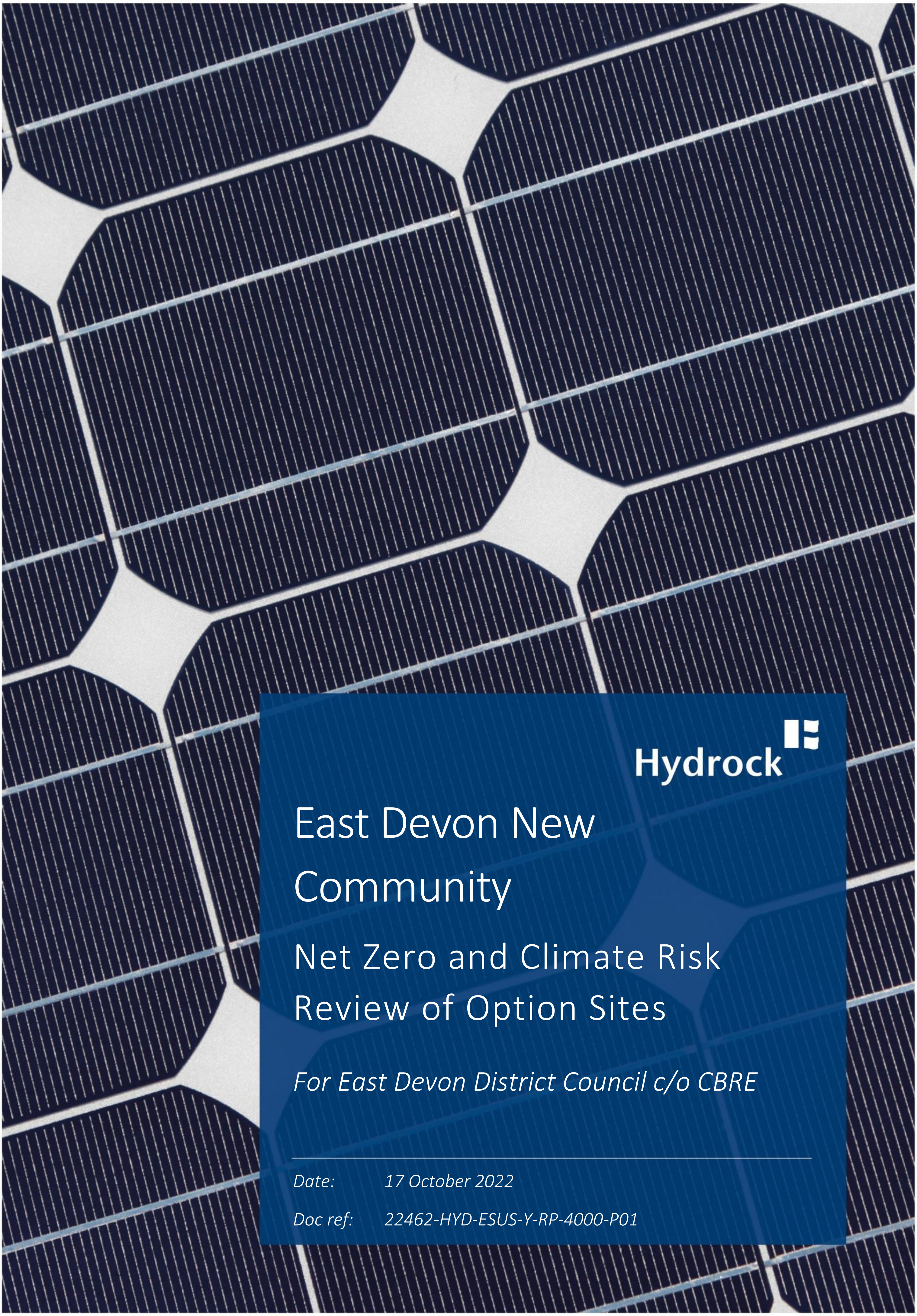
Appendix F - Zero Carbon Assessment



Hydrock

East Devon New Community

Net Zero and Climate Risk Review of Option Sites

For East Devon District Council c/o CBRE

Date: *17 October 2022*

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1.1 Overview

1.1.1 This Net Zero and Climate Risk document has been prepared by Hydrock on behalf of East Devon District Council (EDDC) as an initial exercise to help shape and inform discussions regarding the location of a potential new community of up to 8,000 new homes in the western part of East Devon, to the east of Exeter.

1.1.2 The new community will be shaped by a vision which places an emphasis on net zero and climate resilience, in line with emerging Local Plan objectives. This report explores the opportunities and constraints at each potential location to provide an overview of potential contribution to net zero and highlight any future climate risks which may impact the technical or commercial viability of the new town.

1.1.3 The report is based upon desktop assessment for feasibility of energy generation technologies and interpretation of UK climate projection data. Further detailed investigation will be required upon site selection and as part of masterplanning stages.

1.2 Report Structure

1.2.1 The structure of the report is as follows:

Section 2: Policy Context and Objectives

Section 3: Contribution to Net Zero

Section 4: Climate Change Risk and Resilience

Section 5: Conclusion and Next Steps

1.3 Site Locations

1.3.1 The three site locations are all in the western part of the EDDC area, to the east of Exeter, and are shown indicatively at Figure 1.

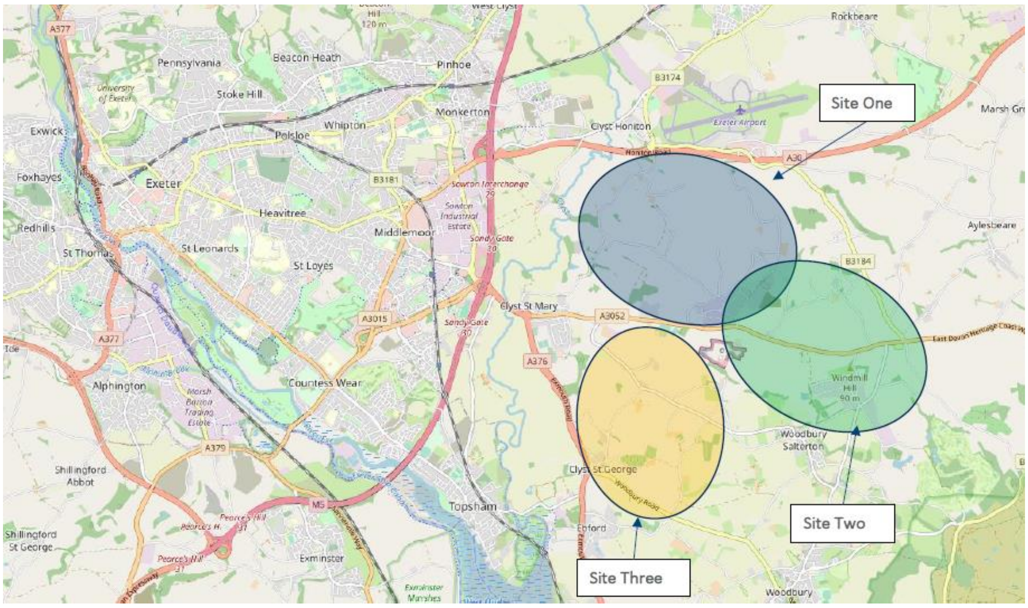

Figure 1 Indicative site option locations

1.3.2 **Site Option 1** (521.0 ha) is located approximately 7km east of Exeter city centre and 3km east of the M5. The A30 is to the north of the site and the A3052 is to the south of the site; Exeter Airport is also located less than 500m north of the site's northern boundary.

1.3.3 **Site Option 2** (521.5 ha) is located approximately 9km south-east of Exeter city centre and has the potential to be bisected by the A3052. The village of Woodbury Salterton is located south of the site's indicative boundary, with Greendale Business Park and Greendale Farm shop located within the site area.

1.3.4 **Site Option 3** (523.2 ha) is located adjacent to the A376, in between Clyst St George (to the south-west) and Clyst St Mary (to the north-west). The site is 2km east of Topsham, which offers a rail link to Exeter and Exmouth via the Avocet Line.

2. POLICY CONTEXT AND OBJECTIVES

2.1 National Policy

2.1.1 The energy and carbon performance expectations for new developments are rapidly evolving as the UK moves towards a legislated net zero commitment by 2050.

National Planning Policy Framework

2.1.2 The National Planning Policy Framework (NPPF or the Framework) was introduced in March 2012 to set out government planning policy for England, removing all regional level planning policy in favour of '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.'

2.1.3 A number of iterations have since been published. The Framework was revised on the 20 July 2021, replacing the previous update in February 2019. All new Local and Neighbourhood Plans and reviews must align with the polices of the Framework 2021.

2.1.4 The Framework states clearly that the purpose of planning is to help deliver sustainable development and defines three mutually dependent pillars that must be equally considered in order to achieve this:

- Economic;
- Social; and
- Environmental.

2.1.5 There is a clear focus upon:

- Promoting high-quality design for new homes and places;
- Offering stronger protection for the environment;
- Constructing the right number of homes in the right places; and
- Focusing on greater responsibility and accountability of councils and developers for housing delivery.

Building Regulations Part L

2.1.6 The Building Regulations drive minimum energy efficiency and carbon reduction improvements in new buildings.

2.1.7 New development will need to meet the standards set within Building Regulations Approved Document Part L 2021 - Conservation of Fuel and Power in New Dwellings/New Buildings other than Dwellings, respectively for the residential and non-residential elements.

2.1.8 A minimum level for regulated carbon emissions is defined by the Target Emission Rate (TER) which relates to a 'Notional Building' automatically generated as part of the Standard Assessment Procedure (SAP) and Simplified Building Energy Model (SBEM) toolkits.

2.1.9 The resulting Dwelling Emission Rate (DER) or Building Emission Rate (BER) must be less than the relevant TER in order to comply. In addition, there are minimum levels of fabric efficiency set by the Target Fabric Energy Efficiency rating (TFEE) for dwellings under the SAP methodology.

2.1.10 It was the intention via progressive changes to Part L to require zero carbon homes by 2016. However, in July 2015 the Government Productivity Plan ("Fixing the Foundations") announced that it would not proceed with the allowable solutions carbon offsetting scheme, or the proposed 2016 increase in on-site energy efficiency standards. Part L 2013 remained 'current' for a number of years whilst the UK Government kept standards 'under review'.

2.1.11 In late 2020 the Government consulted on an update to Part L for new dwellings and following a substantial review of comments received, the new interim update to Part L (2021) came into effect in June 2022, requiring a circa 30% carbon reduction from Part L 2013 to achieve compliance.

2.1.12 As part of the interim update, there has also been an uplift to Part F (ventilation) as well as a new Approved Document O to mitigate the risk of overheating in new homes.

SAP 2012 vs. SAP 10.2

2.1.1 The carbon factor for grid supplied electricity was significantly outdated within the Building Regulations methodology and not reflective of the power sectors efforts to decarbonise through an increase in renewable generation feeding into the grid as well as the winding down of a number of fossil fuel power plants. The carbon intensity of grid electricity has reduced by circa 75% over the past decade and will continue towards net zero emissions, with plans for a net zero grid by 2030.

