Gravity

Smart Campus

Gravity Local Development Order

Energy Strategy

Fast-track to the future, naturally | thisisgravity.co.uk | TA7 8AD

Gravity Local Development Order

Energy Strategy

Final Adopted Version

On behalf of **This is Gravity** and **Sedgemoor District Council**

Project Ref: 332310102 | FINAL ADOPTED VERSION | Date: January 2022

Registered Office: Buckingham Court Kingsmead Business Park, London Road, High Wycombe, Buckinghamshire, HP11 1JU
Office Address: 10 Queen Square, Bristol, BS1 4NT
T: +44 (0)117 332 7840   E: PBA.Bristol@stantec.com

Document Control Sheet

Project Name: **Gravity LDO**

Project Ref: **332310102**

Report Title: **Energy Strategy**

Doc Ref: **Final Adopted Version**

Date: **January 2022**

	Name	Position	Signature	Date
Prepared by:	Josie Edwards	Graduate Environmental Consultant	JE	01/10/21
Reviewed by:	Jonathan Riggall	Director Built Environment	JR	01/10/21
Approved by:	Jonathan Riggall	Director Built Environment	JR	01/10/21
For and on behalf of Stantec UK Limited				

Revision	Date	Description	Prepared	Reviewed	Approved
1	09.07.2021	Draft for Comment	JE	JR/JH/SH/SN	JR
2	20.08.2021	Draft	JE	JR	JR
3	01.10.2021	Final Draft	JR	JR	JR
4	13.10.2021	Draft for consultation	JE	JR	JR
5	06.01.2022	Final Adopted Version	JE	JR	JR

Contents

Figures

Tables

Appendices

This page is intentionally blank

Executive Summary

Introduction

Gravity is the UK's first commercial smart campus, creating a blueprint for a smarter, cleaner future - faster. It will deliver a new era of possibility by supporting companies making a difference socially, economically and environmentally, driving the UK's transition to a cleaner economy.

At the heart of Gravity's proposals is its Clean and Inclusive Growth Strategy. This strategy underpins the Heart of the South West Local Enterprise Partnership (LEP) Strategic Economic Plan to provide the home for the Green Industrial Revolution in Somerset.

This Energy Strategy supports Gravity's approach to delivering Clean and Inclusive Growth in response to the local, regional and national decarbonisation needs. This includes delivering on the UK's Industrial Strategy's Energy Grand Challenge.

This Energy Strategy presents a pragmatic framework for meeting Part L of the Building Regulations (Conservation of Fuel and Power), anticipated future changes and the local policy requirements, and sets out an approach meet the future energy needs for Industry 4.0.

A conceptual energy framework has been established for the Local Development Order (LDO) to support the net zero carbon economic transition.

A Conceptual Energy Framework for Gravity

Due to the scale of Gravity and the potential development phases build-out periods for specific occupiers to meet market needs, the Energy Strategy needs to be flexible and able to respond to business operational need, regulatory changes, market forces and technological advances.

This strategy therefore sets a conceptual energy framework for Gravity, that follows an energy hierarchy of designing out energy use through master planning and placemaking; using energy more efficiently through smart design and energy management systems; and supplying zero and low carbon energy.

Reducing energy demand

A series of design principles to increase energy efficiency have been considered through careful design. In accordance with the Energy Hierarchy, Gravity will seek to adopt a "fabric-first"[1] approach to building design (enhancing the performance of the components and materials that make up the building fabric itself, such as improving insulation and reducing cold bridging), before considering the use of mechanical or electrical services systems and renewable/low carbon technologies.

New homes will be delivered to be zero carbon ready. This will include the delivery of the Future Homes Standard, building integrated renewable energy systems and connection of new homes into the Gravity smart grid and low emission transport investments.

[1] For the avoidance of doubt, in this application the approach described as "Fabric First" will look to achieve a Fabric Energy Efficiency Standard (FEES) of the 2025 Future Homes Standard when defined or as a minimum 46kwh/m2/yr.

Using energy investments more efficiently

Gravity will be developed as a smart campus. This will include a power system network, which will use active power network management to control energy use through the supply of distributed renewable energy resources.

Investments will be made into heat infrastructure where technically, socially and economical viable. This will maximise opportunities to balance heat loads across Gravity and reduce waste heat.

Investments into new energy demands such as EV charging infrastructure, micro-mobility and smart street lighting will be integrated into the smart campus. This will ensure smart management of Gravity beyond just investing in infrastructure.

Investing in the Gravity community

The scale of the investment into energy infrastructure will establish local benefits beyond the Site boundary of the development and the LDO.

The scale of renewable energy generation could potentially mean Gravity is a net exporter of renewable energy. Gravity will work with our energy retail partners to ensure opportunities for local, lower cost renewable energy tariffs are supported. This will aim to support issues such a rural fuel poverty, decarbonisation of rural community and education in climate change.

Access to EV charging infrastructure and micro mobility will ensure local communities are supported in the decarbonisation of transport locally.

The provision of renewable energy technology at Gravity will also aim to stimulate the local supply chain for technology providers, skills and contractors. This will ensure the green pound is spent locally, keeping the investment within the local economy.

Energy and the LDO

The Energy Strategy will be updated at each application for compliance against the LDO. This is to ensure that the flexibility that this strategy defines is refined towards detailed building design, infrastructure delivery, and onward site management.

At each application for compliance stage, an energy strategy will be presented which will provide an update to the progression of investments into energy efficiency, smart grid and energy demand of the defined occupants.

1 Introduction

1.1 Background

1.1.1 This is Gravity Ltd, known as 'Gravity', is the UK's first commercial smart campus, creating a blueprint for a smarter, cleaner future - faster. It will deliver a new era of possibility by supporting companies making a difference socially, economically and environmentally, driving the UK's transition to a cleaner economy.

1.1.2 The Site is within ownership of This is Gravity Ltd (This is Gravity) and is within the administrative boundary of SDC.

1.1.3 With its unique scale and immediate availability as a 616 acre enterprise zone, excellent connectivity to national and local infrastructure including Bristol port and airport, and, the Site is located at the heart of a South West innovation cluster comprising Bristol University's Smart Lab, the Bristol Robotics Lab, the National Composites Centre, the Institution of Advanced Automotive Propulsion (IAPPS), creating a centre of excellence in the UK for transport decarbonisation and innovation.

1.1.4 With dark fibre in place, and working with Cellnex, Gravity can offer digital connectivity as well as an accessible talent pool including four top-tier universities and a high performing college close by to meet workforce needs. With on-site water provision, national scale energy, including renewable and low carbon energy infrastructure and energy management solutions, Gravity provides occupiers with the ability to invest, transform and create a new era of green jobs driven by advanced manufacturing, as part of a 4th Industrial Revolution.

1.1.5 Gravity establishes the foundations for accelerating and transforming the economy whilst simultaneously cutting greenhouse gas emissions, creating good jobs, integrating low carbon homes and realising positive social outcomes for local communities. Gravity will be a low carbon campus generating more than 4000 green collar jobs, providing both a strategic economic stimulus to drive economic renewal, shaping and connecting to a green supply chain across the UK. Home to international business, start-ups and SMEs, Gravity will be a home for Clean Growth and green industries, creating the space to innovate and create sustainable solutions from energy solutions to smart homes and new smart mobility choices.

1.1.6 Gravity is a UK destination for international occupiers and will drive the delivery of the Sedgemoor, Somerset, and Heart of the South West Local Enterprise economic, climate change, and Local Industrial Strategy: delivering transformational investment opportunities, unlocking connectivity through infrastructure, and bringing new higher value employment and skills opportunities to the South West as a whole.

1.1.7 Gravity is being taken forward through a Local Development Order (LDO) which is a route to planning permission. LDOs are a positive planning tool and a marketing tool for the locality and site. They create a more certain planning environment for investors and potential occupiers, and thereby make inward investment more attractive. They embody a fundamental shift on the part of local authorities from waiting for the market to come to them with a proposal, to initiating development by granting permission for the kind of development that they want to come forward on a site.

1.1.8 The Gravity LDO is therefore informed by the market to be highly responsive in a national and international context and will help Sedgemoor, Somerset and the South West region compete for scarce investment against other national and international competitors.

1.1.9 The function of a Local Development Order (LDO) is to accelerate delivery. They are about adopting a local solution to simplifying planning and provide local authorities with a flexible tool to address particular circumstances. Over 100 LDOs now exist across 80 authorities who wish to be proactive in attracting investment. The Gravity LDO will further demonstrate Sedgemoor District Councils proactive approach to economic development and being 'open for business'. As such, in adopting the Gravity LDO Sedgemoor will add a robust management tool for the EZ, to compliment the Development Plan, to achieve corporate, economic and planning policy objectives to the benefit of the local, regional and national economy providing maximum benefit to the Sedgemoor community.

1.2 Gravity Clean and Inclusive Growth Strategy

1.2.1 The Heart of the South West Local Enterprise Partnership (LEP) Strategic Economic Plan defines manufacturing as a key growth sector. Within the LEP's Economic Plan it clearly sets out the South West's role in the decarbonisation of both the local and national economy. This includes enabling the planning and delivery of low carbon energy production; advanced manufacturing; and electric vehicles. This Energy Strategy supports Gravity's approach to delivering Clean and Inclusive Growth in response to the local, regional and national decarbonisation needs. This includes delivering on the UK's Industrial Strategy's Energy Grand Challenge. Key target areas have been drawn out for clean energy delivery to include:

- Develop an energy strategy to provide national scale power infrastructure to enable high energy intensive industries including cyber infrastructure, advanced manufacturing, biosciences, gigafactories, digital, agri-tech and zero emission transport.
- Work with Ofgem, National Grid and E.ON to coordinate and innovate across the campus and community power networks.
- Establish smart grid infrastructure to provide flexible, and secure low cost energy to meet the commercial, residential and leisure needs, and risk profiles of businesses at Gravity.
- Leverage the geographic benefits of Hinkley Point C including energy supply, distribution, storage, workforce transfer, education and supply chains.
- Shift away from fossil-fuelled combustion technologies, maximising low carbon generation, energy storage and management on site.
- Create an energy sharing system, such as a heating and cooling network where one organisation's waste energy is used by others on site: achieving maximum waste heat recovery for greatest efficiency. Invest in the recycling of heating and cooling from and in industrial processes to save carbon, reduce costs, and improve air quality.
- Collaborate and co-design energy infrastructure to enable clean growth across industrial, residential and leisure partners and occupiers.
- Instigate an ISO 50001 Energy Management Plan for the Campus with industrial decarbonisation and energy efficiency plans for occupancy, leveraging energy load shifting to maximise the available peak supply and give energy security across the Site.
- Provide intelligent digital controls to manage clean energy systems to enable flexibility in energy demand and pricing.
- Provide site wide sustainable transport solutions including rapid charging and support for hydrogen powered vehicles, accessible to the community.
- Use our Enterprise Zone Status to provide incubation facilities for innovative energy technologies.

1.2.2 Gravity has developed its Environmental and Social Governance Policy[2], and this seeks to ensure a system of reporting is embedded through the planning process into campus management and operation. This Energy Strategy sets Gravity's strategic objectives for energy into the context of the LDO.

1.3 Purpose of the Report

1.3.1 Gravity has embedded meeting the Government's Industrial Strategy Energy Grand Challenge, the need for affordable and secure zero carbon energy, within both its Corporate Strategy and across the whole development design ethos. This Energy Strategy sets out how Gravity has established a framework approach to the Energy Grand Challenge through:

- Reviewing existing energy policies and targets;
- Considering the development within the energy hierarchy;
- Assessing potential predicted energy demand and predicting carbon dioxide (CO_2) emissions from energy use; and
- Spatially planning potential renewable and low carbon energy technology to establish an energy framework.

1.3.2 The time between the LDO and the commissioning of the Proposed Development, the UK will see a significant shift in terms of national policy, technology evolution, and consumer needs. This Strategy therefore sets out a framework for achieving greenhouse gas emission reductions relating to energy through the planning, construction and operation of Gravity to allow for this evolution.

1.4 Report Structure

1.4.1 This Strategy is structured as follows:

- **Section 2: Site in Context**: Site context and development proposals;
- **Section 3: Policy and Regulatory Context**: Review of the local and national regulations/policy relevant to Gravity;
- **Section 4: Energy Efficiency:** How energy efficiency measures have been and will continue to be incorporated into Gravity (both in the LDO proposals and in the building design);
- **Section 5: Energy Demand Assessment:** A preliminary assessment of the predicted energy demands and predicted CO_2 emissions of Gravity;
- **Section 6: Renewable and Low Carbon Energy Technologies:** Review of the suitability of renewable and/or low carbon energy generation technologies at Gravity;
- **Section 7: Smart and Low Carbon Infrastructure Design:** Assessment of opportunities to provide active network management and low carbon heating infrastructure; and
- **Section 8: The Energy Framework and Conclusions**: Concluding remarks and next steps.

[2] Gravity ESG Approach – Gravity key project documents. Online, available here: https://thisisgravity.co.uk/key-project-documents/

1.5 Planning Submission and Design Evolution

1.5.1 This Strategy presents a pragmatic framework for meeting Part L of the Building Regulations (Conservation of Fuel and Power), anticipated future changes and the local policy requirements and meet the future needs for Industry 4.0. Due to the scale of Gravity and the potential development phases build-out periods for specific occupiers to meet market needs, the Energy Strategy needs to be flexible and able to respond to business operational need, regulatory changes, market forces and technological advances.

1.5.2 Gravity is committed to delivering high standards of energy efficiency within the Site. Gravity will create a low carbon campus, generating more than 4,000 green collar jobs, providing both a strategic economic stimulus to drive economic renewal, and shaping and connecting to a green supply chain across the UK.

1.5.3 The campus will respond to the UK Industrial Strategy's Energy Grand Challenge through its design and through providing a home for Industry 4.0.

1.5.4 Home to international businesses, start-ups and SMEs, Gravity will be a home for clean growth and green industries, creating the space to innovate and create green solutions from energy solutions to smart homes and new smart mobility choices.

1.5.5 The nature of occupants operating in Industry 4.0 will have energy demands that are variable in terms of scale, phasing and security of supply needs. This enhances the need for a flexible energy strategy to enable Industry 4.0 rather than define any one technology or approach now.

1.5.6 This Strategy has been based upon our current understanding of the development proposals and information set out in the Parameter Plans. It considers the anticipated programme to detailed design and construction.

1.5.7 This Strategy is designed to be a working document and should be reviewed and updated as necessary as the proposals are revised working collaboratively with occupiers on solutions to meet their specific needs. The final energy measures implemented will be confirmed, and subject to development feasibility and viability testing, as operators are identified at Gravity and applications for compliance are submitted to the LDO.

1.6 Consultation

1.6.1 The Proposed Development is being progressed through an iterative process of design, assessment, and review. It is therefore the intention that the LDO proposals to be consulted upon will incorporate measures to mitigate potential adverse environmental effects, and to enhance environmental benefits, wherever possible through its design.

1.6.2 A Gravity LDO Delivery Group has been established to drive forward the LDO and facilitate ongoing collaboration. The Delivery Group includes key statutory consultees; SDC, SCC, Highways England, Environment Agency, Natural England, and Network Rail. The proposed approach to the Energy Strategy has been discussed with the Delivery Group.

1.6.3 There are also several sub-groups to the Delivery Group, including the Transport, Utilities and Environmental Sub-Groups, which facilitate further consultation where required.

1.6.4 Consultation with statutory and non-statutory consultees, along with the local community through the LDO consultation process, will continue to inform the design of the Proposed Development.

2 Site in Context

2.1 Introduction

2.1.1 This section introduces the Site context, including describing the Site location, landscape features and development proposals.

2.2 Site Description

2.2.1 Gravity comprises 646.29 acres of land, of which approximately 616 acres was part of the former Royal Ordnance Factory (ROF) which closed in 2008. The majority of the Site, associated with the ROF, is brownfield land hosting a primary industrial manufacturing use over the past 70 years. Land on the edges of the Site, in particular to the south and east, is currently greenfield agricultural land.

2.2.2 The village of Puriton lies immediately to the south west of the Site and the village of Woolavington lies immediately to the south east. Beyond Puriton, approximately 2km west of the Site, lies junction 23 of the M5 motorway and the motorway runs in north-south orientation.

2.3 Development Proposals

2.3.1 Gravity will facilitate the delivery of the Gravity Enterprise Zone. The description of development, as currently anticipated, is as follows:

any operations or engineering works necessary to enable the development of the Site, including demolition, excavation and earthworks, the formation of compounds for the stockpiling, sorting and treatment of excavated materials, import of material to create development platforms, piling, and any other operations or engineering necessary for site mobilisation, office and worker accommodation, communications, drainage, utilities and associated environmental, construction and traffic management.

the development of a smart campus including

- *commercial building or buildings with a total Gross External Area of up to 1,000,000m^2 which would sit within current Use Classes E (a)-(g), B2, B8 and sui generis floorspace uses and*
- *a range of buildings up to 100,000m^2 within Use Classes C1, C2, E (a) – (g) and F, B8, including restaurants / cafes, shops, leisure, education and sui generis uses and*
- *up to 750 homes in Use Class C3*

together with associated infrastructure including restoration of the railway line for passenger and freight services, rail infrastructure including terminals, sidings and operational infrastructure and change of use of land to operational rail land, multi-modal transport interchange, energy generation, energy distribution and management infrastructure, utilities and associated buildings and infrastructure, digital infrastructure, car parking, a site wide sustainable water management system and associated green infrastructure, access roads and landscaping.

