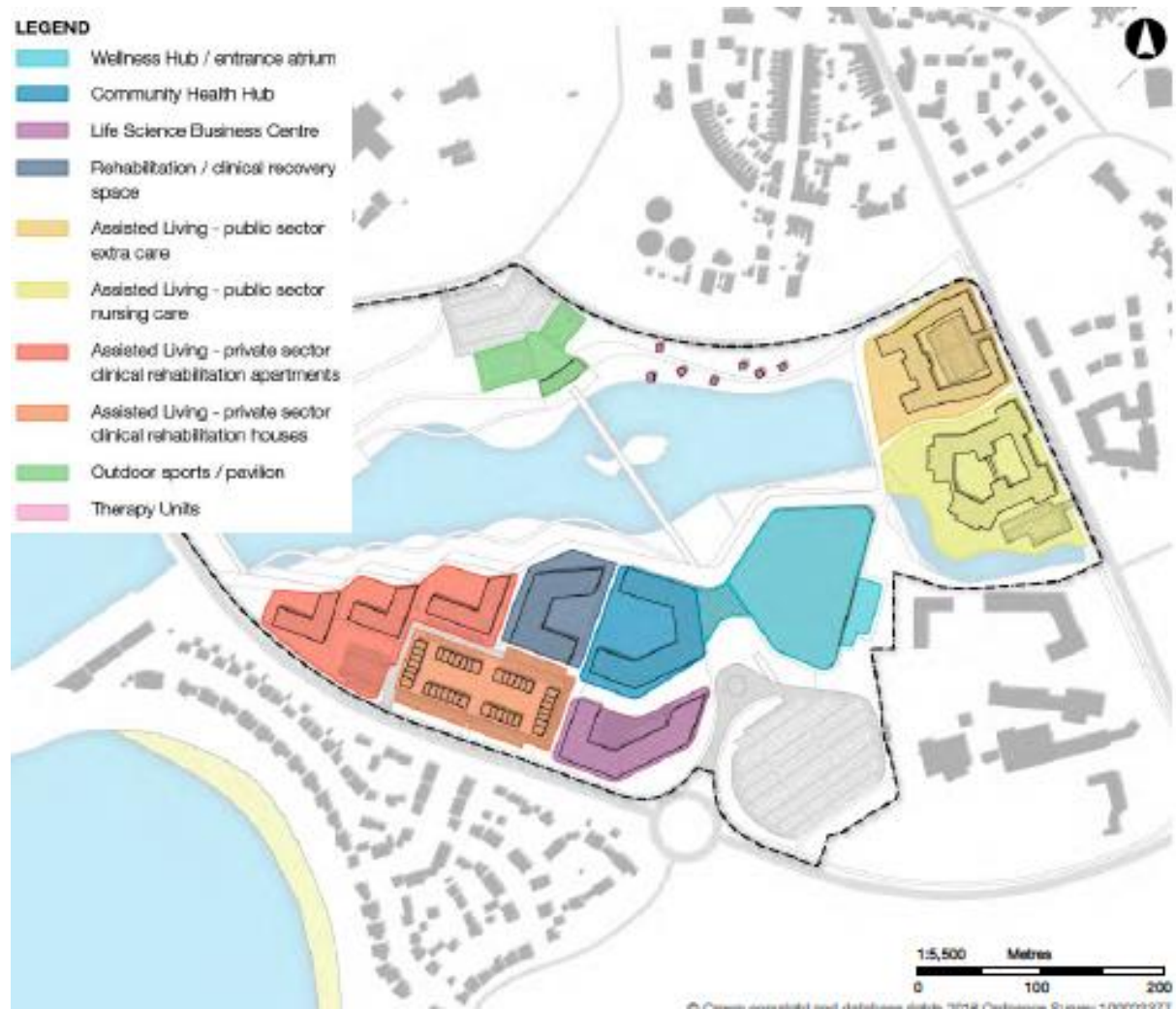
Appendix 2 – Indicative Site Plan



Appendix 3 – Access & Connectivity Plan



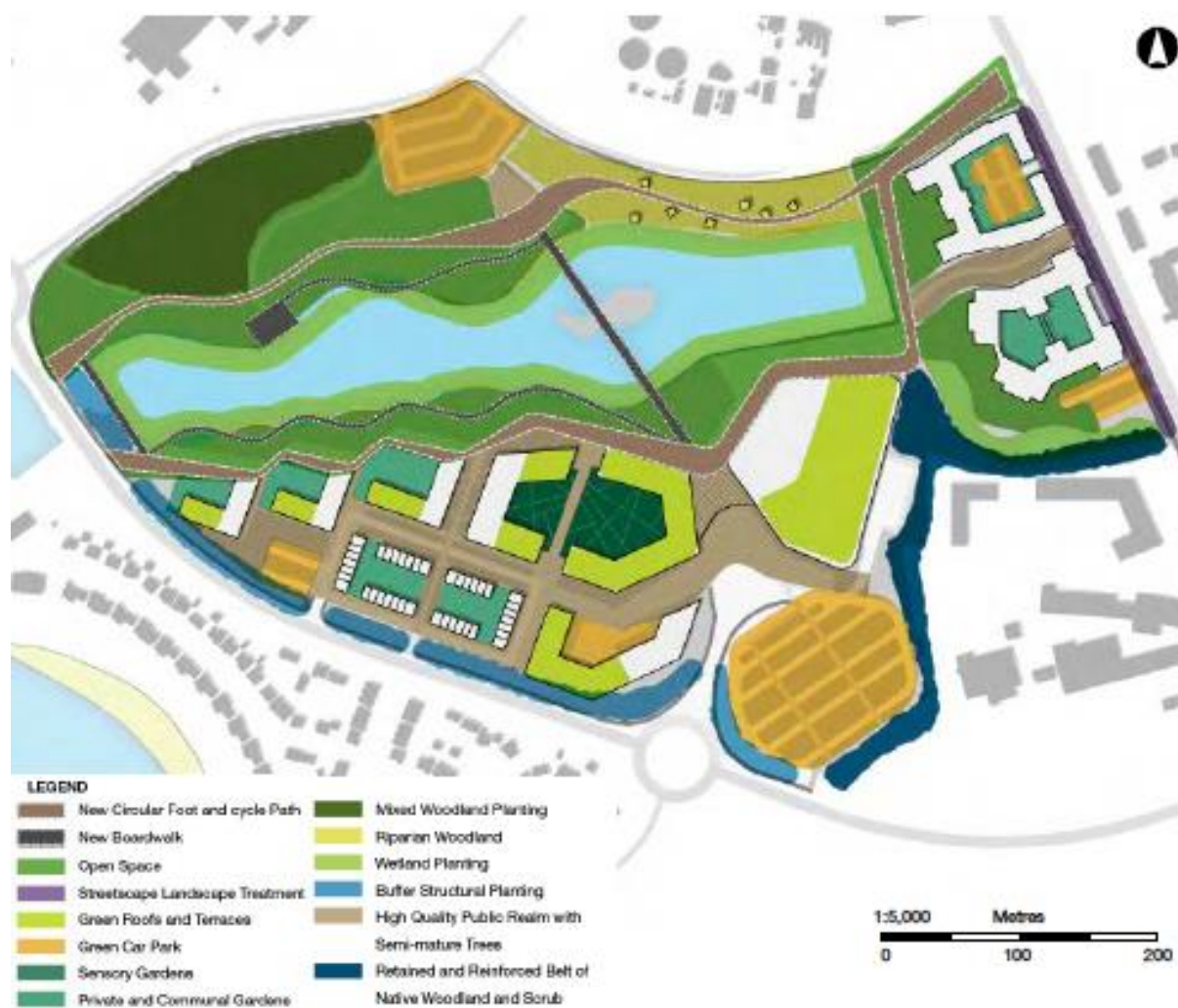
Appendix 4 – Site Opportunities Plan



Appendix 5 – Land Use Plan



Appendix 6 – Building Heights Plan



Appendix 7 – Key Landscape Areas Plan