2.1.2 The carbon factors from SAP are utilised across Building Regulations Part L calculations. The latest update includes key changes to these under the new SAP 10.2 version under which natural gas has a higher carbon factor than electricity for the first time (see Table 1).

Table 1 - Carbon Factors for Gas and Electricity

kgCO2/kWh	SAP 2012 (Part L 2013)	SAP 10.2 (Interim Part L 2021)
Gas	0.216	0.210
Electricity	0.519	0.136

The Future Homes and Buildings Standards

2.1.3 The interim Part L and the updates to SAP carbon factors will lay the groundwork for the Future Homes Standard (FHS) and the Future Building Standard (FBS) to be introduced in 2025.

2.1.4 FHS has been confirmed as requiring a circa 75% carbon reduction for new homes from Part L to demonstrate compliance.

2.1.5 A key feature of the Future Homes Standard will be that it will no longer be possible to demonstrate the required carbon reductions through the use of gas heating systems.

2.1.6 The FHS will be an important consideration when considering appropriate heating strategies for future development. It is likely that uptake of direct electric or heat pump derived heating and hot water will increase and become the standard industry approach for future developments as the UK moves away from the use of fossil fuels.

2.1.7 A Fabric Energy Efficiency Standard will also be utilised to ensure a minimum level of building fabric performance across new homes.

2.1.8 It is likely that no further updates to the Building Regulations will take place after the introduction of FHS and FBS.

UK Climate Change Risk Assessment

2.1.9 Climate Change Risk Assessments (CCRA) act as a bridge between climate science research and climate change policy. They allow risks associated with climate change to identified, forming the basis for planning and decision making. In the UK, the Climate Change Act 2008 requires the UK government to publish a CCRA report every five years, the third and most recent of these was published in January 2022.

2.1.10 The supporting Technical Reports of the latest CCRA show that more action is needed in the majority of risk areas and there are many actions we can take to improve resilience that are low cost, 'low regret actions'.

2.1.11 The evidence shows that we must do more to build climate change into any decisions that have long-term effects, such as in new housing or infrastructure, to avoid often costly remedial actions in the future. And we must consider low probability but high impact events arising from, for example, high warming scenarios and interdependent or cascading risks.

2.2 Local Policy

Climate Emergency – 2040 Carbon Neutral Target

2.2.1 The climate change agenda and the climate emergency declarations of local authorities necessitate that firm commitments are made to achieving net zero in the earliest possible timeframe. EDDC declared a climate emergency in 2019 and committed to becoming carbon neutral by 2040, with a five-year strategy and action plan in place to support this goal.

2.2.2 The built environment and associated energy and green infrastructure has a large part to play in tackling climate change.

2.2.3 The district risks missing the 2040 target by a substantial margin unless current energy efficiency behaviours are significantly altered, low and zero carbon technologies are embraced and the approach to masterplanning and development is adjusted.

Adopted East Devon Local Plan (2013-2031)

2.2.4 The East Devon Local Plan (2013-2031) was adopted in January 2016 and sets out a vision for East Devon's 'West End', with an aim to provide large-scale development to complement the role of the City of Exeter.

2.2.5 Large scale development at the Exeter and East Devon 'Growth Point' has already commenced, with the area now host to developments including Exeter Science Park, SkyPark and the Cranbrook new community.

2.2.6 Given that the new town proposals are aligned to the development of the emerging Local Plan, the adopted EDDC energy and sustainability policies are acknowledged, but are not outlined in detail.

Emerging East Devon Local Plan (2020 to 2040)

2.2.7 The Draft Local Plan (January 2022) was first presented to Strategic Planning Committee in December 2021 and its preparation by EDDC is ongoing.

2.2.8 The strategic policies of the emerging plan seek a concentration of new development on the western side of East Devon to include an additional new town (in addition to Cranbrook).

2.2.9 **Strategic Policy 25 – Climate Emergency** provides an overarching policy requiring that developments support East Devon becoming carbon neutral by 2040, through:

1. Delivering net-zero development;
2. Maximising opportunities for delivery of renewable energy, district heat networks, zero-carbon energy and energy storage facilities; and
3. Calculating the impact of embodied carbon and retaining existing buildings where possible.

2.2.10 **Strategic Policy 26 – Net-Zero Carbon Development** will require that all new residential and commercial development delivers net-zero carbon emissions. Developers would be required to submit a 'carbon statement to demonstrate how this is achieved, in accordance with the energy hierarchy (see Figure 2). There will also be a requirement to maximise opportunities for renewable energy, and ensure that in-use energy performance is as close as possible to design intent.

2.2.11 A currently rejected alternative approach (Option b) is to require a higher standard of development, conforming for example to the more strictly defined and less flexible Passivhaus. EDDC note however that there is insufficient evidence to suggest that all development could viably meet this standard and that is will be explored in viability work going forward.

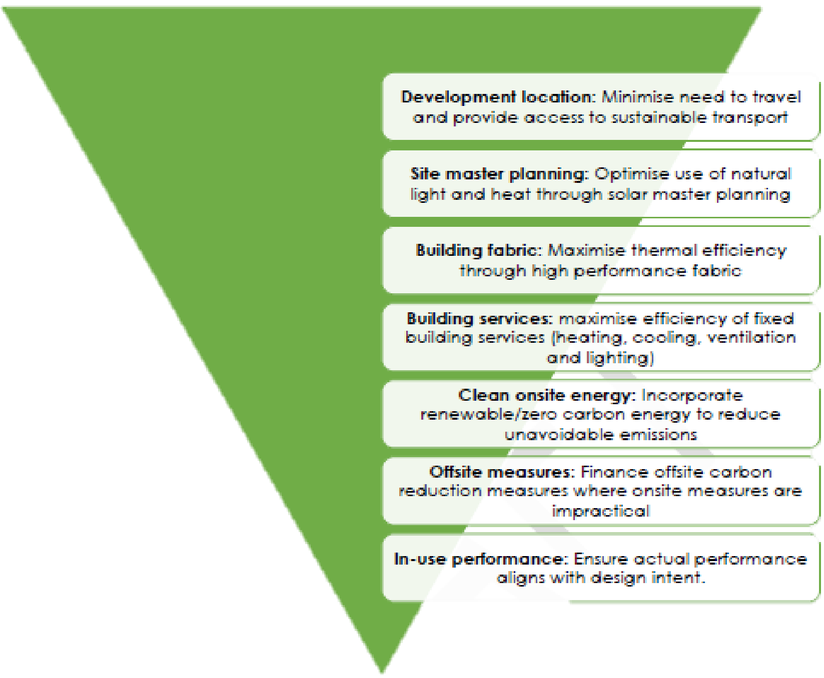

Figure 2 - Proposed Energy Hierarchy for East Devon

2.2.12 **Strategic Policy 27 – Promoting renewables and zero carbon energy** will support the development of zero carbon and renewable energy schemes within the District, encouraging the use of community-led schemes. Development of non-renewable forms of energy generation will only be supported in exceptional circumstances where all reasonable opportunities for using renewables have been exhausted.

2.2.13 The scale of resource available for solar energy within East Devon is vast and despite some schemes coming forward, remains largely untapped. The intention of this policy will be to create an environment which gives certainty to the industry as to where schemes will be acceptable, which should translate into a greater number of schemes coming forward.

East Devon District Council Climate Change Action Plan 2020 – 2040

2.2.14 The EDDC Action Plan is in place to achieve a carbon neutral position, covering themes where the Council can make meaningful climate change interventions such as: energy supply and consumption; permitting and encouraging low carbon development; protecting and enhancing the natural environment; water supply and flood protection; transport and travel and community resilience.

2.2.15 Key actions around GHG reductions include:

- Having a robust policy for granting permissions for low energy buildings;
- Delivering large scale zero carbon development in the West End of the District;
- Gathering evidence and policy ideas for consideration as part of the review of the East Devon Local Plan for specific measures to address climate change in new developments in the district in the future;
- Develop heat supply networks to deliver low carbon heat.
- Encourage the use of smart meters and energy storage solutions.
- Increase the amount of energy generated locally using renewable technologies.

2.2.16 EDDC also make a commitment to work with Exeter, Teignbridge and Mid-Devon Councils on developing strategic planning policies for inclusion in the Greater Exeter Strategic Plan that set a framework for directly and indirectly reducing the risks of climate change on the communities of East Devon.

East Devon New Community Committee Papers

2.2.17 An EDDC strategic planning committee meeting took place on 8th March 2022, focusing on the provision of a new community and infrastructure. An outcome of the committee meeting was the recommendation that members 'agree in principle to the inclusion of a new community as part of the spatial strategy within the working draft Local Plan subject to this being reviewed as further evidence comes forward'. This recommendation followed a previous request (8th February 2022) from members for a further report on the proposed option of a new community in order to support it.

2.2.18 The committee meeting report states that consultants have been commissioned to produce work which will help assess the options for a new community - namely, the appointment of a CBRE-led consortium including Tibbalds and Hydrock, leading to the production of this report as part of the evidence base for an initial options appraisal and development of the preferred delivery option/model.

West End Low Carbon Study

2.2.19 A Low Carbon Study for the West End area was prepared by The Centre for Energy and the Environment at the University of Exeter, published in December 2019. The report pre-dates the full details of the Building Regulations 2021 update and the announcement of the Future Homes and Buildings Standards.

2.2.20 As outlined in Table 2, the report includes assumptions on heat and electricity demand per home (and upscaled to 20,000 and 30,000 homes). However, this does not appear to factor in key considerations of the energy transition, whereby we see the electrification of heat and transport.

Table 2 - Low Carbon Study demand assessment summary

Annual demand (MWh)	Per home	20,000 homes	30,000 homes
Heat	5.7	114,000	171,000
Electricity	2.8	56,000	84,000

2.2.21 A requirement for EV charging at plot level would increase power demand. Further commentary on this is provided within the utilities report.

2.2.22 With respect to heat, the impact of new and emerging legislation will be two-fold; with a reduction in demand seen as result of improved building fabric and a change of fuel units consumed from gas to electricity (noting that technology choices will also impact demand as a result of conversion efficiency e.g. direct electric heating vs heat pumps).

2.2.23 Reviewing the report, the energy consumption figures quoted for heating and electricity are higher than what we have anticipated for Building Regulation Part L 2021 compliance, and should therefore be reviewed against this new regulation. We would suggest that the current figures reflect a Part L 2013 compliant building with an Energy Use Intensity (EUI) of approx. 120 kWh/m^2/yr.

2.2.24 Whilst most of the assessed electrical demand is from plug in equipment and therefore wouldn't substantially reduce, with improved insulation and u-values, the total EUI for current Part 2021 compliant building envelope is estimated from our work to date to be around 70 kWh/m^2/yr. In addition, a space heating consumption of around 30 kWh/m^2/yr, which translates to a space heating demand of 90 kWh/m^2 (COP of ASHP is 3).

2.2.25 The above results in an annual consumption for heating of 2.1 MWh/year and electricity of 2.8 MWh/year, totalling 4.9 MWh/year.