The Gravity Land Use parameter plan is presented in **Appendix A.**

2.4 Development Phasing

2.4.1 The implementation of the LDO will be market-led and therefore a construction programme is not available at this time. It is anticipated that construction will commence in 2022 and be complete by 2032.

2.5 Electricity and Gas Utility Provision

Electricity

2.5.1 The 43MVA connection provided by Wester Power Distribution (WPA) at Bridgwater is along the red hatched route, as shown in **Appendix B Utility Infrastructure Plan**. This emerges adjacent to the new link road. WPD has put the ducting in the ground pursuant to the relevant agreed wayleaves.

2.5.2 National Grid connections will be via the construction of a new on site substation connecting to the National Grid infrastructure . This is represented by the black line bordering the north of the Site, as shown in **Appendix B**. This has been confirmed by National, and also by Balfour Beatty (who are also working on the Gravity site carrying out the upgrade works for National Grid for the benefit of Hinkley).

2.5.3 The works will be tied in to this once a contract is signed with National Grid.

Gas

2.5.4 The two existing on site medium pressure connections will satisfy Stage 1 Reinforcement.

2.5.5 The nominal upgrade works would follow the route, as shown in the plan labelled Design Plan reinforcement at **Appendix B**, to access the majority of the Gravity site. Limited connection work is therefore needed for the whole Gravity site.

2.5.6 If, however, an additional supply is required, then Wales and West have confirmed a connection could be made to the Intermediate Pressure main at Bridgwater following the public highway route. This is shown on the plan labelled Design Plan IP in **Appendix B**.

3 Policy and Regulatory Context

3.1 Introduction

3.1.1 This section reviews the policy requirements in respect of energy in the context of the Gravity site, focusing on both national and local level requirements. This is in relation to relevant energy, associated CO_2 emissions and development design policies.

3.1.2 Each policy is reviewed in more detailed within **Appendix C**.

3.2 National Policy Context

3.2.1 Climate change is recognised as one of the most immediate global environmental challenges. In May 2019, the Committee on Climate Change published the Net Zero report, recommending that the UK Government introduce a target of at least a 100% reduction of greenhouse gas (GHG) emissions by 2050.

3.2.2 In 2019, the Climate Change Act (CCA) 2008 was amended to include a revision of the previous aim of 80% reduction of GHG emissions compared to 1990 levels by 2050. The CCA 2008 now mandates: "*the net UK carbon account for the year 2050 is at least 100% lower than the 1990 baseline*."

3.2.3 The UK Government's international commitment (transposed into national and local policy) has sought to reduce CO_2 emissions associated with new buildings through energy demand reduction and the incorporation of low and zero carbon technologies to deliver electricity and heat.

3.2.4 This overarching commitment defines a range of policies and regulations at a national level that influence Gravity. These include:

- UK Industrial Strategy Energy Grand Challenge (2019) which defines the complexity of delivering a secure and affordable zero carbon energy.
- UK Government Ten Point Plan for a Green Revolution (2020) which sets the approach to decarbonising a broad range of sectors and markets and sets the UK's National Determined Contributions to the Paris Agreement.
- National Planning Policy Framework (2019) which defines a proactive approach to mitigating and adapting to climate change within planning.
- Energy White Paper (2020) which sets out how energy, and the move towards a net-zero carbon economy, will play a critical role in enabling interdependent infrastructure and post-COVID economic growth.
- UK Hydrogen Strategy (August 2021) sets out how the UK will significantly scale up hydrogen production and lay the foundations for a low carbon hydrogen economy by 2030, and how it will support innovation and stimulate investment to get to this position.
- Future Homes Standard Consultation Response (January 2021) defining how new homes will become zero carbon ready by 2025.
- Future Building Standard Consultation (January 2021) sets the direction of travel for how new buildings will achieve net zero carbon outcomes.
- Building Regulations Part L (Conservation of Fuel and Power) which defines the benchmarks for energy performance in new buildings.

- Road to Zero Strategy set an aspiration for the decarbonisation of transport including the electrification of vehicles.
- Consultation on Electric Vehicle Charging Points in New Homes and Buildings (2018) set out the direction of travel for inclusion of EV regulation within the Building Regulations.
- Energy and Planning Act 2008 sets out the responsibilities for local authorities to define energy standards for new growth.

3.3 Somerset Climate Emergency

3.3.1 The Somerset Climate Emergency Strategy notes that Gravity is at the heart of the region's approach to become a Carbon Neutral County by 2030.

3.3.2 This will include the investments in low-carbon and climate-resilient industries and infrastructure at Gravity will create jobs and stimulate economic recovery, change the trajectory of UK emissions toward Net Zero, whilst improving our resilience to Climate Change impacts.

3.4 Local Planning Policy

3.4.1 The Sedgemoor Development Plan is made up of the Sedgemoor Local Plan 2011-2032 and a suite of Supplementary Planning Documents (SPDs) and other adopted strategies and guidance. The Sedgemoor Local Plan sets out the policy framework for future development in the District, including provision of housing, employment, retail and other facilities and infrastructure. It was adopted in February 2019. It therefore forms part of the development plan for the District and is a main consideration in the determination of planning applications.

3.4.2 The Local Plan relates to the whole District and provides a strategy for delivering growth up to 2032. Below the Local Plan sit a number of adopted SPDs, including an SPD relating to the Site itself, strategies (including the Sedgemoor Transport Investment Strategy 2050, for example) and guidance. The Local Plan and pertinent associated considerations for Gravity are set out below.

3.4.3 The following are considered key local policy requirements that have been taken into consideration within this Energy Strategy.

Local Plan 2011-2032

- S4 Sustainable Development Principles
- S5 Mitigating the Causes and Adapting to the Effects of Climate Change
- D3 Sustainability and Energy in Development
- D4 Renewable or Low Carbon Energy and Heat Generation projects

3.4.4 Both the Bridgwater Vision and the Puriton Energy Park SPD previously set the planning context for the Site to include a transformation development, shaped to enable economic structuring and draw in higher value occupiers, including accommodating potential large scale energy generation infrastructure.

3.4.5 The SPD defined a range of potential available technologies including major power generation (such as CHP or energy recovery) and secondary power generation (including microgeneration, for example biomass and wood fuel heating, small scale wind turbines and photovoltaic cells on individual buildings as well as opportunities for solar energy cultivation on the perimeters of the Site).

3.4.6 Fundamentally, site disposal from BAE Systems Ltd demonstrated a lack of market interest in delivering large scale energy generation on this Site, which has led to the Site being re-imagined by the new landowner (Salamanca Group) as part of a new future centred on clean and inclusive growth.

Heart of the South West Local Enterprise Partnership

3.4.7 Sedgemoor is part of the Heart of the South West Local Enterprise Partnership (HotSW LEP) which covers 16 local authority areas across Somerset and Devon. This area is home to nearly 1.8 million people, 72,000 enterprises, four universities and ten further education colleges.

3.4.8 The purpose of the HotSW LEP is to raise productivity and ensure prosperity for all through clean and inclusive growth. There is strong policy alignment from the national economic priorities through to the HotSW LEP, the County Climate Change Strategy and the District economic strategy.

3.4.9 The Blueprint for Clean Growth, published by HotSW LEP in May 2021, brings together and builds on the LEP's existing strategies, including the Local Industrial Strategy and Build Back Better plan, to drive sustainable growth.

3.4.10 It is the aim of the Blueprint to grow the economy in a clean and sustainable way by delivering inclusive economic prosperity whilst protecting the environment, lowering emissions and enhancing natural capital. Six objectives/themes have been prioritised that the LEP intend focus on:

- Leadership;
- Low carbon energy;
- Greening businesses;
- Sustainable communities;
- Decarbonised transport; and
- Natural capital.

3.4.11 The Blueprint also aims to accelerate development of clean growth clusters around several strategic employment sites, such as at "*Gravity near Bridgwater*".

Sedgemoor Economic Development Strategy

3.4.12 The Council's Economic Development Strategy 2020 – 2050 explains that by 2050 Sedgemoor will be a clean growth and energy link on the M5 "Innovation Highway" which connects an environmental, health and marine digital hub to the south and a high-tech transport, cybersecurity, health, and data-driven hub to the north.

3.4.13 The Economic Development Strategy identifies the prominence of Gravity as the key project within the District and states that it offers further long-term opportunity for the transformation of Sedgemoor's economy. The Strategy confirms Gravity's vision is wholly aligned with the UK and local industrial strategies, in aiming to drive productivity through the delivery of an internationally leading innovation campus that is underpinned by clean growth.

3.4.14 The Strategy confirms that Gravity will support high-value business across: low carbon energy generation; manufacturing; electric vehicles; robotics; artificial intelligence, data analytics, R&D and the creative industries. Importantly the Strategy also notes that Gravity will not only create an inclusive environment, with leisure facilities and amenities accessible to both employees and the wider local community, but its development will ensure design and economic activity that does not compromise the quality of the natural environment.

Somerset's Climate Emergency Strategy

3.4.15 Somerset's Climate Emergency Strategy, developed jointly by the five Somerset local authorities, sector experts and external partners, was formally adopted by all five Somerset Councils in November 2020.

3.4.16 The aim of the strategy is to reduce carbon emissions in the county and make Somerset a county resilient to the inevitable effects of Climate Change. The strategy sets ambitious goals for Somerset to become a carbon neutral county by 2030 and also outlines what the five councils intend to do to address the most important issues around the Climate Emergency.

3.4.17 The declarations made within the Climate Emergency Strategy include achieving carbon neutrality by 2030 and building resilience for, or adapting to, the impacts of a changing climate. The Strategy describes many objectives which are aligned with Gravity and describes a number of benefits linked to delivering development in this way across economic, social and environmental areas.

3.5 Policy Summary and Energy Target Setting

3.5.1 SDC has no specific energy or carbon emission targets set within the local plan. The scheme will be designed and developed against Local Plan policies to:

- Incorporate energy efficiency; and
- Utilise renewable and low carbon energy (including decentralised energy) where appropriate;

3.5.2 Gravity is at the heart of the Somerset Climate Emergency Strategy. Gravity see it is imperative to ensure that the Campus supports this strategy. The scheme will therefore support the transition to a zero carbon economy through low carbon design and renewable energy supply to maximise the opportunities to contribute to a Carbon Neutral Somerset by 2030.

3.5.3 The Energy Strategy seeks to demonstrate that adequate energy provision and connectivity is planned to support the delivery of Gravity within the defined parameters established by the LDO.

4 Energy Efficiency

4.1 Introduction

4.1.1 In line with Part L of the Building Regulations, new developments should seek to increase energy efficiency and reduce energy demands through sustainable design and construction. SDC also encourages new developments to adopt sustainable building principles, including energy efficiency and conservation measures.

4.1.2 This section demonstrates that Gravity will aim to be energy efficient by means of project layout, whilst each plot should seek to adopt a "fabric-first"3 approach to reduce energy demands in individual buildings.

4.2 Energy Hierarchy

4.2.1 Gravity will adopt the nationally and locally recognised energy hierarchy of reducing energy demand in the first instance, using energy efficiently and, only then, providing renewable and low carbon energy generation technologies where it is appropriate to do so. The energy hierarchy in new urban development is illustrated in **Figure 4.1**

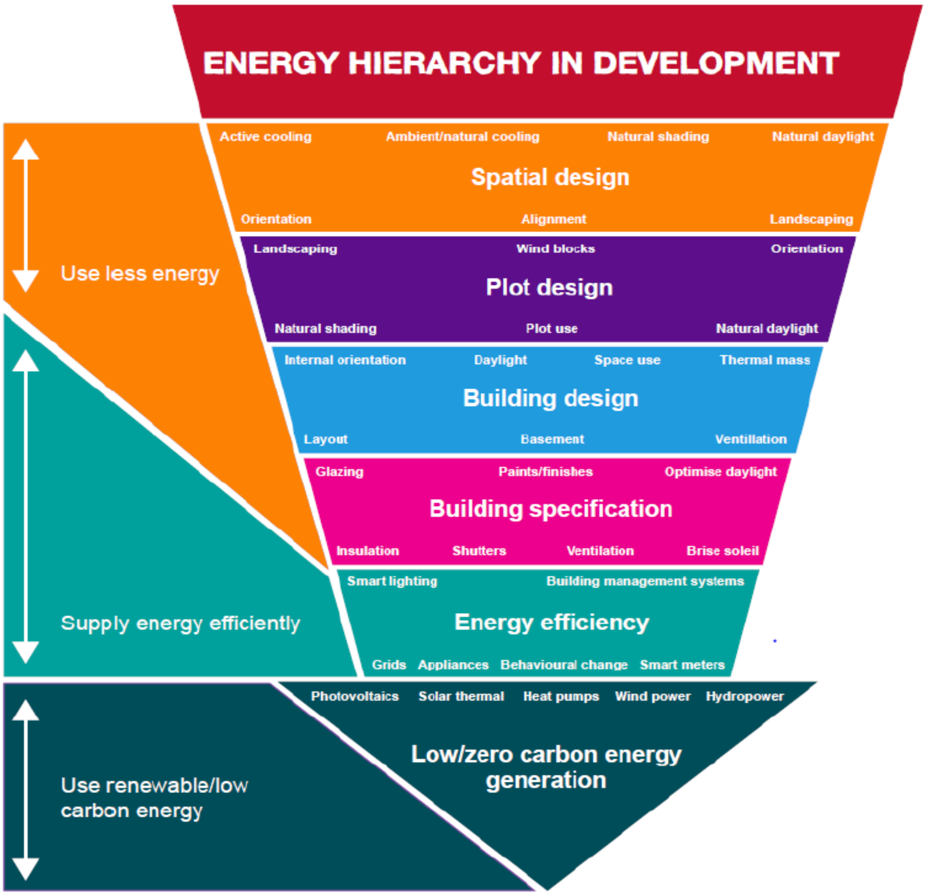


Figure 4.1: The energy hierarchy in new development

[3] For the avoidance of doubt, in this application the approach that starts as "Fabric First" will look to achieve a Fabric Energy Efficiency Standard (FEES) of the 2025 Future Home Standard, when defined or as a minimum 46kwh/m2/yr.

4.2.2 To meet the first principles of the hierarchy (i.e. passive demand reduction) it is important to consider passive design principles through spatial planning, green infrastructure provision and development context. These issues do not contribute to the CO_2 emission reduction calculations under the Building Regulations but can play a significant part in reducing the energy demands of a building.

4.2.3 **Section 4.3** below presents principles that have been considered within the Land Use Parameter Plan in the context of other design considerations and will continue to be considered as the design progresses, to passively reduce the energy demand of Gravity. **Section 4.4** presents 'passive' and 'active' measures that will be considered in the design of individual buildings to further reduce energy demands and use energy more efficiently.

4.3 Parameter Plan Design Principles to Reduce Energy Demand

4.3.1 There are a series of design principles established in the LDO to passively reduce the energy demands for Gravity.

4.3.2 Gravity is set within a comprehensive green infrastructure network with areas of open space as well as retained and proposed woodland and hedgerows and areas for leisure and recreation, including the following:

- Natural open space, in the form of woodland clusters within a natural landscape;
- A series of reedbeds which provide a filtration system to treat water; and
- Existing meadow grassland and paths, as well as an ecological corridor reinforced with new woodland planting.

4.3.3 Street-scene planting will provide naturally shaded areas and corridors connecting different land parcels.

4.3.4 The permeability of green spaces throughout Gravity, as well as the selection of layout and building location, will help to facilitate air movement and enhance natural ventilation.

4.3.5 Where appropriate, building orientations will be optimised to take advantage of south-facing aspects for winter passive solar gains. Where possible planting will be used for summer shading in south facing buildings to reduce over heating risks.

4.4 Building Design Principles to Reduce Energy Demands and Use Energy More Efficiently

4.4.1 In accordance with the energy hierarchy, each plot should seek to adopt a "fabric-first" approach to building design (enhancing the performance of the components and materials that make up the building fabric itself, such as improving insulation and reducing cold bridging), before considering the use of mechanical or electrical services systems and renewable/low carbon technologies.

4.4.2 Measures should be adopted in the detailed design of buildings to reduce energy demands, use energy more efficiently and, where possible, adapt to the predicted impacts of climate change. These measures can be split into 'passive' and 'active' measures.

4.4.3 'Passive' measures are design features, which can include building orientation, appropriate internal layouts and building fabric selection, that inherently reduce the buildings' energy requirements. 'Active' measures are building services design features that will increase the efficiency of the energy used, and therefore also reduce the energy demand requirements.

4.4.4 A combination of 'passive' and 'active' measures will result in well insulated, air-tight buildings with appropriate and efficient building services. As per the energy hierarchy discussed in

Section 4.2, it is important to emphasise the benefits of optimising the long-lasting energy performance of buildings through fabric improvements, before employing low carbon and renewable energy technologies on site.

4.4.5 At this stage, the opportunities for delivering higher fabric energy efficiency performance than the current Building Regulations needs to reflect the potential implementation of the Future Homes Standard in 2025 and the Future Building Standards (subject to the results of the FHS consultation).