2.2.26 Further detail on the use of EUI targets is outlined under section 2.3 Best Practice.

2.2.27 It is important to differentiate between demand and consumption, the former being the required load (e.g. heat load to combat heat loss) before system efficiency is applied. This is to force fabric first principles, and not rely on extra efficient heating systems such as heat pumps to make up for poor design.

2.2.28 The main focus of the previous report was on the potential for large scale solar thermal incorporating thermal storage to replicate the solar thermal power plants seen in Denmark which contribute to meeting heating demands through heat networks.

Climate Risk Assessment for Devon, Cornwall and the Isles of Scilly (DCIoS)

2.2.29 RSK are currently commissioned to undertake a regional level climate risk assessment for the DCIoS which will provide strategic level indications of climate risk, sitting above authority level or site-specific assessments.

2.2.30 Hydrock have engaged with this piece of work during the preparation of the technical workstream for EDDC and whilst our interest on behalf of the Council was received positively, the risk assessment is not yet sufficiently advanced or likely to be granular enough to inform the site selection process for the new town.

2.3 Industry Best Practice

Energy Use Intensity

2.3.1 Currently, Building Regulations use carbon as the key metric to assess the energy efficiency and sustainability of a building; this can create a number of problems for designers, contractors and occupants.

2.3.2 Energy Use Intensity (EUI), measured in kilowatt hours per m2 per year (kWh/m2/annum) is the total amount of energy consumed by a building over a year divided by floor area, allowing easy and direct comparison of building performance. The EUI metric removes 'carbon intensity' which has less relevance as fossil fuels are removed for heating; it is widely adopted by best practice guidance such as the LETI Climate Emergency Design Guide[1], the UK Green Building Council Net Zero Buildings Framework[2] and the RIBA 2030 Climate Challenge[3] targets

2.3.3 EUI also considers unregulated energy use which will be an important consideration for future net zero targets.

[1] Climate Emergency Design Guide, London Energy Transformation Initiative (January 2020)
[2] UK Green Building Council Net Zero Framework, UKGBC (April 2019)
[3] RIBA 2030 Climate Challenge version 2, Royal Institute of British Architects (2021)

3. CONTRIBUTION TO NET ZERO

3.1.1 Emerging Strategic Policy 26 (Net-Zero Carbon Development) will require that all new residential and commercial development deliver net-zero carbon emissions. In addition, future development must maximise opportunities for delivery of renewable energy, district heat networks, zero-carbon energy and energy storage facilities.

3.1.2 Based upon expected delivery timescales, the new town for East Devon will require compliance with the incoming Future Homes and Buildings standards as a minimum and must deliver upon the emerging policy requirement for net zero from the outset to ensure that no further energy efficiency retrofit work will be necessary to make buildings zero-carbon as the electricity grid decarbonises.

3.1.3 Energy demand reduction provides the greatest opportunity for minimising CO2 emissions which in turn also helps to address concerns with respect to fuel poverty as buildings with lower energy demand require less heating. This begins with appropriate passive design features at site level such as orientation, form and massing which must be considered from the earliest stages to benefit the masterplanning response.

3.1.4 In addition, carbon sequestration as part of offsetting for net zero in initial phases of development requires further assessment, influenced by the existing landscape and the ecology and biodiversity work by TEP.

3.1.5 Whilst passive design considerations and carbon sequestration contributions to net zero will predominantly be addressed by masterplanning and building performance design at the chosen site, this section considers the site options in terms of opportunities and constraints for technologies and infrastructure that could contribute to achieving net zero.

3.1.6 Each Option has been provided with a score across three key areas; network capacity (generation), zero or low carbon energy technologies and energy storage.

3.2 Existing Baseline

3.2.1 Based upon the data within the 'Knowing East Devon' Report 2019, the district has one of the lowest per capita (head of population) CO_2 output of all the districts across Devon. In 2016, this amounted to 5.04 tonnes of CO_2 emissions per capita, the Devon average was 5.03 tonnes and the national average was 5.29 tonnes.

3.2.2 Comparison with 2019 figures available from the Office for National Statistics[4] shows an overall total of 622.25 kt CO_2, equivalent to 4.25 tonnes of CO_2 emissions per capita for East Devon showing a continued trend for reducing in CO_2 emissions. However, more than a quarter of this total (c. 1.41 tonnes CO_2 per capita) is still contributed by the domestic sector.

3.2.3 By area, East Devon in 2019 emitted a lower than UK average of 0.8 kt/km2 of CO_2 in 2019 which is comparable to surrounding rural districts such as Mid Devon and Dorset.

[4] UK local authority carbon dioxide emissions estimates 2019, National Statistics, Department for Business, Energy and Industrial Strategy, June 2021

Energy Generation and Storage

Existing energy generation in the vicinity of the three sites is limited.

Based upon desktop review, there are no significant existing ground mount PV arrays in proximity to the site search area.

However, there are a small number of energy generation or low carbon heat technologies operating in the wider area including:

- Gorst Energy, Enfield Farm Anaerobic Digestion plant at Oil Mill Ln, Clyst St Mary;
- Brook Energy, Biomass plant at Hill Barton Industrial Estate.
    - The proposals for a 7.5km district heating interconnector from this facility should be taken in to consideration so that the available 37Mth of heat is utilised, this is detailed further in section 3.4.

A public consultation was also undertaken in June 2022 in relation to a large solar farm (29ha) known as Ford Oaks Solar & Green Infrastructure Facility, proposed off Wescott Lane, close to Exeter Airport and Marsh Green village and bounding the A30. The planning application associated with the proposals is yet to be determined by EDDC but has met with a significant level of local objection at this location.

Figure 3 Submitted proposals for Ford Oaks Solar & Green Infrastructure Facility

3.3 Network Capacity (Generation)

3.3.1 The energy and utility infrastructure for the new town must be developed in a way that delivers:

- A significant reduction in energy use and carbon emissions;
- Affordability and cost competitiveness of energy;
- Security and resilience of supply.

3.3.2 Given the need to include energy generation within the new town proposals, an assessment of network capacity for export to the national grid will aid the decision-making process with respect to the net zero target.

3.3.3 The WPD upstream bulk supply points (BSP) assessed for supply have therefore also been reviewed for generation headroom. Where existing infrastructure cannot accommodate the theoretical output of the energy generation being exported onto its network then the DNO will not allow connection without first upgrading the equipment.

3.3.4 The BSPs from the existing WPD network in the vicinity of the site Options have been assessed for reverse power headroom (the amount of generation that can go back through the transformer) to provide an indication of the capacity for connection of new generators to export to the grid:

Sowton BSP

- **Reverse Power Headroom: -8.54MVA**
- Substation Reverse Power Capability: 45.76 MVA
- Connected Generation: 27.95 MVA
- Accepted not yet connected: 45.12 MVA
- Offered not yet accepted: 0.39 MVA

2. Exeter Main BSP (132/33kV)

- **Reverse Power Headroom: -13.27 MVA**
- Substation Reverse Power Capability : 45.00 MVA
- Connected Generation: 73.77 MVA
- Accepted not yet connected:11.50 MVA
- Offered not yet accepted: 15.86 MVA

3. Exmouth BSP (132/33kV)

- **Reverse Power Headroom: -0.16 MVA**
- Substation Reverse Power Capability : 44.60 MVA
- Connected Generation: 18.90 MVA
- Accepted not yet connected: 36.00 MVA
- Offered not yet accepted: N/A

3.3.5 The results indicate that the available export capacity at Sowton BSP and Exeter Main BSP is committed by existing connection agreements for generators connecting upstream in the network and that network upgrades will be required to accommodate large scale new generation. This is likely to impact all site Options, noting however that there is some inconsistency with how future export connections and upgrades are presented with some included at a budget application (for which connection dates are often delayed) and some only at formal offer stage.

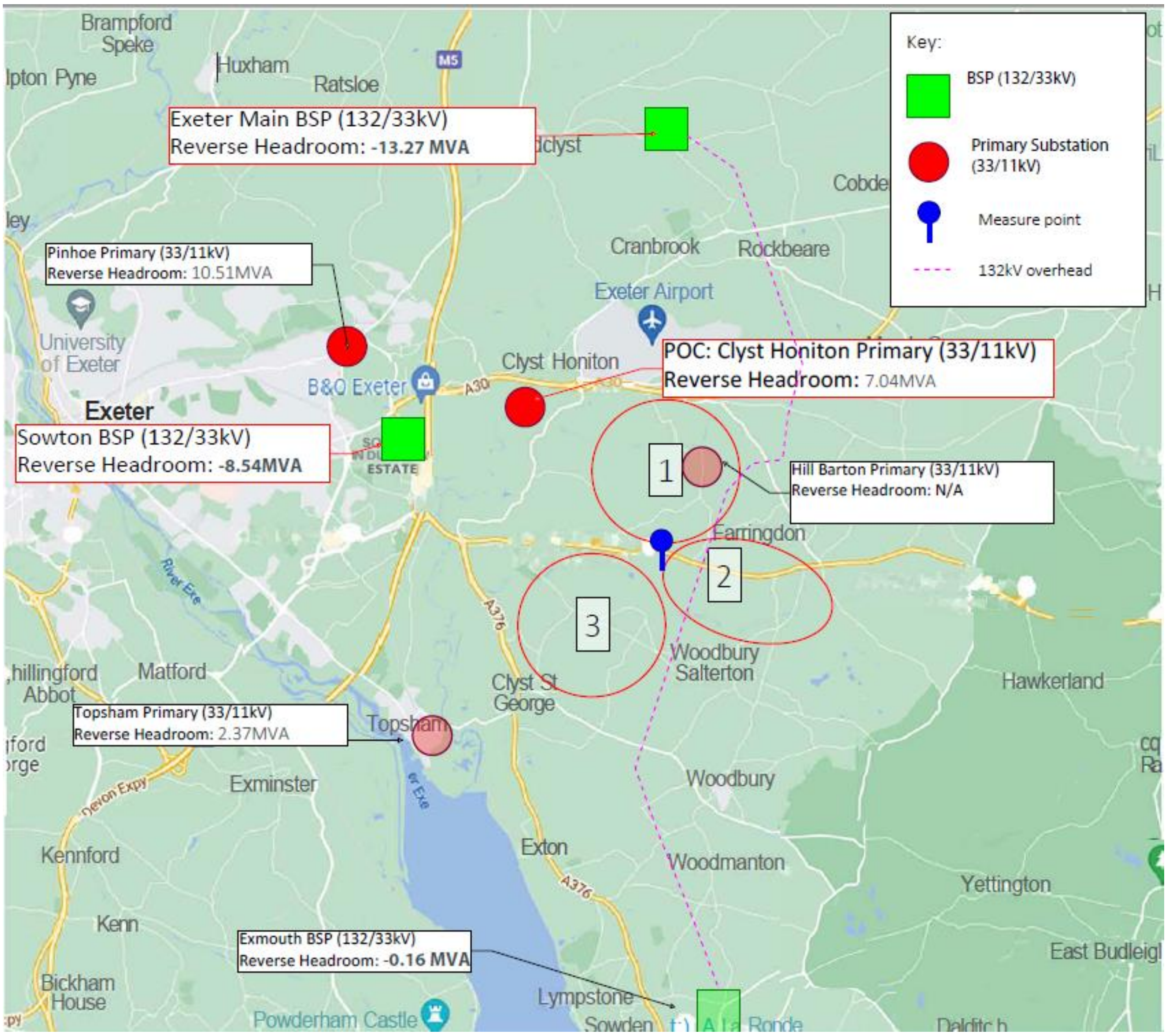

Figure 4 - summary of reverse power headroom for export to grid

3.3.6 Whilst the upstream constraints must be acknowledged, at primary substation level there is some export capacity remaining at Clyst Honiston (7.04MVA) and Pinhoe (10.51MVA), both in closest proximity to site Option One and also at Topsham (2.37MVA), in relation to Option Three.

3.3.7 Further details are needed in relation to the Hill Barton Primary substation indicated on the WPD network map which would be most easily accessed by site Options Two and One. Further detail is provided within the Utilities report.

3.3.8 On-site renewable energy generation 'behind the meter' for self-consumption within the site is more likely to be able to accept a certain level of export limitation (as a result of network constraints) when considering the significant carbon and cost savings against grid supplied power. Solar inverters can also be used to monitor and control the utilisation of power to the site (see Energy Storage).

3.3.9 It may be possible to secure some export capacity so that the limitation process is not activated the moment generation exceeds demand whilst allowing upgrade costs to be avoided or shared between stakeholders though 'fault levels' for the network would also need to be taken into consideration to ensure loss of power to connected customers is avoided.

3.3.10 A WPD budget estimate for the selected site option will inform the solution and provide budgetary costs, however, a formal application will need to be submitted for WPD to determine the exact export solution for the site.

3.4 Zero or low carbon energy technologies

3.4.1 Alongside the need to reduce CO_2 emissions, there are additional drivers for using renewable sources of electricity. Energy prices are increasing, traditional fuel stocks, such as gas, are in decline, whilst the UK's existing fleet of coal-fired and nuclear power stations are all progressively coming offline over the next decade.

3.4.2 There is also the need to ensure a mix of energy supply, whereby we are not overly reliant on one form of energy production to meet our energy needs. At the micro and decentralised scale, additional benefits of renewable and low carbon sources of energy can include reduced energy bills and community ownership.

3.4.3 As such, creating the right low or zero carbon technology mix for the new town will be essential. An emphasis is placed upon technology options that can aid the decarbonisation of heat as well options for onsite power generation.

Decarbonisation of Heat

3.4.4 Where housing densities and heat demands are sufficient, low temperature site-wide heat networks, following the Danish model can provide efficient and cost-effective low carbon heat to homes and buildings.

3.4.5 Air source heat pumps could be equally incorporated across all sites, with potential to install commercial scale heat pumps within energy centres to serve specific phases with a centralised system. This technology is not discussed further at this stage as its implementation is unlikely to affect the decision-making process in terms of the site options.

Geothermal

3.4.6 The potential use of ground source heat pumps presents a key opportunity for the new town. There are a number of different ways to implement the technology, some of which may be influenced by the site selection.

3.4.7 Ground loop systems can operate as follows:

- Closed loop: in either horizontal or vertical configuration use the relatively constant temperature of the earth to heat refrigerant fluid instead of the outside air temperature.

- Open Loop: Extracts groundwater which passes through a heat pump where heat is extracted. Running in reverse during summer months can also 'recharge' the ground, making it easier for a centralised system to work efficiently through the winter months (see Figure 5).

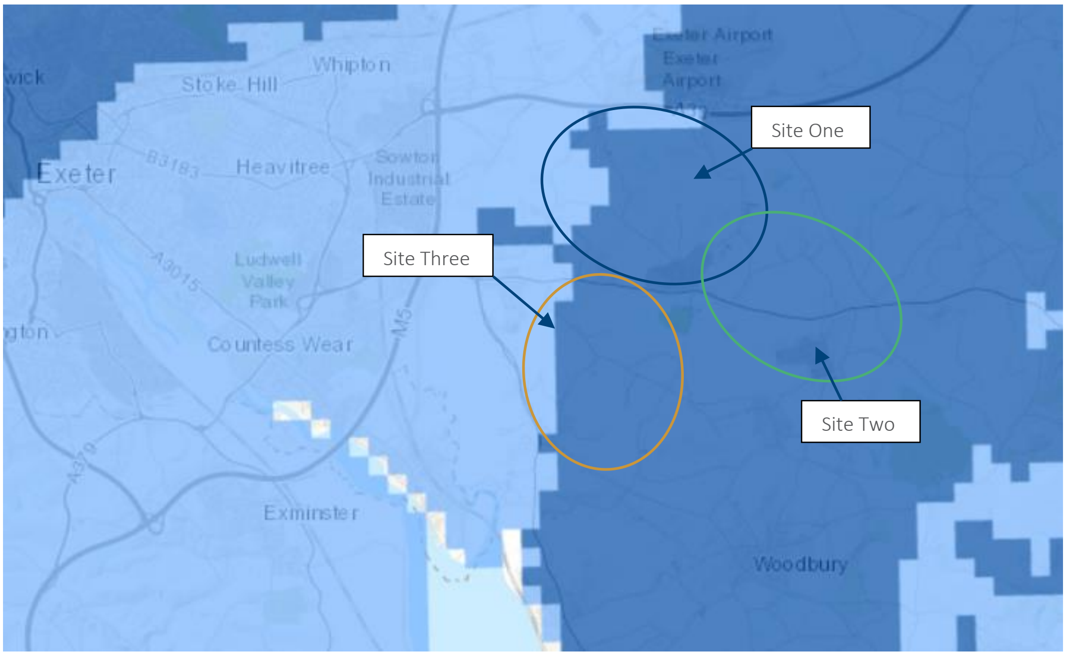

Figure 5 - BGI Ground Source Heat Viability Screening Tool

3.4.8 Two of the three sites (Options One and Three) demonstrate potential locations for open loop ground source technology which could be utilised as part of a technology mix for a low carbon heat network.

3.4.9 Option One includes areas at the north and west of the location which are underlain by a moderately productive aquifer (12L/s) which is also captured by the western boundary of Option Three. Option Two is underlain by rocks with no or very low levels of groundwater which would limit ground source heat pump technology potential to closed loop systems.

3.4.10 Table 3 shows a performance summary of each site option in relation to open loop systems.

Table 3 - site performance summary for open loop systems

Site Option	Potential for Ground Source Heat (Open Loop)	Commentary
One	some	Potentially feasible technology at towards northern and western boundaries as a result of the site location laying partially over moderately productive aquifer (up to 12 L/s).
Two	none	No site areas suitable for technology as underlain by rocks with no or very low levels of groundwater.
Three	some	Some feasibility for technology near western boundary of the site location at the edge of moderately productive aquifer (up to 12 L/s).

3.4.11 Where space is limited, vertical boreholes can be used in place of ground loop systems. This is usually more expensive than digging trenches and would require specialist ground (thermogeological) survey work to be undertaken to confirm the suitability of the chosen site. Borehole depth depends on the heat demand of a property and the underlying site geology.

3.4.12 Hybrid models combining both ground and air heat sources could be explored further for the chosen site to balance upfront costs with low operating costs, resulting in maximum system efficiency, cost effectiveness, and the potential for net zero emissions.

3.4.13 Whilst a heat network solution may offer improvements in carbon reductions, this must be considered alongside the potential increased cost of the infrastructure as well as ongoing operation and maintenance of the network. The extensive works undertaken to date by Devon County Council and East Devon County Council on the extension to the Monkerton scheme and the connection of the Cranbrook scheme should be taken in to consideration. Heat network delivery, would be influenced further by site phasing and the heating (and cooling) demand profiles within each phase.

3.4.14 Decentralised dwelling level systems represent the lowest CAPEX when compared to site scale solutions, due mainly to the additional costs associated with the buried infrastructure of a district heat network.

Solar Thermal

3.4.15 The Low Carbon Study details the potential for Solar Thermal generation following the Danish Solar thermal interfacing with heat networks model. This solution has the potential to benefit any of the three sites however it is highly dependent on the selection of a heat network to deliver heat to the residences.

3.4.16 As highlighted in 3.4.13 the selection of this delivery method may be dismissed due to the high capital outlay of the technology. If heat network delivery is a selected technology than solar thermal has the potential to lower heat price tariffs for residents. However as detailed in the next section it may not be the best use of land if Energy from Waste is able to provide the full load heating demand.

3.4.17 Should heat network delivery not be selected in favour of a low CAPEX alternative, solar thermal should be reconsidered at an individual plot level for residential buildings alongside potential for “behind the meter” microgrids as discussed under section 3.5.

Energy from Waste

3.4.18 Devon County Council and East Devon Council have undertaken extensive feasibility and development works in relation to a potential heat network connector solution to deliver heat from the Hill Barton Energy from Waste (EfW) facilities which are presently under construction.

3.4.19 The combined heat output of the EfW plants is 37MWth and therefore connecting to this heat supply should be considered when selecting the site.

3.4.20 Due to the EfW plant location at Hill Barton each of the sites would be suitable for connection to the heat network interconnector/ extension, the performance summary of each site option in relation to connection to an EfW supplied District Heating Network (DHN) is provided in Table 4.

3.4.21 Connecting to this scheme would allow the "PipeCo" (a special purpose vehicle owned by Devon County Council for ownership and management of the buried infrastructure) and the potential future ESCo operator of the network to provide competitive heat tariffs in line with tariffs proposed for the existing users and with the potential benefit of reductions due to the economy of scale presented by connecting the new development.

Table 4 - site performance summary for EfW DHN

Site Option	Potential for connection to EfW supplied District Heating Network	Commentary
One	excellent	The proposed route of the interconnector transits site option one
Two	good	The EfW plants are on the boundary of Site option two
Three	some	Site three sits to the South of the proposed interconnector and EfW plants but the distance is not prohibitive

Onsite Power Generation

3.4.22 Onsite energy generation is at the point of use, within the boundary of the site where it is to be consumed. When used in conjunction with low energy use buildings (designed to a specific low EUI target), the provision of onsite generation to match annual site demand is the simplest way to demonstrate net zero carbon in operation and avoid the complexities of grid supplied energy of varying carbon intensity.

Solar PV

3.4.23 As detailed within the Low Zero Carbon Study, energy and site area data from utility scale PV farms in Devon indicates an energy-land intensity of 389 MWh per hectare.

3.4.24 All three site Options fall broadly within areas previously assessed as suitable for solar energy. The suitable areas identified within the study highlight that Option 3 has highest overall coverage of suitability for solar. All Options will require also further consideration of landscape and visual impacts.

3.4.25 Where possible within the constraints of identified land, ground mount arrays are recommended in order to most easily and efficiently accommodate a site wide power generation approach which could utilise microgrid technology across the development proposals.