4.4.6 **Section 5** below assesses the potential energy demand impacts of delivering similar energy efficiency targets and the emerging CO_2 reduction benefits.

4.4.7 Consideration of building energy demand will be critical in developing smart energy infrastructure (**Section 7**). As noted in the Clean and Inclusive Growth Strategy, the delivering of standards such as ISO50001 Energy Management will be used within the scheme to ensure that due process is provided to maximise these opportunities, where suitable.

5 Energy Demand Assessment

5.1 Introduction

5.1.1 The Government-approved methodologies for assessing CO_2 emissions to demonstrate compliance with Part L of the Building Regulations in England are:

- The Standard Assessment Procedure (SAP) for the energy rating of dwellings; and
- The National Calculation Methodology (NCM) implemented through the Simplified Building Energy Model (SBEM) for buildings other than dwellings.

5.1.2 At this early stage in the development process it is not possible to undertake SAP or SBEM calculations because sufficient detailed design information is not available. Instead, a Predicted Energy Demand (PED) model has been developed using assumed notional building designs (based upon the principles outlined in **Section 4**) and the Development schedule.

5.1.3 The PED model predicts the regulated and unregulated energy demands of the Development by month-of-year and hour-of-day, as well as the associated CO_2 emissions. The model uses Building Services Research and Information Association (BSRIA) benchmark data and the Energy Efficiency in Buildings CIBSE Guide F 2016 in establishing broad demand profiles.

5.1.4 As the end occupants are not known, generic use classes energy demands have been utilised for illustration purposes. It should be noted that the end energy demand of the Site could vary significantly due to the wide range of potential end users, relating to Industry 4.0.

5.1.5 As noted in the Clean and Inclusive Growth Strategy, it will be critical to re-assess energy demand through waypoints that reflect potential end uses as reflected in **Figure 5.1**.

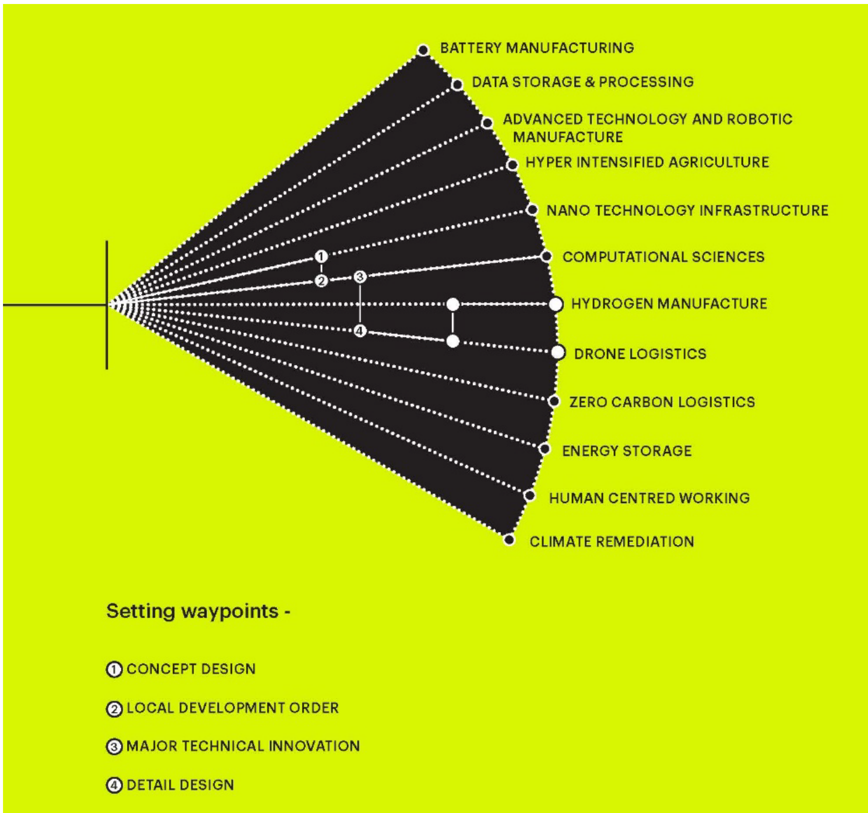


Figure 5.1 Future appraisal of energy demand through the LDO and innovation timeframe

5.1.6 Energy demand is split into regulated and unregulated, where:

- Regulated energy is heat or power for hot water, space heating and cooling, lighting and associated pumps and fans (this energy is regulated through Part L of the Building Regulations); and
- Unregulated energy is all other energy uses such as cooking equipment, electrical appliances and other small power.

5.1.7 The electrical demand required to charge electrical vehicles is currently not part of the standard assessment procedure within the Building Regulations. For the predicted energy demand modelling for buildings transport energy demand has not been included.

5.1.8 The method and predicted results of the PED assessment for Gravity proposals are provided in **Appendix D**.

5.2 Predicted Scenarios

5.2.1 The PED Model has assessed the predicted energy demand of Gravity under two different energy efficiency and emissions scenarios, as follows:

- **Baseline:** showing how the buildings would perform in terms of energy consumption and associated carbon emissions if built to the current Part L of the Building Regulations 2013 standards (utilising natural gas heating); and
- **Predicted energy demand:** based on how Gravity would be built to future Building Regulation Standards, with grid reductions and electric led development.

5.2.2 The results of these assessments are given below to illustrate how the energy demand and total CO_2 emissions of Gravity will inherently decrease over the next 10 years. This is a direct result of the rapid decarbonisation of the Grid. Through a reduction on the reliance of fossil fuels and an increase in the share of renewable / low carbon technologies, the carbon factors for electricity are anticipated to decrease.

5.2.3 This is pertinent to Gravity, given that development delivered by the LDO will be market-led, it is not possible to predict phasing, as there is the potential for the LDO to be delivered as a single phase of development or broken into multiple phases. Therefore, the energy demand and total CO_2 emissions will be significantly lower. There may also be higher energy performance targets which Gravity must address.

5.2.4 To address this, the Energy Strategy will need to be flexible and respond to these regulatory changes and technological advances.

5.3 Results of the PED Model

5.3.1 The annual PED for hot water, space heating, regulated electricity and unregulated electricity for Gravity are summarised in **Table 5.1**. The total carbon dioxide emissions in tonnes for gas, regulated electricity and unregulated electricity is also shown. The full results of the PED Model can be found in **Appendix D**.

5.3.2 No change is expected for the unregulated electricity demand under any of the Building Regulations as this source of electricity is not currently covered by the Building Regulations Part L.

5.3.3 **Table 5.1** below sets out both the assumed baselined energy demand and associated carbon emissions based on Part L 2016, and the total predicted energy demand based on the project being delivered by 2030.

Table 5.1: Baseline and Predicted Energy Demand and CO_2 emissions of the Development 2030.

Building Regulations	Total Annual Predicted Energy Demand (GWh)				Total Annual CO_2 Emissions (Tonnes)	
	Hot Water	Space Heating	Regulated Electricity	Unregulated Electricity	Regulated	Unregulated
Baseline (Part L)	53	195	22	22	65,000	12,000
Predicted energy demand (2030)	48	170	19	22	12,000	1,100

5.3.4 A key part of Gravity is that the residential development will be 100% electric led using low carbon heating solutions such as heat pumps, with all homes using heat pump technology for their heating, and hot water.

5.3.5 Through a combination of the step change in the decarbonisation of the National Grid, adoption of the future homes and future building energy efficiency standards and the use of electric heating the CO_2 emissions arising from Gravity are estimated to decrease beyond 83% by the year 2030 compared to the baseline.

6 Renewable and Low Carbon Technologies

6.1 Introduction

6.1.1 In accordance with the energy hierarchy, the proposed Energy Strategy for Gravity is to reduce energy demands and use energy efficiently by means of scheme layout and building design and orientation before employing renewable and low carbon technologies (as outlined in **Section 4**). However, it is also important to consider opportunities to incorporate renewable and low carbon energy technologies at an early stage in the design process.

6.1.2 SDC's policies encourage new development to take advantage of opportunities to use renewable and low carbon energy sources. Policy D3 Sustainability and Energy in Development states that new buildings and converted buildings will be encouraged to be supplied by renewable (or low carbon) energy, having regard to the type of development involved, its design and whether it is feasible or viable.

6.1.3 The requirement to assess the feasibility of decentralised energy systems is also set out in Policy D4 Renewable or Low Carbon Energy and Heat Generation projects. This states that the Council will support projects that maximise the generation of energy and heat from renewable or low carbon sources, including solar, or waste.

6.1.4 A review of the suitability of various renewable and low carbon technologies for the Site has been undertaken in the following sub-sections below, at both a 'plot' level (i.e. standalone energy infrastructure) and 'building-specific' level. Further detail on certain technologies is presented in **Appendix E**. In summary, the variables affecting suitability include:

- **Environmental Constraints:** e.g. suitable geology for Ground Source Heat Pumps or the presence of protected ecological species that may be affected by the technology;

- **Resource constraints:** e.g. the availability and reliability of local biomass fuel supplies or the local wind resource;

- **Social constraints**: e.g. visual or health impacts of placing combustion-based technologies near housing; and

- **Infrastructure constraints:** e.g. impacts on aviation from wind turbines or the availability of suitable transport infrastructure to import fuel, plant or equipment.

6.1.5 **Table 6.1** and **Table 6.2** below provide a summary of the multi-plot and building specific renewable/low carbon technologies available to Gravity respectively.

6.1.6 The options highlighted in green are preferred options for further investigation, those in orange have some potential which should be explored once further detail is available, and those in red are considered to be the least appropriate for Gravity at this stage. Each technology's carbon intensity has been qualitatively assessed and given a rating of low, medium or high.

6.1.7 Technologies are evolving and costs are changing so the comments given below may be superseded over time.

6.2 Plot Scale Renewable and Low Carbon Opportunities

Table 6.1: Summary of Multi-plot or Site Wide Renewable and Low Carbon Opportunities

Technology	Technological risk	Energy availability	Potential contribution (kW / MW)	Estimated Carbon Intensity	Suitability	Comment
Photovoltaic Solar Panels (PV)	Low	Intermittent	kW to MW	Zero	Potential to be further explored	The yearly in-plane irradiation[4] is 1,240 kWh/m^2. Though the Site contains large areas of open space, these are designated for other uses including formal open space and green infrastructure. There is limited space within the Site boundary for a larger-scale, standalone PV installation due to competing land use. Solar canopies on the top of the commercial buildings including multi story car parks could be a potential option to consider. A potential large scale solar array could be developed between roof mounted and car park canopy solar development. With the potential for over 1 million m^2 of roof space potentially available over 100MW of solar generation could be accommodated. This would need to be subject to landscape visual impact and massing consideration as the design progresses. The scale of potential generation from roof mounted solar generation would potentially allow scaling against the onsite demand to enable a potential 100% supply of annual energy demand from renewables. This would require active network management infrastructure The adjacent and nearby solar arrays are being considered as an energy source to connect to the Site. Additional solar arrays could potentially be feasible near to the Site, subject to further investigation and viability appraisal. The potential to connect to existing and proposed solar arrays is explored further in **Section 7.4**
Battery storage	Medium/high	Baseload / as required	kW to MW	Neutral	Potential to be further explored	There is existing external space surrounding the Site that could be utilized for battery storage. Alternatively, battery storage could be housed withing the dedicated energy infrastructure on Site. A battery project in conjunction with renewable energy generation could help reduce peak electrical demands.

[4] Photovoltaic Geographical Information System, available online: https://re.jrc.ec.europa.eu/pvg_tools/en/#PVP

Technology	Technological risk	Energy availability	Potential contribution (kW / MW)	Estimated Carbon Intensity	Suitability	Comment
						A battery project could reduce peak electrical demands. However, the technology is currently expensive, and the energy storage markets are largely untested. This risk is likely to diminish over the next five to ten years. Potential to explore further as detailed design progresses.
Centralised heat pumps (water source)	Medium / high	Baseload	kW to MW	Low	Potential to be further explored	Huntspill River, whilst designated as a National Nature Reserve, was constructed as a water reservoir for the former use with consent for large scale water extraction. Water abstraction and discharge will be a key element to support large scale advanced manufacturing on site. Groundwater extraction can be considered, subject to hydrological appraisal.
Ground source heat pumps	Medium	Baseload	kW to MW	Low	Potential to be further explored	This approach would require significant land area and is dependent on suitable ground conditions. A review of the British Geological Survey (BGS, 2021 online viewer) mapping indicates that the Site is underlain by bedrock geology of the Langport Member, Blue Lias Formation and Charmouth Mudstone Formation (undifferentiated). Superficial deposits are indicated to be Tidal Flat Deposits, comprising clay, silt and sand, for the majority of the Study Area. These geological features would support the delivery of ground source head pumps as an option on the Site. Further techno-economic appraisal would be required, including detailed appraisal of the thermal conductivity properties of the ground conditions in order to determine whether the geology/bedrock of the area can be used as thermal battery. Important to determine in situ variability in lithology and properties, including depth and nature of the weathered zone.
Conventional gas-powered turbines	Low	Baseload (combined cycle gas turbine) / Intermittent	kW to MW	High	Potential as part of smart grid	Potential for peaking plants or Short-Term Operating Reserve (STOR) scheme as a means of providing back-up power to intermittent renewable energy sources. The power generated from such systems would not be directly supplied to dwellings, but rather feed into an active network management system to manage peak demands on the

Technology	Technological risk	Energy availability	Potential contribution (kW / MW)	Estimated Carbon Intensity	Suitability	Comment
		(open cycle gas turbine)				Site. The technology may be required by the Distribution Network Operator but would be subject to a separate application. Subject to further investigation and viability appraisal, and consideration of whether this technology is suitable. The delivery of such infrastructure would be considered separately from how buildings meet Part L of the Building Regulations.
Biomass district heating	Low	Baseload	kW to MW	Low	Potential to support heat generation	The Renewable Heat Incentive (RHI) can reduce the costs of a biomass scheme and provide financial returns. District heating needs high heat demand densities to be viable (e.g., high-density housing, industrial manufacturing etc.). Various potential local biomass suppliers are located in close proximity to Gravity, within a 10km radius (Biomass Suppliers List[5]). There could be potential opportunity to secure long term fuel contracts required for security of supply, which would need to be tested and early engagement with occupiers based on quality of heat supply. However, the need for regular and large-scale solid wood fuel deliveries via Heavy Goods Vehicle (HGV) make this option undesirable from a traffic generation, air quality and exhaust carbon emissions perspective. This may limit the scale of biomass heat supply.
Hydrogen Generation and Use	High	Baseline	MW	zero	Potential for innovation	UK Hydrogen Strategy (August 2021) sets out the need for the development of scaled hydrogen generation across the UK. Locations with good energy supply and water are suitable for hydrogen generation, which makes Gravity a suitable location based on water and energy. Gravity also could use energy within transport and electricity generation.
Gas Combined Heat and Power (CHP)	Low	Baseload	kW to MW	High	No	Under predicted changes to the Building Regulations in 2020, gas CHP will not achieve the required carbon emission reductions. Government has an ambition for homes to be ‘gas-free’ by 2025.

[5] GOV.UK, Biomass Suppliers List, available online: https://biomass-suppliers-list.service.gov.uk/Search.aspx

Technology	Technological risk	Energy availability	Potential contribution (kW / MW)	Estimated Carbon Intensity	Suitability	Comment
district heating						
Wind energy	Low	Intermittent	kW to MW	Low	No	The windspeed within this area is estimated to be ranging between 6.2 m/s (at 45m height)[6]. This speed can be suitable for wind turbines. A wind turbine would have to be located off-site at least 150m distancing from buildings and road infrastructure. A wind turbine(s) within the Site could potentially cause a significant noise, visual and wind-flicker disturbance, which would be detrimental to the amenity of residents and other site users located in close proximity. There may be potential for micro generation integrated on site to be explored in the design process. The Huntspill River is designated as a National Nature Reserve and is located in close proximity to the Site. This is highly likely oppose conflict with large scale turbines which may have an effect on the local ecology and visual impact. Large turbines are not included within the Gravity vision and LDO concept.
Hydropower	Low	Baseload	kW	Low	No	No suitable watercourses identified in the vicinity of the Site. The Huntspill River is designated as a National Nature Reserve and is located in close proximity to the Site. However, this watercourse is not a suitable waterbody for generating power for Gravity (inappropriate head and flow and no suitable weir structure), as well as due to the potential effect on local ecology.

[6] RenSmart, available online: https://www.rensmart.com/Maps#NOABL

6.2.1 Based upon the Site location and the development principles established by the LDO, there are some 'plot' scale renewable and low carbon energy generation solutions that should be explored further as the project progresses in the future.

6.2.2 The options include the delivery of battery storage and balancing plant, commercial building roof solar power generation, micro wind generation, peaking plant, biomass heating, and heat pump technology.

6.2.3 Following the appraisal of buildings integrated opportunities, **Table 6.2** below examines opportunities to produce on-site low carbon heat for individual buildings and to provide building-integrated renewable electricity solutions.

Table 6.2: Summary of Building-specific Renewable and Low Carbon Opportunities

Technology	Technological risk	Energy availability	Potential contribution (kW / MW)	Estimated Carbon Intensity	Suitability	Comment
PV	Low	Intermittent	kW	Zero	Most suitable	Solar PV systems could be installed on suitable south facing roofs within Gravity. Frame-mounted systems can be used on flat roofs to optimise energy use performance alongside smart grid infrastructure. Key buildings such as the large-scale advanced manufacturing space, energy center, offices, car parks and homes could potentially accommodate roof-mounted PV arrays. The suitability of PV will depend on the final design of individual buildings. Where suitable roof space is available, PV could be an effective renewable energy technology to install on both residential buildings and commercial buildings, as well as the advanced manufacturing space. Over 100MW of solar generation could be delivered at the scheme as noted previously.
Solar water heating (or solar thermal)	Low	Intermittent	kW	Zero	Most suitable	Could be installed on suitable roof spaces to supply a portion of buildings' heat demands. Solar thermal panels require to be installed on suitable south facing roof spaces to supply a portion of a buildings' heat demands.
Heat recovery	Low	Baseload	kW	Low	Most suitable	The use of wastewater and air heat recovery technology could be implemented in all buildings.
Heat pumps	Low	Baseload	kW	Low	Most suitable	Could be installed in suitable buildings to supply a portion of heat demands. External condensers need careful positioning to avoid visual / noise disturbance. Opportunities for air, ground water and ground source heat pumps are available.
Wind energy (medium / micro)	Low	Intermittent	kW	Zero	Potential to be further explored	Small scale turbines could be appropriate in employment zones.

Technology	Technological risk	Energy availability	Potential contribution (kW / MW)	Estimated Carbon Intensity	Suitability	Comment
						Building-mounted turbines are unlikely to be appropriate in the short term as there are challenges securing long-term reliable performances and structural vibration issues however this may be overcome in the future and may be an option to consider. There are also potential adverse visual, and noise/vibration impacts and structural design impacts.
Hydropower	Low	Baseload	kW	Zero	No	No suitable watercourses identified in the vicinity of the Site. The Huntspill River is designated as a National Nature Reserve and is located in close proximity to the Site. However, this watercourse is not a suitable waterbody for generating power for Gravity (inappropriate head and flow and no suitable weir structure), as well as due to the potential effect on local ecology.
Wood burning stoves	Low	As required	kW	Low	No	Widespread use could potentially have a detrimental impact on local air quality.

6.3 Summary of Technology Options

6.3.1 There is a 'suite' of 'building-specific' technologies that could potentially be deployed at Gravity. At this stage, the most suitable technologies are anticipated to be photovoltaic solar panels (PV), heat recovery technology, solar water heating systems (or solar thermal) and heat pumps.

6.3.2 A potential large scale solar array could be developed between roof mounted and car park canopy solar development. This would deliver in excess of 100MW of generation providing over 100GWh of energy. In addition, potential connection to existing offsite solar arrays could also supply local renewable energy.

6.3.3 Key to bringing together modern 'smart' infrastructure will be needed that looks to balance variable energy demands with the intermittency of renewable generation. Section 7 below sets out the principals of how smart energy infrastructure will be used to support the Somersets net zero transition.

6.4 Renewable Energy Landscape

6.4.1 A further opportunity to incorporate low carbon and renewable energy exists in the establishment of a smart grid associated with the surrounding renewable energy landscape. This would provide the opportunity to capture and distribute power generated externally from the LDO boundary within the development.

6.4.2 Local off-site renewable energy developments have been identified using the Department for Business, Energy & Industrial Strategy (BEIS) Renewable Energy Planning Database[7] to assess the feasibility of feeding into the smart energy infrastructure strategy. There are six operational renewable energy schemes within a 10 km radius of the Site comprising of approximately 43MW of renewable generation. These are summarised in **Table 6.3** below. The location of these schemes, as well as the nearby biomass suppliers, sub stations, pylons and water bodies is provided in **Appendix F**.

Table 6.4: Local renewable energy schemes within 10 km radius of the Site.

Renewable Energy Site Name	Grid Reference	Distance from Site	Operator	Type	Installed Capacity (MW)
Puriton Solar Farm	332462 142273	Directly adjacent (>100m)	BNRG Renewables	Ground Mounted Solar Photovoltaics	4.6
Puriton Landfill Solar Farm	331704 142629	500m	SBC Renewables	Ground Mounted Solar Photovoltaics	11.4
Pyde Drove	335530 142499	1.8km	Wessex Solar Energy	Ground Mounted Solar Photovoltaics	7.0
Watchfield Lawn	334135 147772	5.2km	Belltown Power	Ground Mounted Solar Photovoltaics	10.2

[7] Only operational or approved schemes were searched for within a 20 km radius. Data obtained from BEIS (June 2021) *Renewable Energy Planning Database quarterly extract*, online, available: https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract

Renewable Energy Site Name	Grid Reference	Distance from Site	Operator	Type	Installed Capacity (MW)
Park Wall Solar Park	332133 136030	5.8km	Unknown	Ground Mounted Solar Photovoltaics	5.0
Cobbs Cross Solar Park	327500 135300	8.9km	PS Renewables	Ground Mounted Solar Photovoltaics	5.0

6.4.3 These schemes could offer potential direct connections into Gravity to supply 100% renewable energy to end users.

6.4.4 This will be based on using active network management and connecting the energy solutions deployed at Gravity with existing and potential future local renewable energy solar arrays, where appropriate and viable.

6.4.5 As noted in the Gravity Clean and Inclusive Growth Strategy the geographical proximity to Hinkley Point C provides further opportunities to benefit from a nationally significant energy landscape. Gravity will look to capitalise from this local benefit through key stakeholders within the local authority and at Hinkley. Discussions are advanced with National Grid on connecting to the grid infrastructure and this is integrated within the LDO concept.

7 Future Energy Infrastructure

7.1 Introduction

7.1.1 This section considers the opportunity to integrate and manage all potential renewable and low carbon energy technologies that may be employed at Gravity using emerging 'smart' energy infrastructure, across the campus and potentially deliver local benefits to communities to access low cost renewable energy.

7.1.2 As operators are identified at Gravity and applications for compliance are submitted to the LDO, there may be an opportunity to develop and deliver an integrated and 'smart' energy approach. This could form part of the wider strategy to deliver integrated infrastructure solutions to develop a high quality and well-functioning built environment. 'Smart' in this context relates to the use of data and the incorporation of information and communication technologies to deliver improved operational outcomes. This could be centralised and managed as an integral part of the campus management facilities management infrastructure and linked to marketing/ visitor centre for the Site.

7.1.3 In relation to energy, the opportunities include potential incorporation of emerging technologies to actively manage the generation and use of energy. This section discusses two ways in which this could be explored going forward: through active network management, and heat distribution approaches.

7.1.4 A key part of Gravity is that the residential development will be 100% electric led, with all homes using electricity for their heating, hot water and cooking.

7.1.5 The campus will provide an opportunity for occupiers to reduce operating costs and respond to their own CSR ambitions.

7.2 Active Network Management for Power

7.2.1 Given the potential for decentralised energy generation at Gravity (**Section 6**), it could be possible for the distribution network operator to develop a distributed energy resource (DER) strategy across the project. This would connect the power generation distributed across the project with the development's energy demand through network controls (turning power and demand on and off accordingly).

7.2.2 This approach is driven by demand management in the first instance and followed by energy generation to support the management of demand.

7.2.3 DER is an energy system which links up decentralised energy generation across the development via a central control system (remotely). This turns this decentralised energy into a Virtual Power Plant (VPP) for the project. A VPP is a system that integrates several types of power sources, (such as PV) so as to give a more reliable overall power supply.

7.2.4 The advantage of integrating these technologies with control mechanisms and potentially back-up storage systems is also that these technical interventions reduce the reliance on the distribution network for peak supply and maximises the use of renewable energy. In return this reduces the need for potential offsite grid reinforcements which can require the need for early capital outlay.

7.2.5 The progression of this approach should be considered in parallel to any further appraisals of specific technologies. If this option is to be considered further, a more detailed technical and commercial appraisal will be required including engagement with the Distribution Network Operator (DNO) or an Independent DNO, to see whether this option would be accepted.

7.2.6 To maximise this opportunity the control of energy use within the building would increase the opportunity of maximising power distribution and the use of renewable energy. This approach is often referred to as Whole System Thinking.

7.2.7 In order to facilitate the opportunity for developing smart energy infrastructure and maximise the opportunity to capture locally generated offsite renewable energy space has been made available for energy infrastructure that could be used to accommodate such infrastructure.

7.3 Emerging Technologies

7.3.1 There will be opportunities to incorporate new emerging technologies within the wide range of land uses approved by the LDO or within the local power infrastructure. New technologies such as hydrogen generation, pico-nuclear, and electric movement will emerge over the next decade that may be suitable for Gravity. At this stage however, the parameters through which such technology (and others not yet invented) may emerge are not known.

7.3.2 Hydrogen, for example, is currently growing on the agenda for driving the growth of low carbon transport. In August 2021, the UK Government released the UK Hydrogen Strategy. The strategy sets out how the UK will significantly scale up hydrogen production and lay the foundations for a low carbon hydrogen economy by 2030, and how it will support innovation and stimulate investment to get to this position. The Governments Ten Point Plan for a Green Industrial Revolution also states that the UK is already a world leader in investigating the use of hydrogen for heating, replacing fossil fuels like natural gas with hydrogen and hydrogen blends. The Government is keen to accelerate this work and develop resilient supply chains, support jobs and position UK companies at the forefront of an exciting growing global market, as well help things like industrial processes, industrial heat, power, shipping and trucking to make the shift to net zero.

7.3.3 As noted in the Clean and Inclusive Growth Strategy, Gravity will also aim to use its Enterprise Zone status to support and incubate new technology in the emerging energy technology space. This will include establishing 'living lab' approaches to support emerging technology enabling action on the UK's Industrial Strategy's Energy Grand Challenge.

7.4 Electric Vehicle Charging

7.4.1 The incorporation of EV charging infrastructure will be enabled to provide adequate access to infrastructure at Gravity for workers, residents and visitors, and to encourage the uptake of, and transition to, EVs. Gravity provides an opportunity to enable EV charging infrastructure that services the development and could benefit the wider community within a social service station and centralised EV charging hub.

7.4.2 It is noted that the final uptake of EV charging points will depend on a wide range of external factors beyond the control of this development - such as demographics, electric vehicle ownership and technology shifts. Different charging solutions may be required to service dwellings and commercial / community uses, or in the event that a central hub could not be delivered, these can include private home charging points and/or shared on street charging pillars. The proposed EV charging strategy should therefore be flexible and consider social, environmental and economic factors associated with the proposed strategy.

7.4.3 Through linking the geographic benefits of energy and data infrastructure Gravity will create the stimulus to enable the transition to zero carbon movement. Charging hubs will be provided for Gravity service EVs, including autonomous vehicles, freight consolidation etc. EV charge points will also be provided as required for commercial vehicles based at Gravity, as well as individual charge points to be provided for homes with off-street parking. A network of public charge points will also be provided for residents without off street parking, employees and visitors. These will be rolled out with increasing EV uptake.

7.4.4 A centralised hub would be proposed to be built in proximity to retail and commercial services. It would involve installing fast and potentially rapid direct current chargers which could charge vehicles on a much faster basis than a household trickle charge, almost akin to a conventional filling station. Centralised charging would offer benefits including faster charging for vehicles and equal access to charging infrastructure for Gravity residents and for other local residents. Centralised infrastructure would also increase the flexibility and ability to incorporate future technological changes. It would also create an opportunity to be combined with other community uses and services and deliver a social service station. Other potential benefits could relate to reducing street clutter and maximising the flexibility for re-allocating parking in future.

7.4.5 The proposed EV charging provision for Gravity will be confirmed with the LDO development, and brought forward with a phase by phase approach, to allow flexibility and enable the incorporation of up-to-date technologies as different phases of the development come forward.

7.4.6 Decarbonising transport: a better, greener Britain, which is a plan published by the Government to decarbonise the entire transport system in the UK, states that hydrogen will play a role in a decarbonised transport system.

7.4.7 Hydrogen fuels can be incorporated through Gravity via hydrogen fuel cell buses and Heavy Goods Vehicles.

7.5 Smart Heat Network Opportunities

7.5.1 Heat networks have existed in many forms for centuries when early pioneers realised the potential of tapping into waste energy sources and distributing high temperature heat (<80 degrees) to various locations.

7.5.2 The starting point historically for heat networks was a source of excess/waste heat. Having undertaken a review of waste heat supply there are no sources of waste heat within 1km of the Site.

7.5.3 In the absence of sources of waste heat gas fired CHP energy centres could be delivered. An appraisal of gas CHP (**Section 6**) suggests these are not likely to be suitable due to the need to meet Building Regulations. Centralised biomass could also be delivered. Whilst there is a local supply chain of biomass, the scale of heat demand for Gravity (**Section 5**) would require access to a national supply chain for biomass. A detailed transport logistics assessment would be needed to understand further viability of delivering a site wide biomass heating strategy. It is not considered this would be the optimum energy solution for Gravity at this stage.

7.5.4 At this stage it is considered that a traditional high temperature heat network is unlikely to be suitable at Gravity.

7.6 Ambient Heat Network Opportunities

7.6.1 Ambient loop district heat networks are generally a heat pump led low temperature heating network system.

7.6.2 For Gravity there are opportunities related to the potential to capture waste heat sources from industrial activities and using these to distribute through a low temperature heat network to end users with low grade heat demand.

7.6.3 Typically, these systems consist of in-building heat pumps connected to a refrigerant free communal energy loop. A centralised low temperature heat store keeps this water loop maintained at a regulated temperature (circa 25°C). An integral unit is provided within each building unit which contains the heat pump technology and a hot water cylinder. The heat pump can be specified to provide heating only or heating and cooling.

7.6.4 At this stage of planning the end occupiers are not known and therefore the end energy demand is not known. Defining the need and scale of a district heat network is therefore not currently known.

7.6.5 The opportunity though to maximise sustainable heat supply still requires consideration. Gravity has undertaken early engagement with E.ON to look at this opportunity and define potential parameters through which a heat network may be delivered sustainably.

7.6.6 As noted in the Clean and Inclusive Growth Strategy, Gravity are engaged with Government on approaches to net zero. Through E.ON, Gravity are also currently engaging with the UK Government on delivering smart heating infrastructure.

7.6.7 Based on potential end users E.ON have established working parameters for an energy centre within the scheme that incorporates typical heat network infrastructure.

7.6.8 An innovation hub is also planned to be delivered as part of the E.ON site. Physical infrastructure such as potential stacks for emissions and cooling towers will need to consider the wider building massing for the development. The maximum parameters for any potential emissions from combustion infrastructure will be defined by environmental assessment process at the appropriate time.

7.7 Community Benefit

7.7.1 The scale of the investment into energy infrastructure will establish local benefits beyond the Site boundary of the development and the LDO.

7.7.2 The strategic shift away from the fossil fuel gas fired power plant to renewable energy investment and supply will support reducing the local carbon intensity of power.

7.7.3 The scale of renewable energy generation could potential mean Gravity is a net exporter of renewable energy. Gravity will work with our energy retail partners to ensure opportunities for local lower cost renewable energy tariffs are supported were possible. This will aim to support issues such a rural fuel poverty, decarbonisation of rural community and education in climate change.

7.7.4 The provision of renewable energy technology at Gravity will also aim to stimulate the local supply chain for technology providers, skills and contractors. This will ensure the green pound is spent locally keeping the investment within the local economy.

7.7.5 A key part of the digital strategy for Gravity will be establish data on energy use. This will support learning associated with energy use and where suitable provide information for local education and training facilities on courses relating to energy and climate change.

8 Summary of the Energy Framework

8.1 Introduction

8.1.1 The Energy Strategy has set the key principles for Gravity to deliver the energy hierarchy. Energy policy and technologies are evolving, and costs are changing constantly, therefore, the approach presented here may be superseded over time.

8.1.2 The options presented in this Energy Strategy are based upon current planning policy requirements and Building Regulations. As this is a large development that will progress over several years, the Energy Strategy needs to be flexible and able to respond to regulatory changes, market forces and technological advances.

8.1.3 The suitability of the various technologies should continue to be reviewed as the detailed design progresses. This is to ensure compatibility with detailed building designs and the mechanical and electricity strategy.

8.2 Clean and Inclusive Growth

8.2.1 This energy strategy supports Gravity's approach to delivering clean and inclusive growth. This includes delivering on the UK's Industrial Strategy's Energy Grand Challenge. The strategy sets Gravity's strategic objectives for energy into the context of the LDO.

8.3 A Conceptual Energy Framework for Gravity

8.3.1 A broad range of technologies are available that cover potential site wide energy delivery and building integrated opportunities.

8.3.2 Integrating these technologies requires consideration of the nature of energy demand (instantaneous demand, daily and monthly variations) in the first instance prior to selecting a technology.

8.3.3 At this stage a conceptual energy framework considering the spatial relationship between potential technologies and the spatial plans has been developed. This is provided in **Appendix F**.

8.4 Conclusions

8.4.1 Gravity is committed to delivering high standards of energy efficiency and has undertaken a series of pre-application consultations to develop a proposed approach that will enable the best Energy Strategy solutions to be delivered.