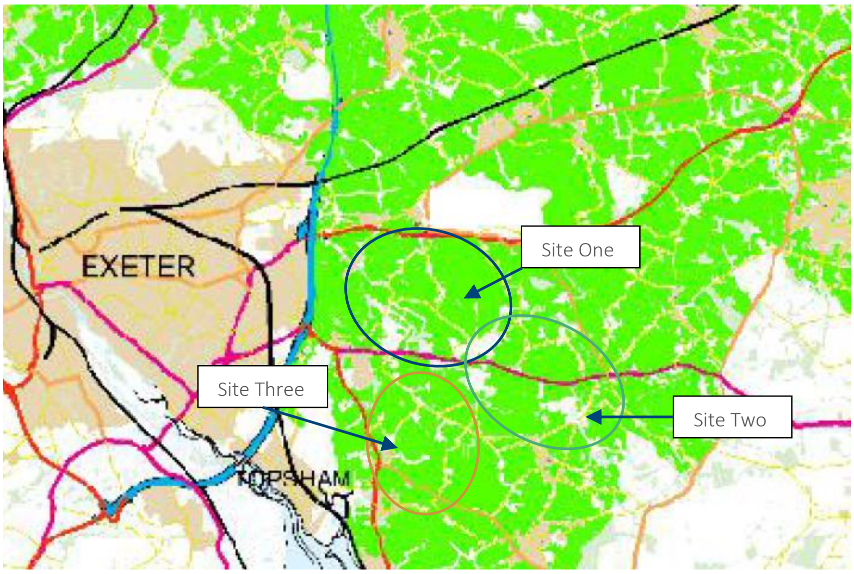

Figure 6 - Extract from EDDC Low Carbon Study showing areas suitable for solar energy

3.4.26 Table 5 shows a performance summary of each site option in terms of the ability to accommodate a large-scale PV installation.

Table 5 - site performance summary for solar energy

Site Option	Potential for large-scale Ground Mount Solar PV Array	Commentary
One	good	Some areas previously identified as unsuitable for solar at the south and south western areas of the site.
Two	good	Some areas previously identified as unsuitable for solar at the north western areas of the site.
Three	excellent	Only existing highways infrastructure present as non-opportunity areas within or near the site.

Wind

3.4.27 The areas identified by the previous Low Carbon Study as suitable for wind energy are very limited when compared to the potential for solar PV generation (see Figure 7).

3.4.28 Standoff distances to residential properties would need to be carefully considered for the technology, particularly with respect to noise (to meet ETSU-R-97 noise limits). It is unlikely that wind could be deployed at a sufficient scale to address the full energy demands of the site and that it would only form part of a technology mix to diversify on-site generation.

3.4.29 Additional consideration would also need to be given to the influence that large scale wind infrastructure could have on the Exeter Airport operations. As shown in Figure 7 the area applicable for wind generation may have the potential to affect the flight path and radar operations.

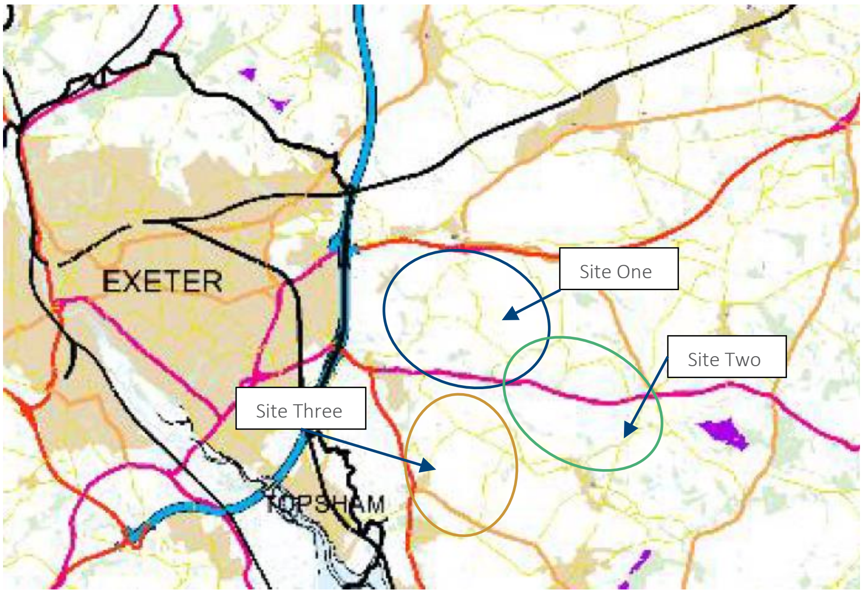

Figure 7 - Extract from EDDC Low Carbon Study showing areas suitable for wind energy

3.4.30 Table 6 shows a performance summary of each site option for utilising energy from wind.

Table 6 - site performance summary for wind energy

Site Option	Potential for wind turbines on or near site	Commentary
One	none	No areas suitable for energy located within or near the site.
Two	limited	One area suitable for energy located c. 2km from the south eastern extents of the site.
Three	none	No areas suitable for energy located within or near the site.

Anaerobic Digestion

3.4.31 As identified in the Land Requirements for Network-based Zero Carbon Energy Solutions in East Devon report, the generation of heat and power from anaerobic digestion (AD) of the food waste associated with a development of this scale is unlikely to deliver a significant enough contribution to the development to be considered commercially viable.

3.4.32 Therefore, it is recommended that the waste food refuse generated be handled by collection and delivery through the existing infrastructure within the local area rather than within a new AD facility.

3.4.33 Based on the above, this technology option is not assessed further.

3.5 Energy Storage

3.5.1 Energy storage forms an essential element of the replacement of fossil fuels for heat and transport with renewable or low carbon energy alternatives.

3.5.2 The draft policies within the emerging Local Plan support proposals for renewable and zero carbon energy storage systems in principle. A number of criteria will need to be met with respect to mitigating landscape impacts, not having an unacceptable impact on designated heritage or nature sites and not emitting excessive noise which would harm amenity for nearby residents.

3.5.3 Grid connected battery storage naturally compliments on-site generation as it provides a platform for moderating and managing the intermittency of renewable technologies and providing a number of benefits for development:

- Flexibility to match generation and demand
- Shift generated energy from off peak times to when it is needed.
- Grid stabilisation to maintain voltage and frequency levels.
- Continued resilience of supply in the event of grid failure.
- Rationalising on-site generation from PV and use of renewable electricity.

3.5.4 These grid connected ('In front of the meter') battery storage solutions are essentially viewed as generators and the demand and export capacities are critical components of viability. Based upon the assessment undertaken, grid connected batteries is not currently recommended at any of the site Option locations.

3.5.5 With respect to 'behind the meter' applications, all site Options have the potential to use battery storage in 'island mode' and as part of a microgrid solution for the development. Further detail on development mix and phasing is needed to undertake a more detailed assessment.

3.5.6 Table 7 shows a performance summary of each site option for 'behind the meter' battery storage.

Table 7 - performance summary of each site option for 'behind the meter' battery storage

Site Option	Potential for 'behind the meter' battery storage	Commentary
One	good	Opportunity level equal across all site options - More detailed assessment is needed with clarity on development mix and phasing. 'Behind the meter' battery storage is however recommended as an element of site infrastructure.
Two	good	
Three	good	

Models for Operation

3.5.7 Establishing an Energy Service Company (ESCo) would be necessary to utilise energy storage within a microgrid arrangement or to manage the delivery of heat through a district heating network. An ESCo would provide a commitment to deliver the benefits of energy to a specified level of performance and reliability whilst providing long-term revenue streams.

3.5.8 There are already examples of Local Authority owned ESCos in the UK, for example the creation of Energetik, by Enfield council in 2015. ESCo's such as this are driven predominantly by the need to address fuel poverty and a desire to create social benefit and shape local energy systems to deliver on their carbon reduction objectives.

3.5.9 ESCo's can be delivered in the form of many different commercial structures with each project having different specifications and requirements. There is no 'one size fits all' commercial structure that can be applied to every project. EDDCS could act as 'Project Sponsor' which would enable the enter in to one of the following 'shell structures':

1. 3rd Party Esco – The Project Sponsor enters into an Energy Services Agreement (ESA) with a 3rd party that will deliver the low carbon energy scheme through an ESCo entity, such as the existing arrangement with Eon on the Monkerton scheme.
2. Concessions – The Project Sponsor enters into a Concession Agreement (CA) with a 3rd party ESCo to deliver the low carbon energy scheme.
3. Joint Venture (JV) – The Project Sponsor jointly establishes an ESCo entity with a Joint Venture Partner to deliver the low carbon energy scheme.
4. Project Sponsor ESCo – The Project Sponsor establishes a wholly owned ESCo to deliver the low carbon energy scheme.
5. In-House Delivery – The Project Sponsor develops the low carbon energy scheme without establishing a stand-alone delivery vehicle (such as an ESCo).

3.5.10 Establishing an ESCo at the new town can introduce both opportunity and risk for the development. We would recommend that this model is explored in further detail both during site selection and in development of the masterplan. Whilst investigations are underway it is recommended that stakeholder engagement sessions are coordinated to explore the appetite for community owned elements to be adopted in to the ESCo.

3.6 Site Options Assessment of Contribution to Net Zero

The three option sites have been analysed based on three categories; network capacity for generation (export), low or zero carbon technologies and energy storage. The outcome of the scored assessment is provided in the Table below where the opportunity level is scored as follows:

High – 5

Medium-high - 4

Medium – 3

Low-medium - 2

Low (limited) - 1

Table 8 - Contribution to Net Zero - scored assessment

Assessment Category	Option 1	Option 2	Option 3
Network Capacity (Generation)	2	2	2
Low or Zero Carbon Energy Technologies	5	2	4
Energy Storage	3	3	3
Overall (/15)	**10**	**7**	**9**

Source: Hydrock (2022)

Options 1 and 3 both perform strongly in relation to low and zero carbon energy technologies, with Option 1 performing marginally better. Option 2 would require the greatest level of intervention, and in our assessment provides the lowest opportunity to contribute to net zero.

A number of recommendations are made throughout the detailed Technical Report (Document ref. 22462-HYD-ESUS-Y-RP-4000-P01) for further work, much of which is required after site selection in alignment with the masterplanning process.

4. CLIMATE CHANGE RISK AND RESILIENCE

4.1.1 In addition to the contribution to net zero, the Sustainability Appraisal as part of the emerging Local Plan evidence base considers climate adaptation but predominantly in relation to flood risk. Whilst in our experience, specific climate change risks and broader environmental, social and economic challenges local to the site options will be key to ensuring the future resilience of the new town proposals, there can and should be consideration of future climate risks to infrastructure within the site selection process.

4.1.2 The latest scientific evidence and industry guidance, including Met Office UK Climate Projections (UKCP18) data, IEMA and UKGBC guidance and the most recent Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6)[5] as well as the ongoing development of the third National Adaptation Programme (NAP3) by Defra have formed the basis of an assessment of future climate risk to infrastructure as relevant to the West End site options.