8.4.2 The LDO seeks to incorporate ambitious and progressive energy solutions to deliver significant carbon savings across Gravity. This includes:

- Option to connect to and deliver large scale energy supply to Gravity to attract international business through the National Grid infrastructure.
- Delivering high standards of energy efficiency within the Site. Gravity will create a low carbon campus generating between 4,000 and 7,500 green collar jobs, providing both a strategic economic stimulus to drive economic renewal, and shaping and connecting to a green supply chain across the UK. Home to international businesses, start-ups and SMEs, Gravity will be a home for clean growth and green industries, creating the space to innovate and create green solutions from energy solutions to smart homes and new smart mobility choices;

- In order to facilitate the opportunity for developing smart energy infrastructure and utilise the opportunity to capture locally generated offsite renewable energy, space has been made available for energy infrastructure. This is in the form of energy generation infrastructure, and the E.ON energy centre;
- Solar PV systems could be installed on suitable south facing roofs within Gravity. Frame-mounted systems can be used on flat roofs to optimise performance. Key buildings such as the large scale advanced manufacturing space, energy center, offices, car parks and homes could potentially accommodate roof-mounted PV arrays. This would deliver over 100MW of generation providing in excess of 100GWh of energy.
- The permeability of green spaces throughout Gravity, as well as the selection of layout and building location, will help to facilitate air movement and enhance natural ventilation;
- Charging hubs will be provided for Gravity service Electric Vehicles, commercial vehicles, residential homes, employees and visitors; and
- A further opportunity to incorporate low carbon and renewable energy and move towards achieving zero carbon status exists in the establishment of a smart grid associated with the Bridgwater Substation (BSP).

8.4.3 The Future Homes Standard is anticipated to come forward by 2025 and aims to “future-proof” new build homes with low carbon heating and high energy efficiency, However, it should be noted a Future Homes Fabric Standard has not yet been set by Government. Targets will be refined in accordance with the emerging National requirements at each stage of the LDO.

8.4.4 A series of design principles to increase energy efficiency has been considered through careful design. In accordance with the Energy Hierarchy, Gravity will seek to adopt a “fabric-first”[8] approach to building design (enhancing the performance of the components and materials that make up the building fabric itself, such as improving insulation and reducing cold bridging), before considering the use of mechanical or electrical services systems and renewable/low carbon technologies.

8.4.5 This Energy Strategy has identified a number of opportunities for incorporating renewable and low carbon energy generation technologies.

8.4.6 A review of the suitability of various renewable and low carbon technologies for the Site has been undertaken, at both a ‘multi-plot’ level and ‘building-specific’ level, to identify a ‘suite’ of technologies that could potentially be deployed at Gravity.

8.4.7 A further opportunity to incorporate low carbon and renewable energy exists in the establishment of a smart grid associated with the surrounding renewable energy landscape. This would provide the opportunity to capture and distribute power generated externally from the LDO boundary within the development. A review of near site renewable energy generation has indicated that solar development could potentially be feasible near to the Site and directly connect into the Bridgwater Substation, subject to further investigation and viability appraisal.

8.4.8 There is a ‘suite’ of ‘building-specific’ technologies that could potentially be deployed at Gravity. At this stage, the most suitable technologies are anticipated to be photovoltaic solar panels (PV), heat recovery technology, solar water heating systems (or solar thermal) and air source heat pumps.

[8] For the avoidance of doubt, in this application the approach described as “Fabric First” will look to achieve a Fabric Energy Efficiency Standard (FEES) of the 2025 Future Homes Standard when defined or as a minimum 46kwh/m2/yr.

8.4.9 Subject to further investigation, there may be potential for small-scale ground source heating solutions serving individual or small collections of buildings and small/medium scale wind turbines (e.g. in less sensitive areas such as employment zones).

8.4.10 The use of on plot generation will be integrated into the wider projects ability to deliver a smart grid. This will be based on using active network management and connecting the energy solutions deployed at Gravity with existing and potential future local renewable energy solar arrays, where appropriate and viable.

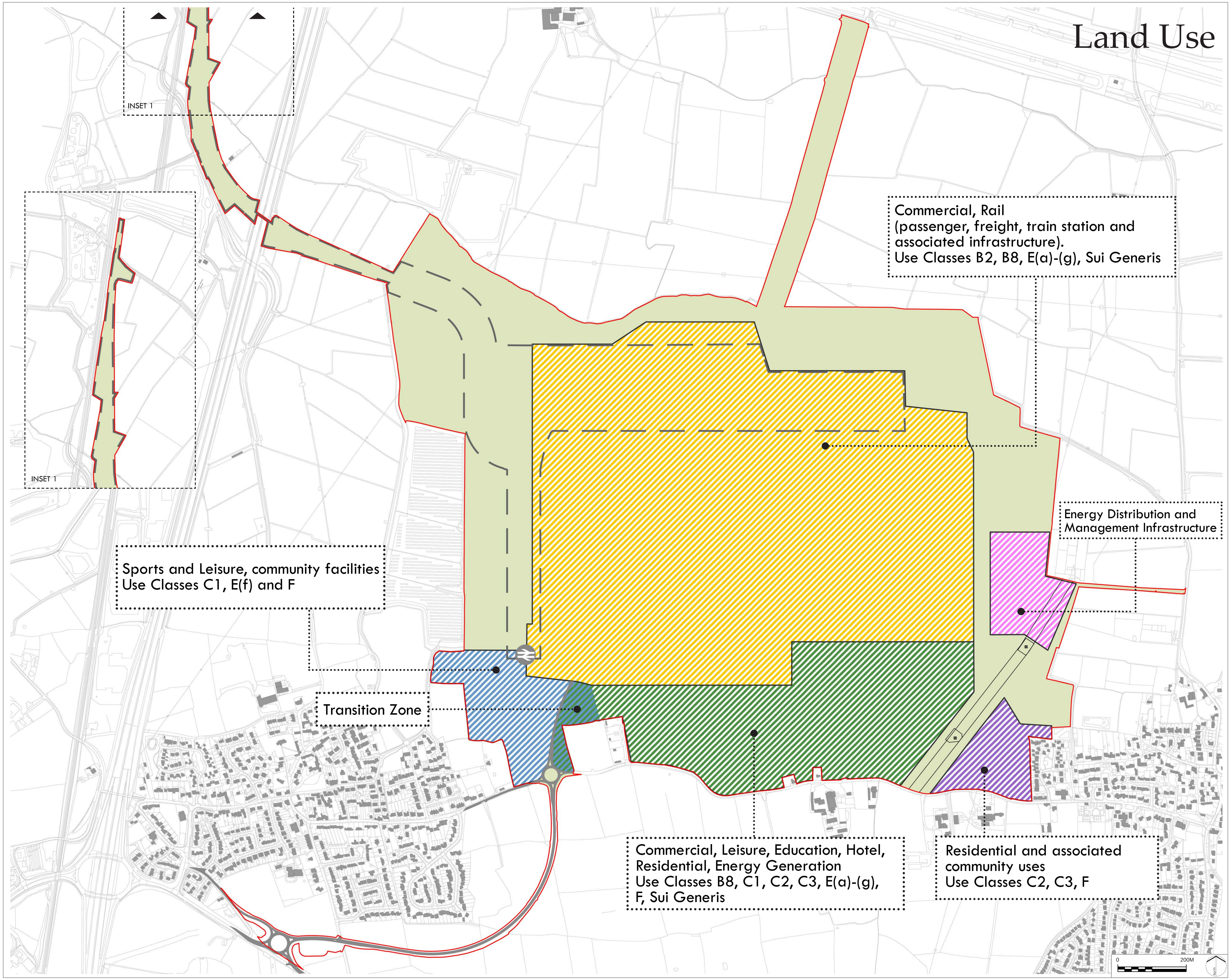
8.4.11 Compliance with the energy and CO_2 targets will be demonstrated through full Standard Assessment Procedure calculations for Building Control at the next detailed LDO compliance stage for each occupier.

8.5 Energy and the LDO

8.5.1 The Energy Strategy will be updated at each application for compliance against the LDO. This will be to ensure that the flexibility that this strategy defines is refined towards detailed building design, infrastructure delivery, and onward site management.

8.5.2 At each reserved matters stage an energy strategy will be presented which will provide an update to the progression of investments into energy efficiency, smart grid and energy demand of the defined occupants.

Appendix A Land Use Parameter Plan



LEGEND

- LDO Boundary
- Commercial, Rail (passenger, freight, train station and associated infrastructure). Use Classes B2, B8, E(a)-(g), Sui Generis
- Energy Distribution and Management Infrastructure
- Residential and associated community uses Use Classes C2, C3, F
- Commercial, Leisure, Education, Hotel, Residential, Energy Generation Use Classes B8, C1, C2, C3, E(a)-(g), F, Sui Generis
- Sports and Leisure, community facilities Use Classes C1, E(f) and F
- Transition Zone
- Open space and biodiversity zones Including surface water attenuation features, watercourses, woodland, hedgerows and trees, utilities, occasional vehicular routes and rail line with associated infrastructure.
- Rail corridor - Freight and Passenger, and associated infrastructure
- Passenger Station (indicative location)

REV.	DESCRIPTION	APP.	DATE
L	Changes to title block	RF	08.09.21
K	Key updated	RF	25.08.21
J	Key updated	RF	16.08.21
I	Key updated	RF	16.08.21
H	Key updated	RF	16.08.21
G	Uses zones updated	RF	13.08.21
F	Key updated and train station logo relocated	RF	13.08.21
E	Key updated following comments from JH	RF	08.06.21
D	Key updated following comments from CP	RF	04.06.21
C	Rail corridor; plan inset	RF	03.06.21
B	Use classes	RF	24.05.21
A	Format of key amended	RF	24.05.21
-	First Issue	RF	21.05.21

LDĀ DESIGN

PROJECT TITLE
GRAVITY

DRAWING TITLE
PARAMETER PLAN
Land Uses

ISSUED BY	Exeter	T: 01392 260430	
DATE	May 2021	DRAWN	KS/DA
SCALE@A1	1:5,000	CHECKED	RF
STATUS	LDO	APPROVED	FO

DWG. NO. 6599_PP201L

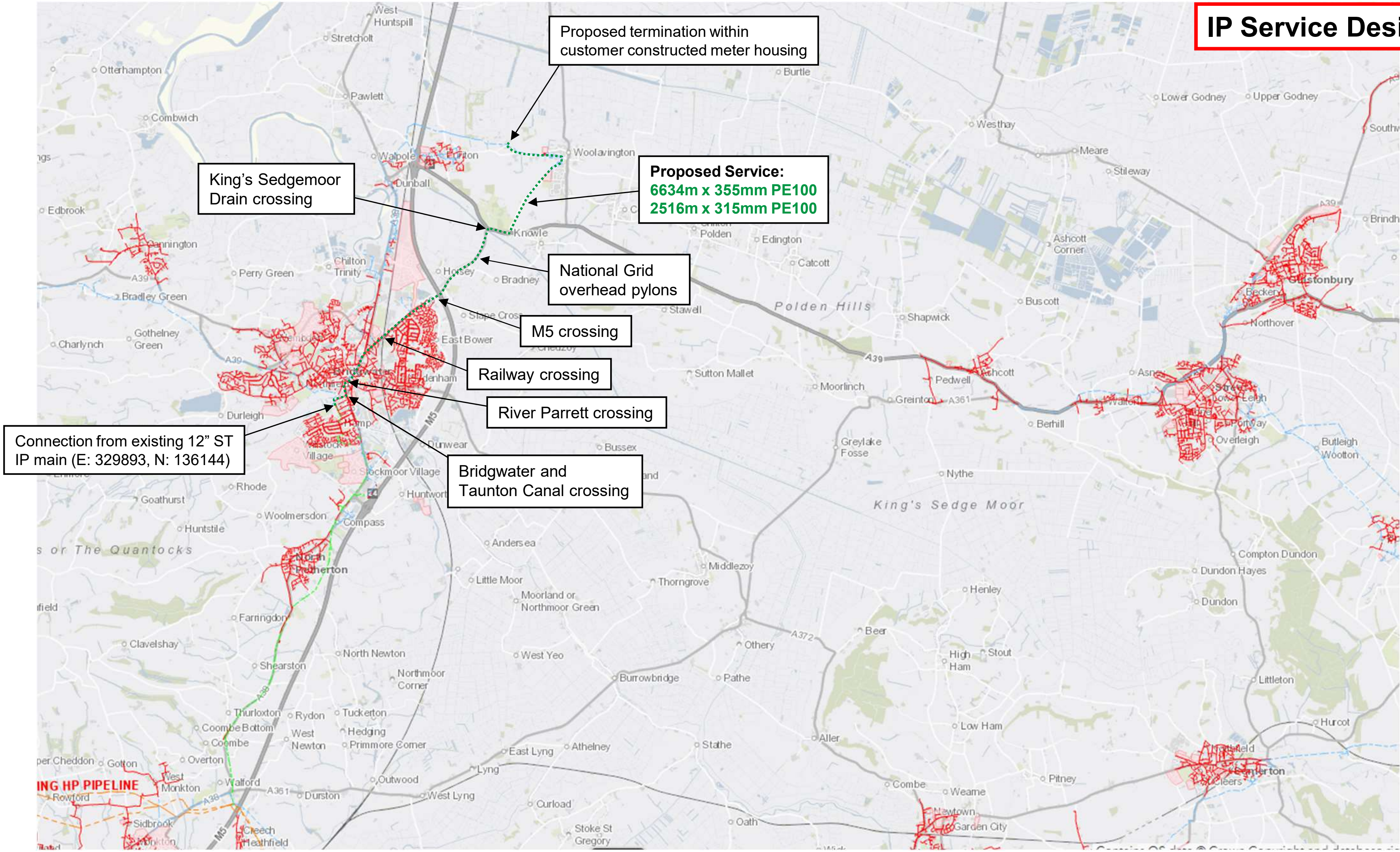
No dimensions are to be scaled from this drawing.
All dimensions are to be checked on site.
Area measurements for indicative purposes only.

Sources: Ordnance Survey

v2018.0

Appendix B Utility Infrastructure Plan

IP Service Design



WALES&WEST UTILITIES

ArcIMS 9.2

- Low Pressure (LP) 21mbar – 75mbar
- Medium Pressure (MP) 350mbar – 2bar
- Intermediate Pressure (IP) 2bar – 7bar
- High Pressure (HP) >7bar
- Line/Fire Valve
- Governor Station
- Change of Diameter
- End Cap

Document Version: CONN_LF_WW_233

35062212: Gravity, Woolavington Road, Puriton, Bridgwater, TA7 8AD.

Date:	14/06/21
Designer:	Michael Vagg
Number:	Not to Scale
Drawing Number:	One of One
Grid Reference:	333888 142952

Stage 1 Reinforcement

WALES&WEST UTILITIES

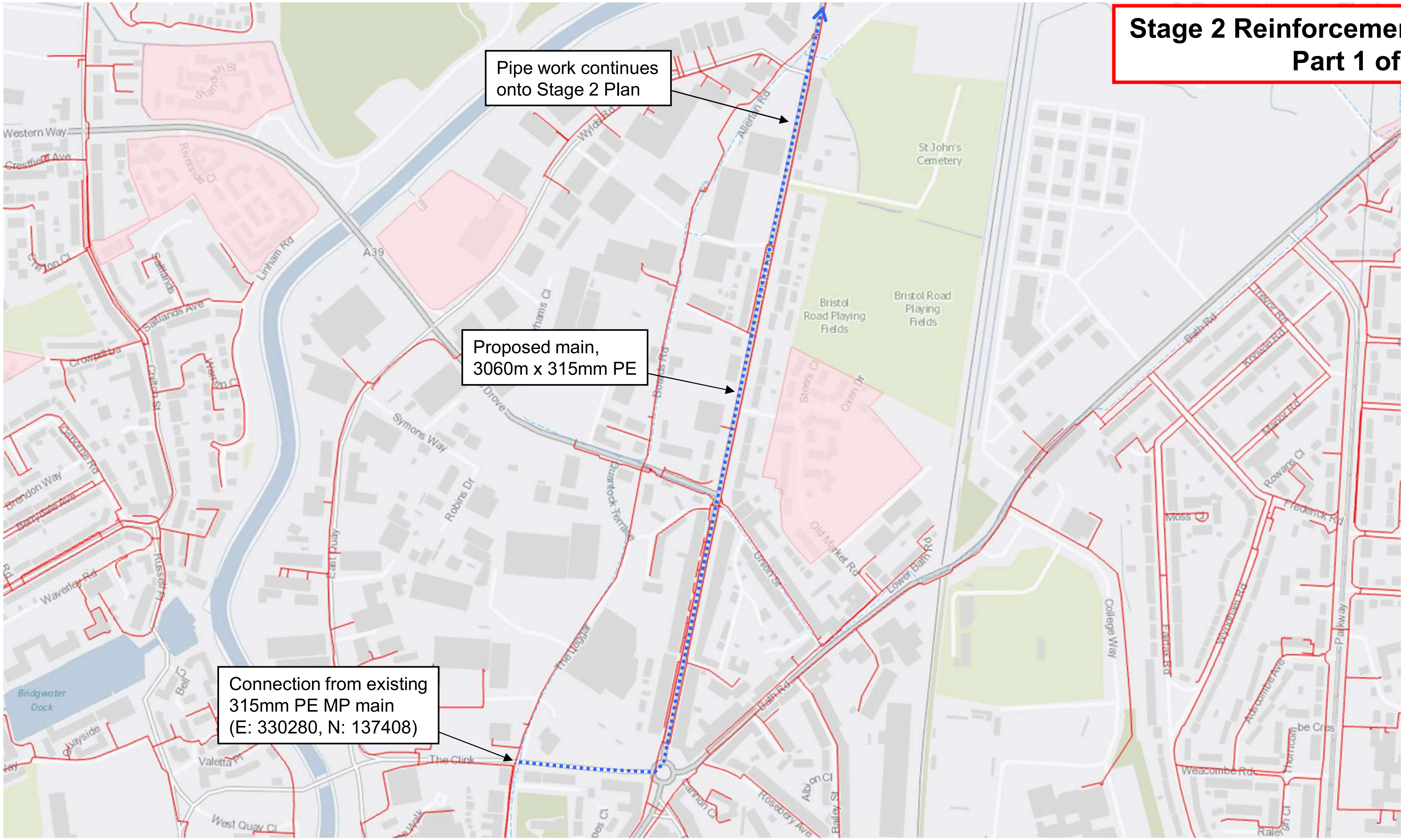
ArcIMS 9.2

Low Pressure (LP) 21mbar – 75mbar	
Medium Pressure (MP) 350mbar – 2bar	
Intermediate Pressure (IP) 2bar – 7bar	
High Pressure (HP) >7bar	
Line/Fire Valve	
Governor Station	
Change of Diameter	
End Cap	

Document Version: CONN_LF_WW_233

35062212: Gravity, Woolavington Road, Puriton, Bridgwater, TA7 8AD.

Date:	14/06/21
Designer:	Michael Vagg
Number:	Not to Scale
Drawing Number:	One of Four
Grid Reference:	333888 142952



WALES&WEST UTILITIES

ArcIMS 9.2

The plan shows those pipes owned by Wales & West Utilities or the relevant Gas Distribution Network in their roles as Licenced Gas Transporters (GT). Gas Pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Wales & West Utilities, the relevant Gas Distribution Network, or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site and before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contactors) working for you or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

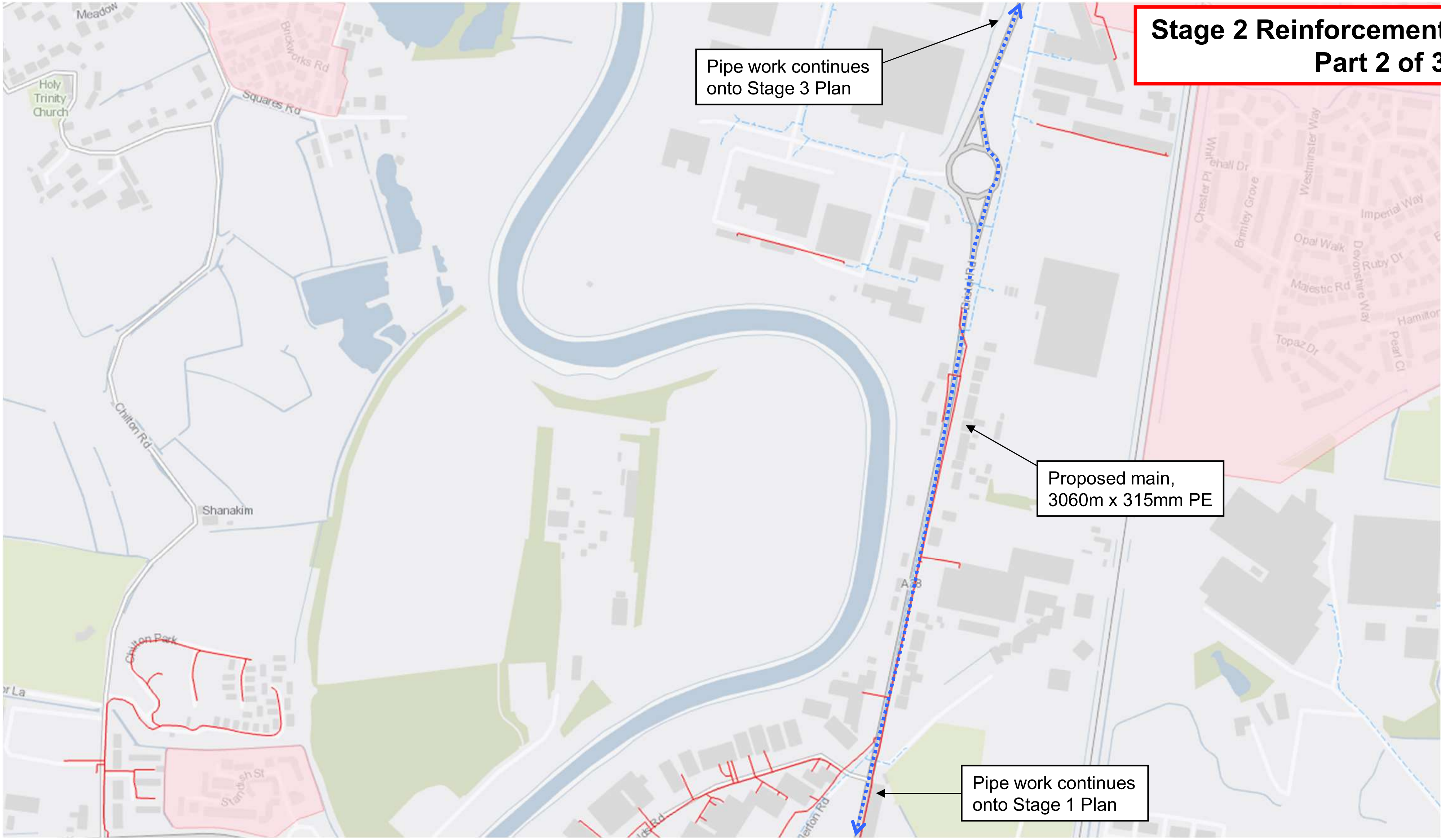
- Low Pressure (LP) 21mbar – 75mbar
- Medium Pressure (MP) 350mbar – 2bar
- Intermediate Pressure (IP) 2bar – 7bar
- High Pressure (HP) >7bar
- Line/Fire Valve
- Governor Station
- Change of Diameter
- End Cap

Document Version: CONN_LF_WW_233

35062212: Gravity, Woolavington Road, Puriton, Bridgwater, TA7 8AD.

Date:	14/06/21
Designer:	Michael Vagg
Number:	Not to Scale
Drawing Number:	Two of Four
Grid Reference:	333888 142952

Stage 2 Reinforcement Part 2 of 3



WALES&WEST UTILITIES

ArcIMS 9.2

Legend
Low Pressure (LP) 21mbar – 75mbar
Medium Pressure (MP) 350mbar – 2bar
Intermediate Pressure (IP) 2bar – 7bar
High Pressure (HP) >7bar
Line/Fire Valve
Governor Station
Change of Diameter
End Cap

Document Version: CONN_LF_WW_233

35062212: Gravity, Woolavington Road, Puriton, Bridgwater, TA7 8AD.

Date:	14/06/21
Designer:	Michael Vagg
Number:	Not to Scale
Drawing Number:	Three of Four
Grid Reference:	333888 142952

Stage 2 Reinforcement
Part 3 of 3

WALES&WEST UTILITIES

ArcIMS 9.2

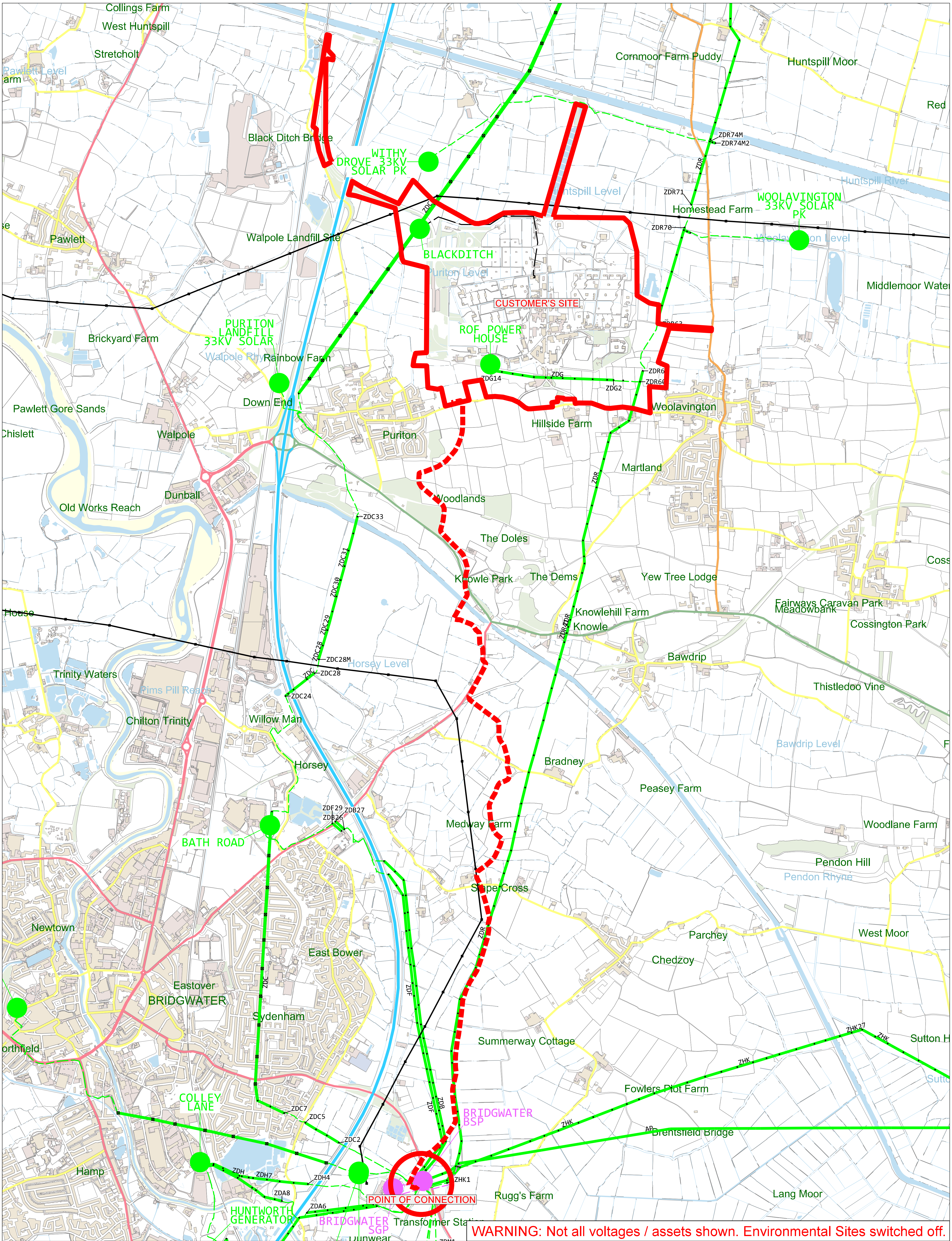
Low Pressure (LP) 21mbar – 75mbar	
Medium Pressure (MP) 350mbar – 2bar	
Intermediate Pressure (IP) 2bar – 7bar	
High Pressure (HP) >7bar	
Line/Fire Valve	
Governor Station	
Change of Diameter	
End Cap	

Document Version: CONN_LF_WW_233

35062212: Gravity, Woolavington Road, Puriton, Bridgwater, TA7 8AD.

Date:	14/06/21
Designer:	Michael Vagg
Number:	Not to Scale
Drawing Number:	Four of Four
Grid Reference:	333888 142952

PLEASE NOTE: This plan ONLY shows assets owned by Western Power Distribution. Electricity assets owned by IDNO's (Independent Network Operators) MAY be present in this area. Information is given as a guide only and it's accuracy cannot be guaranteed.
CARE SHOULD BE EXERCISED TO ENSURE THE PRECISE POSITION OF THE WPD APPARATUS IF WORK IS TO BE EXECUTED IN ITS VICINITY. If in doubt, contact your local WPD office.



TOWER	SWITCH PM	PM SUB	33KV SITE
POLE	FUSE/LINK PM	GM SUB	66KV SITE
	TARGET 60	MASTER SITE	132KV SITE

11kV OH ROUTE 3 PH	66kV OH ROUTE	PRIVATE OH ROUTE
11kV OH ROUTE NON - 3 PH	66kV UG ROUTE	NOT COMMISSIONED OH ROUTE
11kV UG ROUTE	132kV OH ROUTE	NATIONAL GRID OH ROUTE
25/33kV OH ROUTE	132kV UG ROUTE	* LV ASSETS NOT SHOWN IN SMALLSCALE MAPPING *
25/33kV UG ROUTE		

Title:

Scale 1:25000 @ A3

Plot Centre: 332926.251,139692.822

Date: 18/11/2020

WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

Appendix C Policy Summary

National Policy Context – Climate Change

Climate change is recognised as one of the most immediate global environmental challenges. In May 2019, the Committee on Climate Change published the Net Zero report, recommending that the UK Government introduce a target of at least a 100% reduction of greenhouse gas (GHG) emissions by 2050.

In 2019, the Climate Change Act (CCA) 2008 was amended to include a revision of the previous aim of 80% reduction of GHG emissions compared to 1990 levels by 2050. The CCA 2008 now mandates: "*the net UK carbon account for the year 2050 is at least 100% lower than the 1990 baseline*."

The UK Government's international commitment (transposed into national and local planning policy) has sought to reduce CO_2 emissions associated with new buildings through energy demand reduction and the incorporation of low and zero carbon technologies to deliver electricity and heat.

National Planning Policy Framework (2019)

The National Planning Policy Framework (NPPF) (2019) supports the role of the local plan process and maintained the "presumption in favour of sustainable development". Paragraphs 148-154 of the NPPF explain that the planning system should help to: "*shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure*".

Plans should take a proactive approach to mitigating and adapting to climate change and should be planned for in ways that:

- Can help to reduce greenhouse gas emissions, such as through its location, orientation and design; and
- Provide a positive strategy for renewable and low carbon energy sources, that maximises the potential for sustainable development, while ensuring that adverse impacts are addressed satisfactorily as well as identify suitable areas for renewable and low carbon energy sources, and opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems.

When determining planning applications, local planning authorities should expect new development to comply with any development plan policies on local requirements for decentralised energy supply. When setting any described standards and take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

National Building Regulations – Part L (Conservation of Fuel and Power)

The UK's international commitments are also transposed into the national Building Regulations. The energy efficiency requirements of the Building Regulations are set out in Part L (Conservation of Fuel and Power). Part L is subject to 'step changes', becoming increasingly stringent as new revisions are adopted.

New development is encouraged to reduce carbon emissions in accordance with the energy hierarchy of reducing energy demands in the first instance, supplying energy efficiently, and finally the provision of appropriate renewable and low carbon energy technologies.

Current

Approved Documents L1A and L2A set out the requirements for conservation of fuel and power in dwellings and non-domestic buildings respectively.

The current edition of L1A 2013[9] came into effect on 6 April 2014. This strengthens the requirements of Part L1A to deliver 6% carbon savings across the new homes build mix relative to Part L 2010 and introduced a Fabric Energy Efficiency (FEE) target to encourage a minimum efficiency for building fabric (the longest-lasting part of a dwelling).

The current edition of Building Regulations Part L2A 2013 came into effect on 6 April 2014 and included the following main changes:

- Strengthening of the requirement of Part L2A to deliver 9% carbon savings across the new non-domestic building mix relative to Part L 2010; and

- A wider set of notional buildings has now been defined for top-lit (heated only) and side-lit (heated and cooled) buildings, as well as the notional building air permeability has been further subdivided by size.

In their Productivity Plan[10], the Treasury confirmed that the scheduled changes to Part L of the Building Regulations in 2016 would not go ahead. As such, it did not proceed with the previously proposed increase in on-site energy efficiency standards, Zero Carbon Homes or the Allowable Solutions carbon offsetting scheme.

Therefore, the national energy target for Gravity currently is Part L of the Building Regulations 2013. This is subject to changes in the national Building Regulations.

Emerging

In October 2019, the UK Government began a consultation on a proposed uplift to the energy efficiency requirements defined in the Building Regulations Part L, with the aim of implementing these changes by 2020, and a Future Homes Standard (FHS) for 2025[11]. The consultation closed on 7 February 2020 and the Government is currently considering responses.

The consultation document (October 2019) set out two options to uplift energy efficiency standards and requirements in 2020 (now envisaged to be 2021):

- Option 1 (‘Future Homes Fabric’) – a 20% reduction in CO2 from dwellings compared to the current standards delivered primarily through very high fabric standards (the same fabric standard as anticipated for the FHS).

- Option 2 (‘Fabric plus technology’) – a 31% reduction in CO2 from dwellings compared to the current standards delivered through a combination of an increase in fabric standards (though not as high as for Option 1) and technology.

The consultation also set out what a home built to the FHS is likely to be like. It states:

“We expect that an average home built to [the Future Homes Standard] will have 75-80% less carbon emissions than one built to the current energy efficiency requirements (Approved

[9] Conservation of fuel and power: Approved Document L, available online at: https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

[10] HM Treasury (July 2015) Fixing the foundations: Creating a more prosperous nation, available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443897/Productivity_Plan_print.pdf

[11] Ministry of Housing, Communities and Local Government (October 2019) The Future Homes Standard: changes to Part L and Part F of the Building Regulations for new dwellings (online) available at: https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings (accessed 11.03.2020)

Document L 2013). We expect this will be achieved through very high fabric standards and a low carbon heating system. This means a new home built to the Future Homes Standard might have a heat pump, triple glazing and standards for walls, floors and roofs that significantly limit any heat loss."