4.1.3 There are numerous infrastructure related climate risks and opportunities, identified by the IPCC, that can be considered at this stage to influence site selection for the new town. These include:

- Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures
- Risks to infrastructure services from river, surface water and groundwater flooding
- Risks to bridges and pipelines from flooding and erosion
- Risks to transport networks from slope and embankment failure
- Risks to subterranean and surface infrastructure from subsidence
- Risks to public water supplies from reduced water availability
- Risks to energy, transport and digital services from high and low temperatures, high winds, lightning

4.1.4 This assessment remains independent to the findings of the Sustainability Appraisal as there is no site assessment information available yet from ED (due late September), which will add additional criteria on environmental constraints, utility/net zero carbon infrastructure and deliverability.

4.1.5 Current risks are considered under the appropriate sub-headings within Environmental Constraints work prepared by CBRE.

4.2 UK Climate Projections (UKCP)

4.2.1 The UK Climate Projections (UKCP) is a set of climate analysis tools and data forming part of the Met Office Hadley Centre Climate Programme that can be used to shows how the UK climate may change and aid decision makers in assessing their exposure and vulnerability to future risk.

4.2.2 The latest probabilistic projections for the UK (included within the UKCP18 datasets) provide useful information on anticipated atmospheric conditions such as precipitation levels and air temperature and assess the broadest range of outcomes.

[5] IPCC, 2021, Sixth Assessment Report, https://www.ipcc.ch/report/ar6/wg1/

4.2.3 Given it is not possible to exactly predict future global GHG emissions, the UKCP18 climate projections make assumptions about the economic, social and physical changes to our environment that will influence climate change and factor in uncertainty.

4.2.4 Representative Concentration Pathways (RCPs) are the established method for capturing those assumptions with a set of global emissions scenarios and are adopted by most climate change reporting and guidance documents. RCPs specify concentrations of greenhouse gases that will ultimately result in a change in global temperature as outlined in Table 8.

Table 9 - Representative Concentration Pathways

RCP	Change in temperature by 2081-2100 (°C)
RCP 2.6	1.6 (0.9-2.3)
RCP 4.5	2.4 (1.7-3.2)
RCP 6.0	2.8 (2.0-3.7)
RCP 8.5	4.3 (3.2-5.4)

4.2.5 Utilising the above RCPs, Met Office UK Climate Projection data (UKCP18) at regional resolution can be used to predict the likely effects of climate change which may have an impact upon the new town development proposals.

4.3 Assessment Methodology

4.3.1 Using UKCP18 data, potential future conditions have been established over the assumed construction period (2030-2049) and during occupation, well within the design life of the development (2080-2099) in the RCP 4.5 emissions and central probability (i.e. 50%) scenario.

4.3.2 Changes to summer and winter temperatures and precipitation levels within the South West are significant when compared to other regions, showing that after 2080, the new town could face an increase in summer mean temperatures of 3.5°C, that the change in winter precipitation is predicted to increase by 16% and that summer mean precipitation is predicted to reduce by 29% (see Table 9). In addition, extreme weather events are likely to be more common across the whole of the UK.

4.3.3 Based upon this, key climate drivers and physical risks for more detailed consideration across the site options are:

- **Drought:** reduced water availability, ground movement/subsidence, soil erosion and reduced ground permeability
- **Heatwaves:** extreme or prolonged high temperatures, wildfires
- **Extreme precipitation:** ground saturation [increased surface water runoff], soil erosion
- **Storm events (high winds):** soil erosion

Table 10 - UKCP18 Projections (RCP 4.5, 50% probability)

Parameter	Projection (Construction)	Projection (Occupation)
Temperature	Increase in winter mean temperature of 1.0°C	Increase in winter mean temperature of 2.0°C
	Increase in summer mean temperature of 1.2°C	Increase in summer mean temperature of 3.5°C
	Increase in annual mean temperature of 1.0°C	Increase in annual mean temperature of 2.5°C
Rainfall	Increase in winter mean precipitation of 8%	Increase in winter mean precipitation of 16%
	Decrease in summer mean precipitation of 15%	Decrease in summer mean precipitation of 29%

4.3.4 Armed with this high-level climate risk data we have undertaken further desktop analysis across a number of areas to understand exposure and vulnerability and potential additional impacts to infrastructure beyond those caused by (though in some cases linked to) higher temperatures and changes in rainfall at the three site Options.

4.4 Drought

Water availability

4.4.1 The South West Water (SWW) Drought Plan was updated in September 2022 and confirms that all three site Options sit within the Colliford Water Resource Zone (WRZ).

4.4.2 Within the SWW supply area, surface water abstraction dominates, with 90% of total abstraction being from rivers and reservoirs with a 50:50 split (accounting for some variation depending on the weather experienced). Groundwater abstraction accounts for the other 10% and these groundwater sources are more likely to be constrained by licence than water availability.

4.4.3 SWW operate a conjunctive use system with links between and within WRZs, which enables transfer of water from less stressed to more stressed areas and optimisation and use of existing resources prior to the need for drought management actions.

4.4.4 SWW also have a detailed Climate Adaptation Plan in place, published in December 2021 which highlights the following measures in response to risks to public supply as a result of drought and low river levels:

- 50% leakage reduction plan
- New resource development
- Smart metering
- Smarter operation
- Helping customers to use less water

4.4.5 As detailed within the Utilities report with respect to potable water supply, SWW's strategic team have been made aware of the proposals and have expressed their keenness to engage with EDDC on infrastructure upgrades. It is recommended that these discussions consider opportunities to action some of the above measures in tandem with the new town development.

4.4.6 Site Options One and Three may have increased opportunity for new ground water abstraction resource development. All Options may contribute to leakage reduction where the inclusion of new water supply infrastructure could also give rise to leakage detection and planning for repair activities.

Ground movement/subsidence

4.4.7 Subsidence can occur in any location, but certain soil types are more susceptible, including clay, silt, sand and gravel soils.

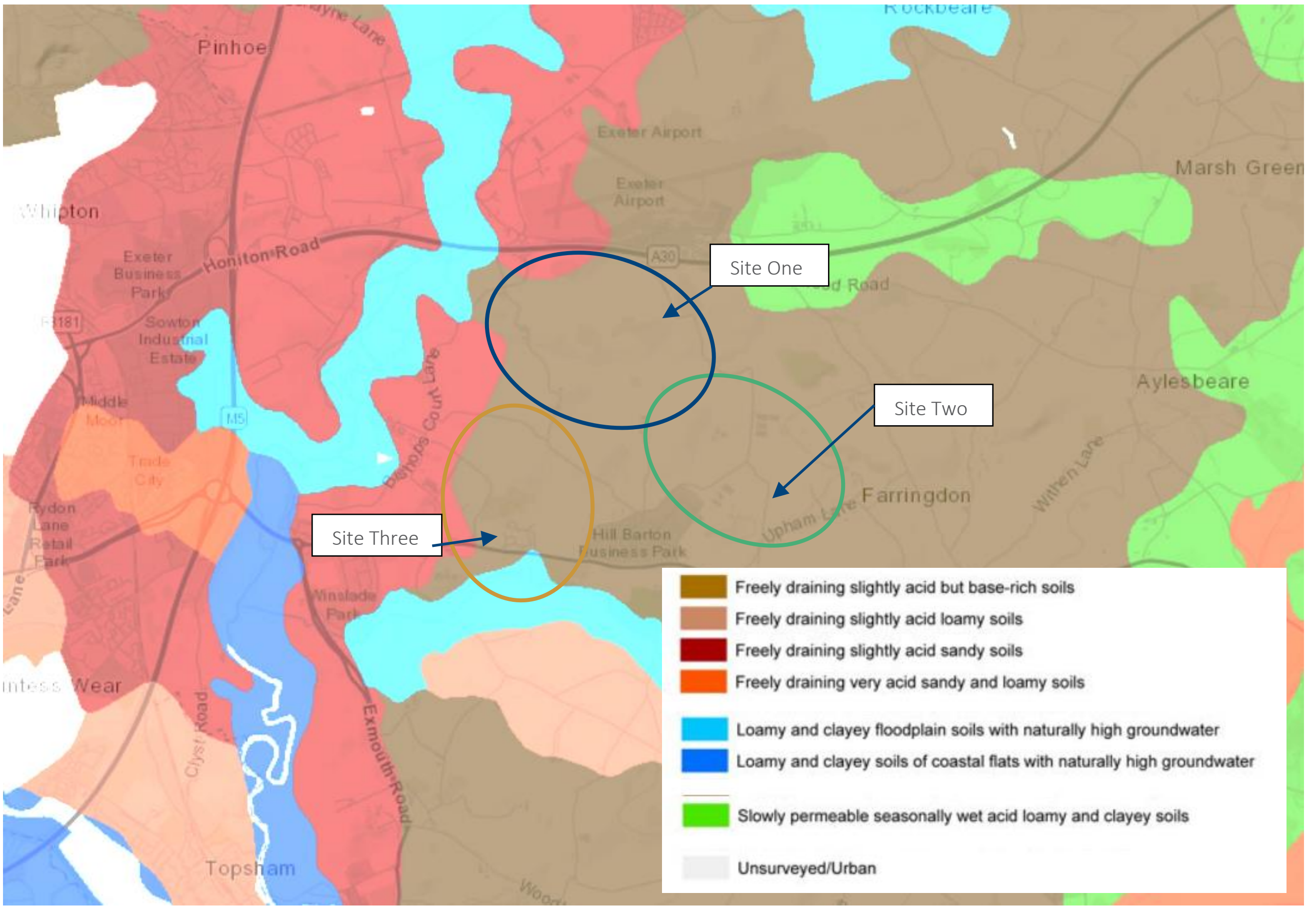

Figure 8 - extract from UK Soil Observatory Map, British Geological Society –Soilscapes for England and Wales

4.4.8 Clay and silt are 'cohesive' soils, which means that their volume will vary depending on their moisture content – they'll swell when wet and shrink when dry. As many as 75% of UK ground subsidence cases are caused by soil shrinkage and as the UK climate warms, these soils will be more at risk of shrinkage.

4.4.9 Sand and gravel are non-cohesive soils, which means that they don't vary in size depending on moisture content but can be washed away by water flow putting them at higher risk during periods of heavy rain or flooding, or if they are located near a body of water.

4.4.10 Figure 8 provides an indication of the soil types across site Options One to Three, utilising the UK Soil Observatory (UKSO) mapping from the British Geological Society. The underlying conditions of the sites are considered a strong indicator to determine their future vulnerability.

4.4.11 An initial assessment of ground permeability and saturation is also made based upon the UKSO mapping.

4.4.12 Option 3 contains the largest mix of soil types which may present additional challenges or require a variety of design approaches in terms of mitigating the effects of future climate change against subsidence that could impact subterranean and surface infrastructure.

4.4.13 All site Options would be likely to require further consideration of soil geology in order to ensure the delivery of climate resilient development.

Soil erosion (water)

4.4.14 The UKSO mapping includes information on water erosion risk to bare soil.

4.4.15 Figure 9 provides an indication of the risk across site Options One to Three. Whilst the future conditions at the new town are unlikely to be bare soil, this information is useful to determine the vulnerability of each site to this risk and potential impact upon the design and cost of key infrastructure such as roads.

4.4.16 Site Option One appears least favourable, given the presence of significant areas of moderate and high risk. Option Three is the least constrained from a soil erosion perspective.

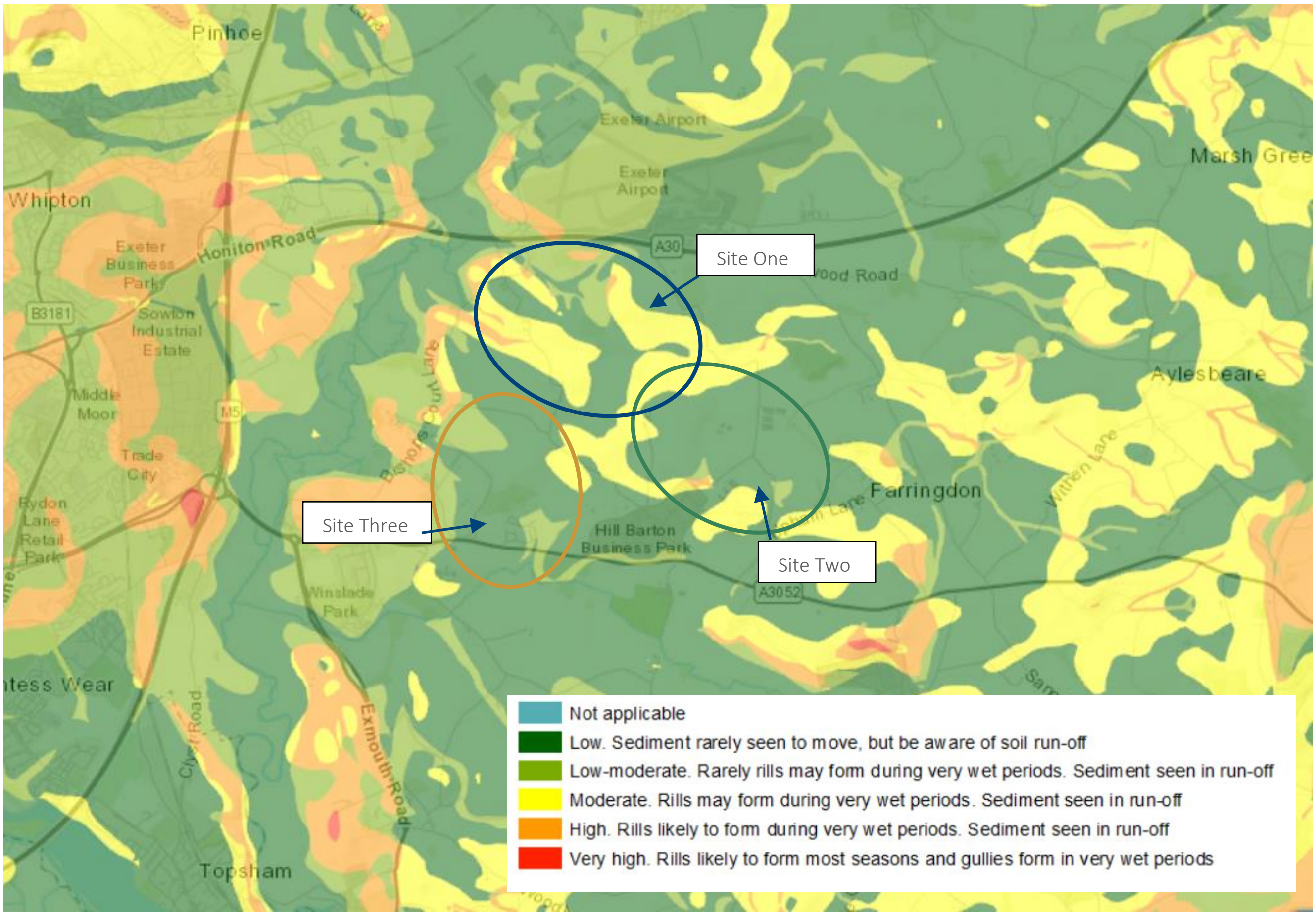

Figure 9 - UK Soil Observatory Map, British Geological Society – Bare soil water erosion risk

4.5 Heatwaves

Extreme or prolonged high temperatures

4.5.1 Infrastructure operators are on the frontline of efforts to ensure we are resilient to extreme weather including extremes of temperature. The majority of Distribution Network Operators (DNOs) have well progressed adaptation plans in place or in preparation.

4.5.2 The WPD Climate Resilience Strategy has included an initiative to ensure that new overhead lines are designed to a higher temperature rating by specifying taller poles to allow for more conductor sag whilst maintaining clearance requirements.

4.5.3 An information request was submitted to WPD to obtain additional data on heat impacts to the WPD network to ensure detailed power network risks are identified and reviewed following site selection. This request has not yet been fulfilled.

4.5.4 Consideration should be given to on-site energy infrastructure such as batteries and energy compounds which may operate independently of the DNO. No further assessment has been undertaken in relation to the site options at this stage.

Wildfires

4.5.5 In July 2022, the Devon and Somerset Fire and Rescue Services attended 322 fires in the open against a five-year average for July of 272. The risk of fires in the open is affected by the weather and the type of vegetation but are of note due to the potential severity of the impact to energy and transport infrastructure where they cannot be controlled.

4.5.6 No further assessment has been undertaken in relation to the site options at this stage.

4.6 Extreme Precipitation

Surface water

4.6.1 Social flood risk at neighbourhood scale is a 'group' measure which incorporates the chance of flooding occurring in the floodplain (accounting for defences), the number of people living within the floodplain and the overall social vulnerability of the neighbourhood. A high score identifies neighbourhoods where large numbers of the most vulnerable people are exposed to flooding.

4.6.2 In the Climate Resilience Strategy published by Western Power Distribution (WPD) in June 2021, it is noted that predicted climate change impacts are an important consideration when planning new installations or safeguarding existing key equipment. The flood protection currently provided is designed to be resilient to the end of this century based upon current Environmental forecasting models.

4.6.3 When social flood risk index information is overlaid upon EA recorded flood outlines as in Figures 10 and 11, there is an indication that Option Three presents the greatest risk of increased future surface water impacts as a result of development where no mitigation is in place as a result of drainage infrastructure design.

4.6.4 Any potential interaction of surface water drainage, power distribution and access and movement strategies for the selected site must be a key consideration during the masterplanning activities to ensure that the site is not locked in to an approach that could cause cascading failures to infrastructure networks.

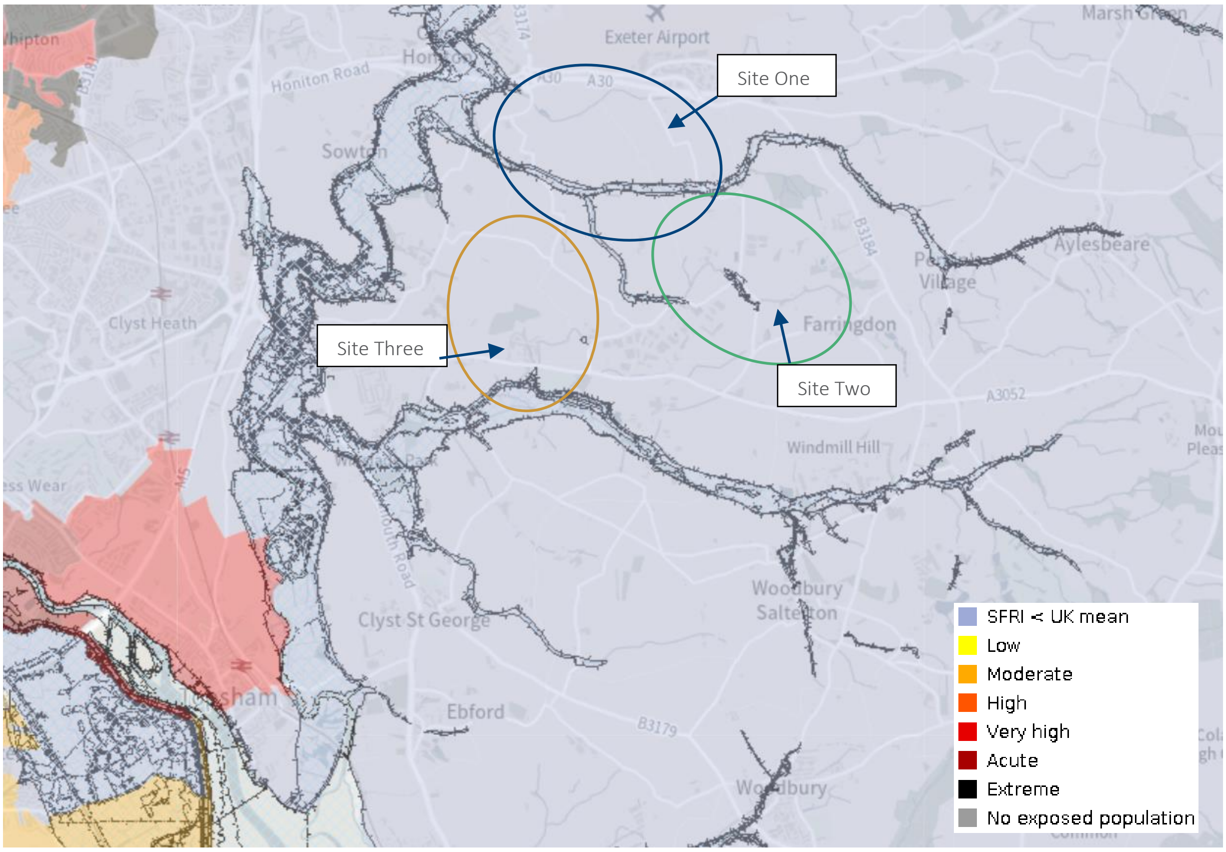

Figure 10 - Surface water (Group) Future 2050s 2°C scenario and EA recorded flood outlines