The FHS will build on the Prime Minister's Industrial Strategy Grand Challenge mission to at least halve the energy use of new buildings by 2030.

At the time of writing this Strategy, formal metrics and standards have not been confirmed.

In his Spring Statement 2019, the former Chancellor Philip Hammond announced that from 2025 the end of fossil-fuel heating systems in all new homes would be mandated (though this has yet to be adopted as official policy). In December 2020 the Government announced plans to consult on whether it is appropriate to end gas grid connections to new homes being built from 2025, in favour of clean energy alternatives.

It is also anticipated that the carbon emissions factors used in Part L calculations (i.e. the Standard Assessment Procedure, SAP) will change as the grid decarbonises. In particular, the carbon emission factor used for grid-supplied electricity will be reduced in the new Part L 2020 as it needs to consider decarbonisation of the grid (a circa 55% reduction from 0.519 kgCO2/kWh to 0.233 kgCO2/kWh is anticipated).

This change is expected to see a shift from gas-led heating strategies in new buildings that have to achieve significant carbon savings, to electric-led strategies using technologies such as heat pumps and heat recovery systems over gas-fired plant. Furthermore, technologies generating on-site electricity (such as gas-engine CHP and photovoltaics) will not achieve the carbon savings they have to date (because they are offsetting less 'carbon' as the grid decarbonises).

The Future Homes Standard: 2019 Consultation on changes to Part L and Part F of the Building Regulations for new dwellings (January 2021)

In January 2021, the FHS 2019 consultation outcomes were published to reflect the potential changes to Part L (Conservation of fuel and power) and Part F (Ventilation) of the Building Regulations for new dwellings. It confirms that, from 2025, the FHS will deliver homes that are 'zero-carbon ready' by setting a performance standard at a level which new homes will not be built with fossil fuel heating (i.e. natural gas boilers).

In addition, homes will be future proofed with low carbon heating and high levels of energy efficiency. As the electricity grid continues to decarbonise, it is deemed that no further energy efficiency retrofit work will be necessary to become zero-carbon. The technical specification of the FHS will be consulted on in 2023. The necessary legislation will be introduced in 2024 and implemented in 2025.

The FHS 2019 consultation paper also confirms that in 2021 the interim uplift in Part L standards will be introduced, delivering a meaningful reduction in carbon emissions. These homes will be expected to produce 31% less CO_2 emissions compared to current standards (i.e. option 2 above).

Energy White Paper

The Government's Energy White Paper, published in December 2020, brings together a series of disparate and as yet unaligned sectors including transport, new homes, power generation and industrial growth under one common theme: Energy.

Rather than focussing on the energy sector alone, the white paper aims to set out how energy, and the move towards a net-zero carbon economy, will play a critical role in enabling interdependent infrastructure and post-COVID economic growth. It is critical to the levelling up agenda.

Specifically relating to housing growth the White Paper continues to set out the delivering of the FHS by 2025 has the mechanism for delivering zero carbon ready homes. It also notes that consultation on new energy performance of non-domestic buildings will be undertaken in due course.

The White Paper also sets out the Government's plan to consult on whether it is appropriate to end gas grid connections to new homes being built from 2025, in favour of clean energy alternatives.

Electrification of Cars

Vehicle electrification has been rising in the Government's agenda over recent years, as electric vehicles (EVs) play a key role in delivering the zero emissions strategy[12] and in proliferating power intensive EV charging infrastructure. The Government has set a national UK goal to "*be a world leader in the development, manufacture and use of zero emission vehicles… [and] in the design, development and manufacture of batteries*." Over the years, this target was supported by additional sales restrictions including:

- Following the Paris COP21 conference, in 2015, the Government set a national target to "*ensure almost every car and van is a zero emissions vehicle by 2050*."[13]
- In May 2018, the Prime Minister announced a further target for 2040, that all new cars and vans should be "*effectively zero emissions*."[14]
- In July 2018, the Road to Zero Strategy set an aspiration for "*at least 50%, as many as 70% of new car sales and up to 40% of new van sales being ultra-low emission by 2030*."[15]
- Following consultation with stakeholders, industry and the wider public, a 2-phased approach to the process was announced in November 2020[16];
  - Step 1 will see the phase-out date for the sale of new petrol and diesel cars and vans brought forward to 2030.
  - Step 2 will see all new cars and vans be fully zero emission at the tailpipe from 2035.

In July 2019, the Government held a consultation on the building regulations for EV charge points in residential and non-residential buildings and published several proposals to alter the building regulations to include EV infrastructure requirements.[17]

For new residential buildings, the Government proposes "*a requirement of a charge point in every new home with an associated parking space… the charge points must have a minimum*

[12] https://www.gov.uk/government/news/government-launches-road-to-zero-strategy-to-lead-the-world-in-zero-emission-vehicle-technology

[13] https://www.gov.uk/government/news/uk-government-pledges-bold-ambition-for-electric-cars

[14] https://www.gov.uk/government/speeches/pm-speech-on-science-and-modern-industrial-strategy-21-may-2018

[15] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf

[16] https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030

[17] https://www.gov.uk/government/consultations/electric-vehicle-chargepoints-in-residential-and-non-residential-buildings

power rating output of 7kW". This may be subject to an appropriate exemption based on the grid connection cost, with a proposed "*threshold for exemption set at £3,600 which is three times the high scenario cost of the average electrical capacity connection required for one charge point*".

For new non-residential buildings, the Government proposes "*a requirement for new non-residential buildings… with more than 10 parking spaces to have at least one charge point and cabling routes for one in five spaces*". This is in line with the Energy Performance of Buildings (EPBD) requirement.

The outcome of the consultation is awaited (timescales have not been confirmed).

Somerset Climate Emergency Strategy

The Climate Emergency Strategy for Somerset is built around the following 3 Goals:

GOAL 1 To decarbonise Local Authorities, the wider public sector estates and reduce our carbon footprint;

GOAL 2 To work towards making Somerset a Carbon Neutral County by 2030; and

GOAL 3 To have a Somerset which is prepared for, and resilient to, the impacts of Climate Change.

The Strategy sets out the evidence of how our climate is changing, the impacts Climate Change will have at a global, national and local level and outlines the many challenges Somerset faces, and the measures and opportunities Somerset must take to enable us all to adapt and thrive in the future.

Local Planning Policy

The Sedgemoor Development Plan is made up of the Sedgemoor Local Plan 2011-2032 and a suite of Supplementary Planning Documents (SPDs) and other adopted strategies and guidance. The Sedgemoor Local Plan sets out the policy framework for future development in the District, including provision of housing, employment, retail and other facilities and infrastructure. It was adopted in February 2019. It therefore forms part of the development plan for the District and is a main consideration in the determination of planning applications.

The Local Plan relates to the whole District and provides a strategy for delivering growth up to 2032. Below the Local Plan sit a number of adopted SPDs, including an SPD relating to the Site itself, strategies (including the Sedgemoor Transport Investment Strategy 2050, for example) and guidance. The Local Plan and pertinent associated considerations for Gravity are set out below.

Local Plan 2011-2032

Policy B1 supports and protects the transformational projects set out within the Bridgwater Vision with the Gravity site specifically mentioned as one of those projects under the 'Local Projects' banner.

S4 Sustainable Development Principles – "Development proposals will be supported where they contribute to meeting the relevant following objectives:

- *Mitigating the causes of climate change and adapting to those impacts that are unavoidable*

- *Minimising the impact on natural resources, avoiding pollution and incorporating the principles of sustainable construction to contribute to energy efficiency, renewable energy, waste reduction and recycling, the use of sustainably sourced materials, sustainable drainage, reduced water use, water quality and soil protection*".

S5 Mitigating the Causes and Adapting to the Effects of Climate Change – "Development should contribute to both mitigating and adapting to climate change and to meet targets to reduce carbon dioxide emissions. Development should seek to reduce greenhouse gas emissions and contribute to mitigating the causes of climate change. Proposals for zero carbon development will be strongly supported. Development should contribute to all of the relevant following objectives:

- *Minimising of natural resources by the use of sustainably sourced materials;*
- *Minimising of greenhouse gas emissions;*
- *Incorporating energy efficiency;*
- *Utilising renewable and low carbon energy (including decentralised energy) where appropriate, taking into account the need to safeguard amenity, the natural, built and historic environment, and landscape*".

Development should adapt to the effects of climate change by contributing to all of the relevant following objectives:

- "*Maximising resilience to climate change through design, layout and construction;*
- *Providing additional measures through natural shade and cooling in the built environment and the provision of networks of green infrastructure and tree planting to compensate for CO2 emissions*".

D3 Sustainability and Energy in Development – "New buildings and converted buildings will be encouraged to be supplied by renewable (or low carbon) energy, having regard to the type of development involved, its design and whether it is feasible or viable".

D4 Renewable or Low Carbon Energy and Heat Generation projects – "The Council will support projects that maximise the generation of energy and heat from renewable or low carbon sources, including solar, waste".

Puriton Energy Park SPD

In order to elaborate and provide greater detail on policies within the Core Strategy relating to the 'Energy Park', SDC produced the Puriton Energy Park SPD and adopted it in March 2012.

The SPD provided a framework for assessing planning applications for the Site and focused on the main development objectives required to deliver the Energy Park. The SPD was informed by technical studies to gain an understanding of site constraints and opportunities. The SPD is clear to stress that it does not set out full details of how the Site will be redeveloped, for example detailed building plans, road layouts and known end users. Instead it sets out high level parameters against which detailed schemes submitted to SDC as planning applications will need to be assessed.

The SPD is therefore described as high-level planning tool that sets out the important requirements and considerations that should be borne in mind when preparing planning applications. Importantly, the SPD clearly states that it does not set out what the Site will ultimately look like or who will occupy it, which it states is the role of subsequent planning applications.

The SPD provides a more detailed account of potential uses that could be accommodated within the Energy Park. This list is not exhaustive and instead serves to demonstrate what uses would be appropriate having regard to the Energy Park concept and the specific attributes of the Site. It suggest that energy production in Site could be in the form of major power generation (such as CHP or energy recovery) or secondary power generation (including microgeneration, for example biomass and wood fuel heating, small scale wind turbines and photovoltaic cells on individual buildings as well as opportunities for solar energy cultivation on the perimeters of the Site).

Since 2012, much has changed in terms of the national policy and political context, with a new Framework, a stronger focus on Enterprise Zone (EZ) delivery, Industrial Strategy and Clean Growth. The SPD is therefore somewhat outdated in places, however, does provide some valuable input in terms of design principles.

Specifically, Design Principle 4: Sustainability states that "*Workplaces that contribute to the achievement of sustainable development by minimising energy use through design, both during construction and in occupation".*

Bridgwater Vision

In 2009, SDC, working alongside a range of partners, published the first iteration of the Bridgwater Vision. The aim of the Bridgwater Vision was to develop a ‘spatial’ vision for Bridgwater in order to bring about place transformation and help to create distinctiveness with a re-vitalised image and economic base, effectively repositioning the town over the subsequent 50-year period to 2060. The Vision for Bridgwater set out in the Bridgwater Vision explains that *‘In 2060 Bridgwater will be an energy conscious town known for its ambitious approach to sustainability and low carbon living. Bridgwater will be seen as a place that has been re-energised into a confident town…’.*

This first iteration of the Bridgwater Vision describes the Gravity site as one of the key character areas of focus to deliver that Vision. It explains that the Gravity site will be a significant employment area linked to a renewable, low carbon energy source. It continues to describe that the employment area would benefit from on-site rail links, a bespoke travel plan service for workers from Bridgwater town centre and the promotion of cycle tracks and footpaths through the Site providing links to Puriton, Woolavington and Bridgwater, encouraging greater use of non-vehicular transport modes.

In 2015 the Bridgwater Vision was refreshed to provide an update on the successes delivered in over the intervening 6-year period. Gravity continued to be identified as a priority, maintaining detail on SDC’s ambitions for the Site, although it did state that at that point there was significant uncertainty about the future of this site. The concept of Huntspill Energy Park was described, and the Vision anticipated it could be a significant employment development for B1 and B2 energy related uses for the town linked to a renewable low carbon energy source. The refreshed Vision explained that the then owner, BAE Systems, was considering initial ideas for potential energy uses, but that the Site could also provide a unique opportunity to the support services and industries related to a new generation of nuclear investment, possibly to accommodate foreign direct investment to supply components. Again, housing on the Site, or in its wider locale, was also considered dependent on the long-term future of the Site.

Both iterations of the Bridgwater Vision were adopted as a material consideration in the planning process and the transformational / priority schemes identified within it are directly referenced in the Local Plan.

A section named **Sustainable and Vibrant** states that the “*region will be an environmentally conscious, vibrant and contemporary town based on sustainable growth. Bridgwater is to become an exemplar for sustainable and contemporary development through a continued demonstration of innovative and environmentally conscious design. Further integration of* *energy generation, green infrastructure, air quality improvements, sustainable transport and flood prevention measures into growth and development will ensure that Bridgwater is resilient and able to adapt to climate and economic change*".

Appendix D Predicted Energy Demand Model

Project Name: Gravity
Project No: 49102
Consultant: JR

Masterplan Energy Model: Data Report

This data report provides a summary of the masterplan energy model and its results. These results are provided in line with the recommendations presented in the main body of the report and the limitations provided below.

Key Performance Indicators and Assumptions

Commercial and Industrial Use Class

Data References

Energy Efficiency in Buildings CIBSE Guide F 2016
BSRIA Rules of Thumb Fourth Edition 2018
Stantec Industry Experience 2021
BCO Guide to Specification 2018

Methodology

The benchmark data from the above references have been used to create Building Regulation 2016 compliance. Predicted energy demand reduction is based on efficiency in water and space heating only to meet the prevailing policy changes.

Additional carbon emission reductions required to meet standards for Building Regulations 2021 have been established through Stantec's knowledge of M&E and Structural Engineering and guidance presented by the BCO.

Unregulated energy demand has not been adjusted to reflect changes in demand use since 2016. Our assumption is that whilst appliances contributing to the unregulated demand continue to have improved efficiencies and lower energy requirements, more appliances and technologies are being bought and used, hence displacing the carbon emission savings achieved.

Each commercial use class has been subdivided into a use typology to provide a range of different use scenarios. High street and local centres have taken data from a range of end uses to provide an average energy demand for the use class.

Domestic Use Classes

Data References

The Government's Standard Assessment Procedure for Energy Rating of Dwellings 2016 edition
Government's Response to Future Homes Standard February 2021
BSRIA Rules of Thumb Fourth Edition 2003
Energy Efficiency in Buildings CIBSE Guide F 2016
BRE Domestic Energy Model (BREDEM 8 &12)

Methodology

The baseline regulated energy demands for domestic use classes were primarily calculated using the methodology as set out in The Government's Standard Assessment Procedure (SAP). The baseline unregulated energy demand however was calculated using the methodology set out in BREDEM. These methodologies enabled a 2016 baseline to be calculated for domestic units directly.

In order to calculate the predicted energy demand for 2021 and 2025 SAP models were developed in line with the fabric standards defined within the Governments 2021 Future Home Standard. Emission scenario are taken from SAP 10 and Treasuries Green Book Guide and BEIS Future Grid Projections. The unregulated energy demand for residential units was assumed to remain the same as the baseline for the reasons stated above, which follows the BREDEM approach to calculating unregulated supply. Technology selection is based on gas boiler efficiencies of 85%, electric heating 100% and ASHP with CoP 2.5:1.

Description	Quantity	Total Area (m2)	Total Predicted Energy Demand (MWh)					Total CO2 Emissions (Tonnes)			
			Hot Water	Space HTG	Reg Elec	Unreg Elec	Total	Heating	Reg. Electric	Unreg. Electric	Total
Residential											
Phase 1	750	70,450	1,251	2,976	337	2,347	6,911	1,050	175	1,218	2,443
Subtotal	**750**	**70,450**	**1,251**	**2,976**	**337**	**2,347**	**6,911**	**1,050**	**175**	**1,218**	**2,443**
Non- Residential											
Phase 1	16	1,100,000	51,833	192,348	21,171	20,105	285,457	52,743	10,988	10,434	74,166
Subtotal	**16**	**1,100,000**	**51,833**	**192,348**	**21,171**	**20,105**	**285,457**	**52,743**	**10,988**	**10,434**	**74,166**
GRAND TOTAL	**766**	**1,170,450**	**53,084**	**195,324**	**21,508**	**22,452**	**292,368**	**53,793**	**11,163**	**11,653**	**76,608**

Residential	**Average DFEE kwh/m2**	**59.99439**

RESULTS: Predicted energy demand

Description	Quantity	Total Area (m2)	Total Predicted Energy Demand (MWh)					Total CO2 Emissions (Tonnes)			
			Hot Water	Space HTG	Reg Elec	Unreg Elec	Total	Heating	Reg. Electric	Unreg. Electric	Total
Residential											
Residential	750	70,450	1,101	2,076	281	2,347	5,805	47	14	120	181
			0								
			0								
			0								
			0								
			0								
Subtotal	**750**	**70,450**	**1,101**	**2,076**	**281**	**2,347**	**5,805**	**47**	**14**	**120**	**181**
Non- Residential											
Commercial	16	1,100,000	47,365	168,177	19,054	20,105	254,701	10,993	972	1,025	12,990
Subtotal	**16**	**1,100,000**	**47,365**	**168,177**	**19,054**	**20,105**	**254,701**	**10,993**	**972**	**1,025**	**12,990**
GRAND TOTAL	**766**	**1,170,450**	**48,466**	**170,253**	**19,335**	**22,452**	**260,506**	**11,040**	**986**	**1,145**	**13,171**

Residential	**Average DFEE kwh/m2**	**45.09397**
Total regulated CO2 reduction over baseline		**81%**
Total CO2 reduction over baseline		**83%**

Energy Efficiency % reduction for Space Heating over 2020 Baseline

House Type	2021	2025	2030
Detached	9%	18%	18%
Semi Detached	9%	18%	18%
Terrace	9%	18%	18%
Flat	9%	18%	18%

Energy Efficiency % reduction for Hot water over 2020 baseline

House Type	2021	2025	2030
Detached	3%	3%	3%
Semi Detached	3%	3%	3%
Terrace	3%	3%	3%
Flat	3%	3%	3%

Energy Efficiency % reduction for regulated electricity over 2020 baseline

House Type	2021	2025	2030
Detached	20%	20%	20%
Semi Detached	20%	20%	20%
Terrace	20%	20%	20%
Flat	20%	20%	20%

Assumptions and Limitations

1. The masterplan energy model is based on published benchmark data. Stantec are not responsible for the benchmark data and its quality of collation or quality assurance.