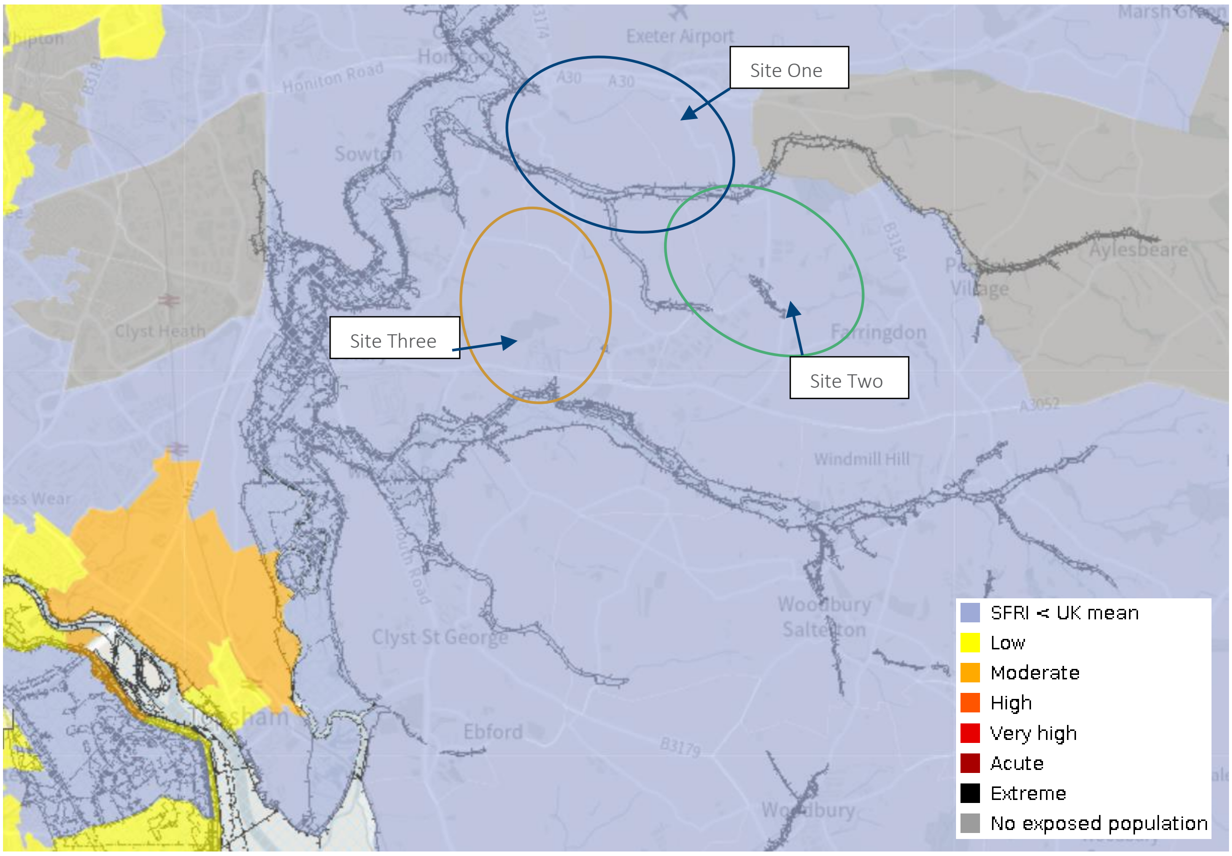

Figure 11 - River & Coastal (Group) Future 2050s 2°C scenario and EA recorded flood outlines

4.7 Storm events

High winds and lightning

4.7.1 In the UK, most wind-driven rain is associated with winter storms and the intensity and frequency of these will increase which will in turn lead to an increased risk of wind driven rain.

4.7.2 Projections for wind-speed are less clearly defined within UKCP18 but an increase in wind-driven rain should be considered as this also increases the risk of water penetration of vertical structures.

4.7.3 An information request was submitted to WPD to obtain additional data on storm impacts to the WPD network to ensure detailed power network risks are identified and reviewed following site selection. This request has not yet been fulfilled.

Soil erosion (wind)

4.7.4 The UKSO mapping includes information on wind erosion risk to bare soil.

4.7.5 Figure 12 provides an indication of the risk across site Options One to Three. Whilst the future conditions at the new town are unlikely to be bare soil, this information is useful to determine the vulnerability of each site to this risk and potential impact upon the design and cost of key site infrastructure.

4.7.6 Site Options One and Three are similarly affected by areas prone to soil wind erosion. Option Two is the least constrained from a wind soil erosion perspective.

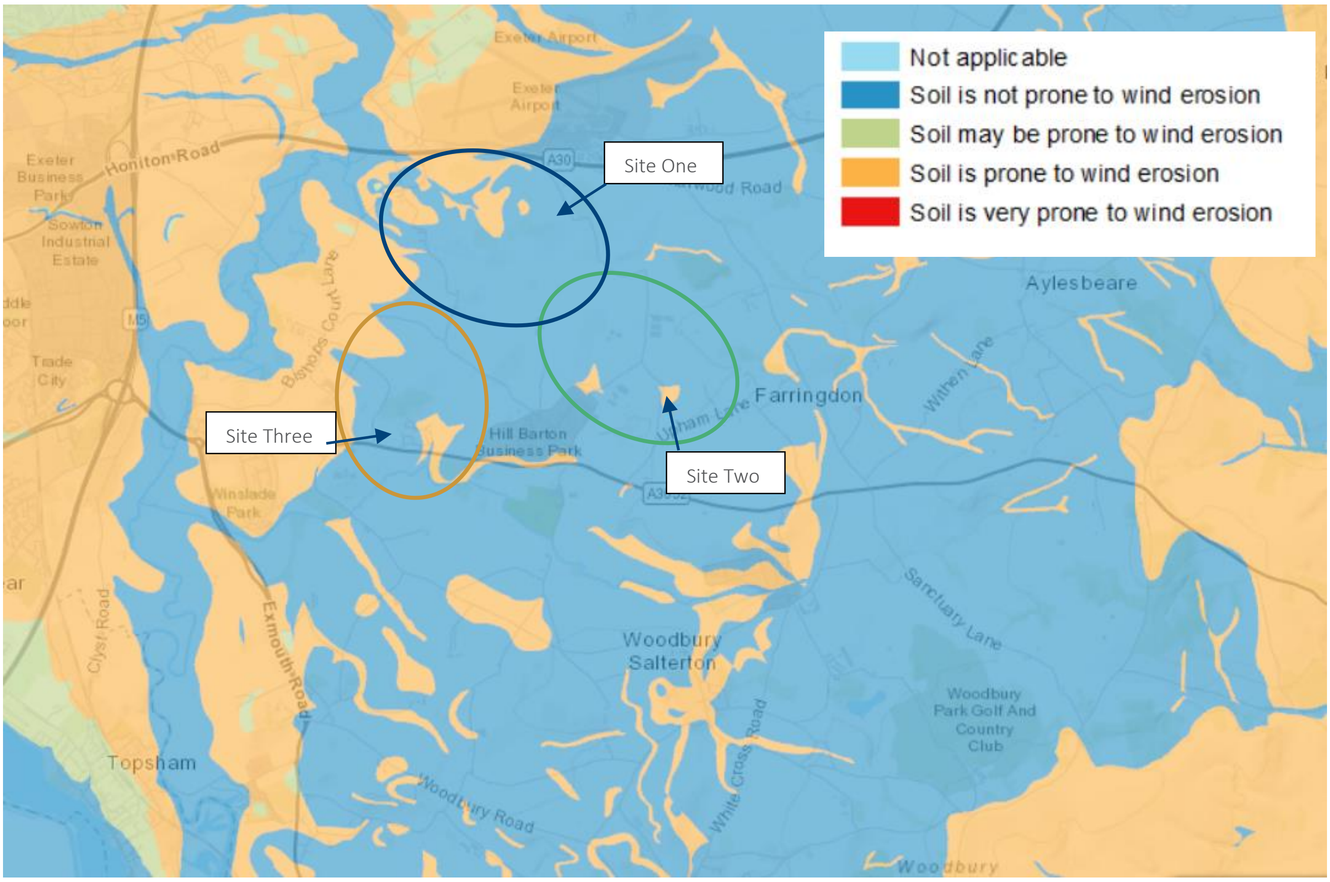

Figure 12 UK Soil Observatory Map, British Geological Society – Bare soil wind erosion risk

4.8 Site Options Assessment of Key Climate Risks for Infrastructure

4.8.1 Any site Option which brings forward ground mount solar PV arrays at scale should consider any additional risk or additional drainage design mitigation to ensure future resilience against surface water runoff from the panels.

4.8.2 Based upon desktop analysis in sections 4.4-4.7, each site has been assessed qualitatively for its ability to respond to a variety of risks to infrastructure as a result of future climate change.

4.8.3 To quantify the assessment in relation to the site selection process, Table 7 shows a performance assessment of each site option against key considerations at site level where:

- Low exposure/vulnerability or high opportunity – 5
- Low-medium exposure/vulnerability or medium-high opportunity - 4
- Medium exposure/vulnerability or medium opportunity – 3
- Medium-high exposure/vulnerability or low-medium opportunity -2
- High exposure/vulnerability or low opportunity – 1

4.8.4 In terms of future climate risk for infrastructure, Option Two has been assessed as the best performing site option on the basis that it provides the highest overall level of resilience through lower exposure and/or vulnerability.

Table 11 – Site Options performance assessment against future climate risks

Future Climate Risk	Key Considerations for Infrastructure	Option One	Option Two	Option Three
Drought	water availability	4	3	4
	ground movement/ subsidence	3	4	2
	soil erosion (water)	2	3	5
	ground permeability	3	4	2
Heatwaves	extreme or prolonged high temperatures	not assessed	not assessed	not assessed
	wildfires	not assessed	not assessed	not assessed
Extreme precipitation	surface water	2	3	2
	Ground saturation	3	4	2
Storm events	high winds	not assessed	not assessed	not assessed
	Soil erosion (wind)	2	3	2
	Overall (/35)	**19**	**24**	**19**

5. CONCLUSION AND NEXT STEPS

5.1.1 The EDDC new town will be shaped by a vision which places an emphasis on net zero and climate resilience, in line with emerging Local Plan objectives. This report explores the opportunities and constraints at each potential location to provide an overview of potential contribution to net zero and highlight any future climate risks which may impact the technical or commercial viability of the new town from an infrastructure perspective.

Contribution to Net Zero

5.1.2 The three option sites have been analysed based on three categories; network capacity for generation (export), low or zero carbon technologies and energy storage. The outcome of the scored assessment is provided in Table below.

Table 12 - Contribution to Net Zero site performance summary

Assessment Category	Option 1	Option 2	Option 3
Network Capacity (Generation)	2	2	2
Low or Zero Carbon Energy Technologies	5	2	4
Energy Storage	3	3	3
Overall (/15)	**10**	**7**	**9**

5.1.3 Options One and Three both perform strongly in relation to low and zero carbon energy technologies, with Option One performing marginally better. Option Two would require the greatest level of intervention, and in our assessment provides the lowest opportunity to contribute to net zero.

5.1.4 A number of recommendations are made throughout the section for further work, much of which is more appropriate to undertake in alignment with the masterplanning process.

Future Climate Risk

5.1.5 The desktop assessment highlights the need for EDDC to ensure strategic dialogue is continued with site developers, land owners, statutory organisations and utilities providers so that appropriate climate mitigation and adaptation measures are considered early in the design and development stage to reduce exposure to future risk.

5.1.6 In terms of future climate risk for infrastructure, Option Two has been assessed as the best performing site option on the basis that it provides the highest overall level of resilience through lower exposure and/or vulnerability.

5.1.7 As further detail or a preferred site option emerges, key questions should be asked by EDDC to ensure that the climate resilient vision is maintained:

- *Is the proposed infrastructure/utilities being built to withstand the projected future climate expected in the development's lifetime?*
- *Is the proposed infrastructure/utilities exacerbating any current identified risk within the region?*
- *Will the proposed infrastructure/utilities increase other risks (e.g. increase the risk of flooding due to changes in the landscape, or increased non-permeable surfaces etc.)*
- *Are synergies between both mitigation and adaptation objectives being considered with sufficient weight given to climate adaptation alongside the net zero target?*