2. The applications of rules of thumb have been used to adjust benchmark data to represent likely changes in the Building Regulations. Adjustments have been made through the use of industry guides and Stantec's experience in structural engineering and M&E engineering. It is recognised that through adjustments such as these a generic approach to energy demand modelling has been created.

3. The masterplan energy model is a generic model and not building specific. The development of detailed energy infrastructure or plant should not be based on high level assessment figures.

4. The domestic energy demand is aligned to the Office of the Communities and Local Government Standard Assessment Procedure. This masterplan energy model is therefore limited by the assumption, number and calculations presented within the SAP.

5. Domestic energy demand reductions are based on Energy Saving Trust guidance as benchmark reductions. The application of energy demand reductions are therefore limited to the standards set by the Energy Savings Trust.

6. The masterplan energy model is limited by the nature of information that is present at the outline planning stage. In this respect the model is based on the masterplan development schedule broken down as use classes where available. Where use classes are not available assumptions have been made to estimate the typology.

7. Use of the Homes and Community Agency's benchmark data for occupation has been utilised to assess the likely water consumption per person within each dwelling. It has been assumed that 33% of water used within a dwelling will be for hot water. Water reduction targets are taken from Building Regulations Part G.

8. BEIS future carbon emission projects have been used to assess the carbon benefits of energy used.

9. A wide variety of factors will influence the final energy demand of a development. Many of these factors cannot be incorporated within a model without significant conjecture. It is recommended that more detailed energy demand modelling is undertaken for the development once more detailed designs are available. Detailed modelling should use both the SAP and Simplified Building Energy Model.

10. Demand profiles have been normalised to enable them to be representative of the likely total energy demand. As such these profiles provide an indication of the energy profile.

Appendix E Renewable and Low Carbon Technologies

E.1 Introduction

E.1.1 This appendix provides additional information on certain renewable and low carbon energy technologies in support of the feasibility study presented in Section 6. The variables affecting their suitability include:

- Environmental constraints (e.g. suitable geology for ground source heat pumps or the presence of protected ecological species that may be affected by the technology);
- Resource constraints (e.g. the availability and reliability of local biomass fuel supplies or the local wind resource);
- Social constraints (e.g. visual or health impacts of placing combustion-based technologies near housing);
- Infrastructure constraints (e.g. impacts on aviation from wind turbines or the availability of suitable transport infrastructure to import fuel, plant or equipment); and
- Site specific constraints.

E.2 Photovoltaic Solar Panels (PV)

E.2.1 Photovoltaic (PV) solar panels offset grid electricity and therefore provide a CO_2 saving (currently 0.519 kg CO_2/kWh, expected soon to reduce to 0.233 kg CO_2/kWh and reducing further as the grid decarbonises in the future). Payback periods for PV are now commercially attractive due to a significantly increased supply base and tariffs such as the Smart Export Guarantee.

E.2.2 PV arrays are connected to the electrical system of a building via inverters. The electricity generated by PV can be used on-site and, when not required, can be exported to the National Grid. This process requires no user intervention.

E.2.3 Sunshine is intermittent and often unreliable in England, which can significantly impact PV performance. PV also only operates in daylight hours, so cannot generate electricity continuously. PV is generally most efficient when it is positioned as south-facing at a pitch of 30-35° from horizontal, and in areas free from shading.

E.2.4 Use of PV arrays is subject to detailed visual impact appraisal and structural engineering assessments.

E.2.5 The suitability of PV at Gravity will depend on the final masterplan and design of individual buildings. Where suitable roof space is available, PV could be an effective renewable energy technology to install on both residential buildings and commercial buildings.

E.3 Solar Water Heating (or Solar Thermal)

E.3.1 Solar water heating systems could be used to offset a portion of the hot water demand in both the domestic and non-residential buildings in Gravity. In well-designed buildings, solar water heating can reduce the fuel consumption associated with hot water by circa 60-70% and the associated CO_2 emissions.

E.3.2 As with PV, solar water heating systems rely on solar energy and therefore the most effective heat production occurs during the daytime and sunny periods, and efficiencies are greatly reduced in winter. Therefore, their output for the 'whole year' is relatively low.

E.3.3 In order to accommodate solar water heating systems, buildings must be designed to allow space for hot water cylinders and flow/return pipework. As with PV, solar water heating operates most efficiently when installed on south-facing (or almost south-facing) roof space.

E.3.4 Use of solar thermal technologies is also subject to detailed visual impact appraisal and structural engineering assessments.

E.4 Ground Source Heat Pumps

E.4.1 Ground source heat pumps draw heat energy from the ground, concentrate it and then release it into a property. Some heat pumps are able to reverse this process in the summer, thereby providing cooling in buildings.

E.4.2 Ground source heat pumps can be either 'open loop' or 'closed loop'. Closed loop systems are typical in the UK and consist of laying a series of coiled pipes in shallow trenches (horizontal collector loops) – which requires considerable land area - or down boreholes (vertical collector loops). In open loop systems, groundwater is abstracted at ambient temperature from the ground, passed through a heat pump before being reinjected back into the ground or discharged at the surface. Open loop systems have the advantage of limited underground infrastructure but require an environmental permit to extract and discharge water.

E.4.3 In order for systems to operate effectively, buildings must achieve a high standard of fabric energy efficiency and, where appropriate, an underfloor heating system (wet system) could be incorporated to optimise system performance.

E.4.4 The efficiency and cost-effectiveness of a ground source heat pump system is affected by underlying ground conditions and the thermal conductivity of the geology.

E.4.5 If the developer wishes to pursue the use of horizontal GSHP systems, the masterplan will have to allow space for the equipment either in individual gardens or in areas of public open space.

E.5 Water Source Heat Pumps

E.5.1 Water source heat pumps work on a similar principle to ground source heat pumps. Instead of taking advantage of the heat in the ground, they take advantage of the relatively consistent temperatures found in a body of water.

E.5.2 A series of flexible pipework is submerged in a body of water, such as a lake, river or stream. A heat pump pushes working fluid through the network of piping, and this fluid absorbs the heat from the surrounding water as it goes.

E.5.3 This working fluid is then compressed by an electric compressor, in a similar fashion to the other types of heat pump, which raises the temperature. A heat exchanger can then be used to remove the heat entirely from this working fluid, providing a building with hot water that can be used for space heating (in radiators or under floor heating). It can also be plumbed into a building's hot water system, where a boiler can just provide the small amount of additional heat needed to bring it up to the required temperature, so it can be used for showers and baths.

E.5.4 Once the heat has been removed from the working fluid via the heat exchanger, it is once again pumped back through the pipework, thereby completing a continuous cycle.

E.5.5 An environmental permit is required to extract and discharge water.

E.6 Air Source Heat Pumps

E.6.1 Air source heat pumps absorb heat from the outside air, which can then be used to heat radiators, underfloor heating systems, or warm air convectors and hot water in a building. Heat pumps have some impact on the environment as they need electricity to run the fans for air extraction and compressors (typically in excess of 2 kW).

E.6.2 Air source heat pumps require the installation of external condensers, which are usually mounted on roofs or rear/side walls. They also feature moving parts (an electrically driven fan) and therefore make noise when they operate.

E.6.3 Air source heat pumps are generally installed on individual homes, apartment blocks or commercial buildings. The use of numerous air source heat pump systems would have an impact on electrical loads and grid reinforcements.

E.7 Wind Energy

E.7.1 Wind is a well-established energy source. The expertise and skills to undertake a range of wind turbine installations is extensive and the good supply base for wind energy means there is strong market competition. With this experience and knowledge behind wind energy generation, the financial risks are relatively low. A detailed assessment of the on-site wind regime would be needed before committing to a wind power strategy.

E.7.2 The RenSMART Wind Map[18] indicates that the Site has the following wind speeds:

- At 10 meters: 4.8 metres/second
- At 25 meters: 5.6 metres/second
- At 45 meters: 6.1 metres/second

E.7.3 However, the accuracy of this database can vary considerably (even to the extent that it can make a site unviable). In addition, it does not consider the impact of the built-up environment on wind regimes, including increased turbulence and reduced speeds.

E.7.4 A large wind turbine development within the Site boundary would potentially cause a significant noise, visual and wind-flicker disturbance, which would be detrimental to the amenity of residents and other site users. However, small/medium scale turbines could be appropriate in employment zones.

E.7.5 Building-mounted turbines are unlikely to be appropriate as there are challenges securing long-term reliable performances and structural vibration issues.

E.8 Hydropower

E.8.1 Hydropower is a form of renewable energy that uses the water stored, for example in dams as well as flowing in rivers, to create electricity in hydropower plants. Desktop analysis indicates there are no suitable watercourses in the vicinity of the Site for a practically and financially viable hydropower scheme.

[18] RENSmart (2020) *Maps*, online, available at: https://www.rensmart.com/Maps (accessed 02.04.2020).

E.9 District Energy

E.9.1 Heating and / or cooling can be provided to multiple buildings from a central energy centre via a district heating and / or cooling network. The energy centre can use a variety of fuels and this therefore enables the use of low and zero carbon energy sources. The role of district heating and cooling as a means of achieving carbon reduction targets for land development projects is increasingly being considered in the UK.

E.9.2 There are three basic elements in a district heating system:

- Production – An energy centre containing the heat sources;
- Delivery – A Hydraulic Interface Unit (HIU) for each end-user; and
- Distribution – An insulated pipe network connecting the energy centre with the end-users' HIUs.

E.9.3 The energy centre houses the heating plant, which can include a range of technologies and fuels such as gas boilers, biomass boilers and CHP. Hot water from the energy centre is pumped through the pipe network to the individual buildings. In each building, heat is conveyed via the HIU to the central heating system and to the hot water taps. Sometimes an Energy Services Company (ESCo) is established to manage the distribution and sale of heat.

E.9.4 When considering a district heating approach, it is important to consider the balance between constructing energy-efficient buildings (with a very low heat demand) and establishing a utility that is dependent on selling high volumes of heat in order to be viable.

E.9.5 District heating is most resource-efficient in developments with high baseload heat demands. Typically, this means residential developments of very high densities or other heat-intensive uses such as industrial manufacturing, hospitals, swimming pools or schools. Modern, energy-efficient and low-density developments built to Part L standards usually have a very limited heat demand.

E.9.6 Heat losses from distribution pipes are also an important environmental consideration (heat losses tend to be higher in low density developments with longer heat main runs).

E.9.7 Establishing a district heating network requires major capital investment, but the costs vary considerably depending on the project. A major driver of the high costs of district heating is the network of hot pipes[19]. This is another reason why district heating is best suited to high density developments with shorter heat main runs.

E.9.8 Heat network viability is established through the relationship of capital infrastructure costs and returns from heat sales (including standing charges and a price per kWh of heat). District heat networks are not regulated by the Office of Gas and Electricity Markets (OFGEM). Therefore, there is a risk of end-users experiencing higher prices compared to a more standard approach, in order for the developer to recover the high capital costs of installation. However, it is the intention of the Heat Trust to establish a framework to protect consumers connected to heat networks.

[19] DECC (2015) Assessment of the costs, performance, and characteristics of UK heat networks.

E.10 Biomass

E.10.1 Biomass can be used as a fuel source for heat, power and CHP applications. Energy is typically derived from burning biomass in biomass boilers. Other potential technologies include gasification and pyrolysis, but these are yet to be commercially proven.

E.10.2 Biomass plants can be scaled to meet the needs of a development and to reflect the availability of biomass in the area. Large biomass plants can be used to supply heat (and power) to multiple buildings via a heat network. Smaller systems can be used to heat a single building.

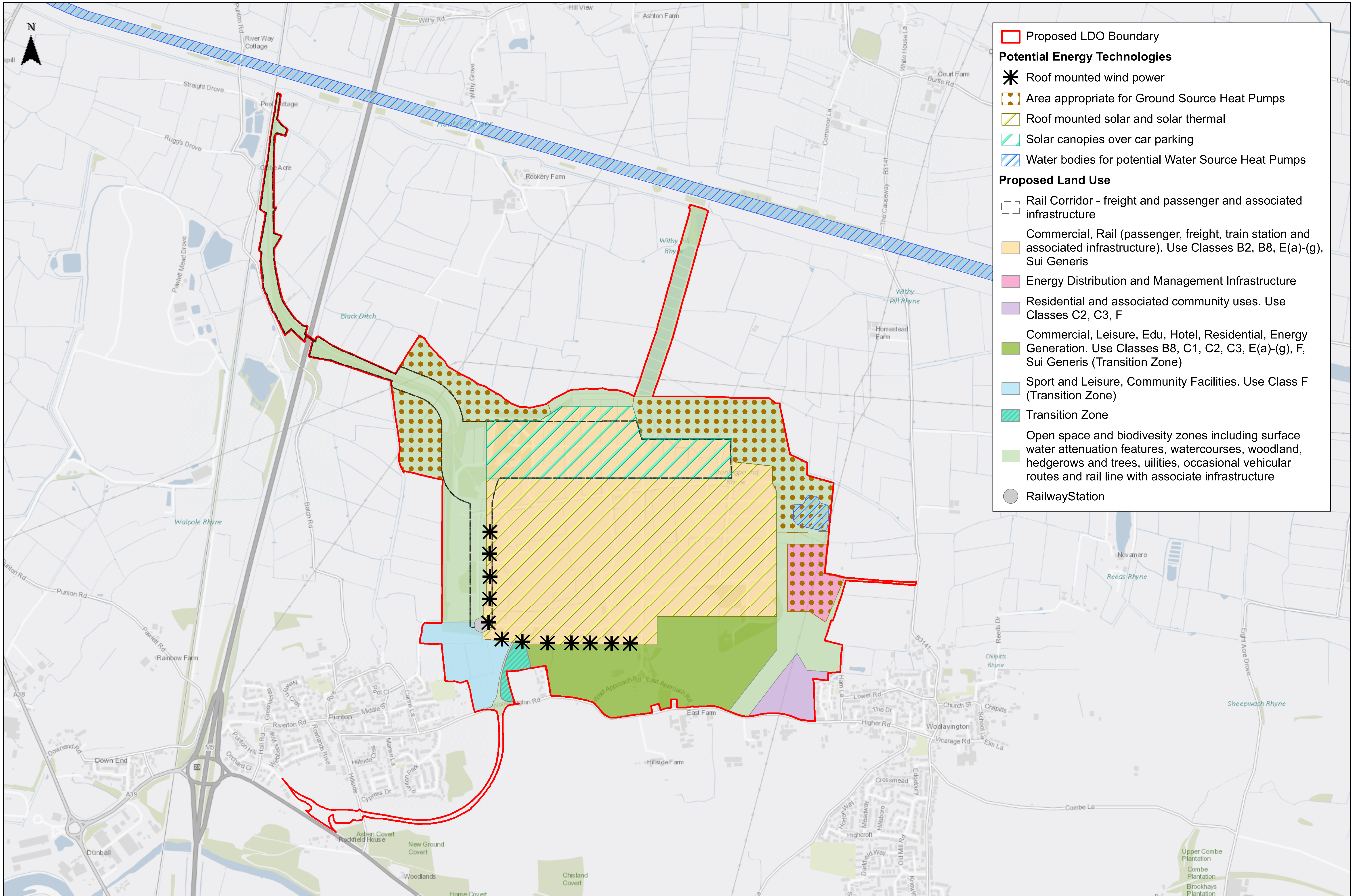
E.10.3 The lifecycle costs of biomass systems are typically greater than tradition fossil fuel heating systems. However, incentive schemes such as the Renewable Heat Incentive (RHI) can reduce the costs and provide financial returns.

E.10.4 As a solid fuel, biomass often requires transportation over significant distances. However, the carbon intensity of biomass can be less than traditional fossil fuels (oil and gas), even including the emissions associated with intercontinental transportation.

E.10.5 The use of biomass technologies is subject to the availability of long-term contracts to support security of supply and sufficient generation for a Proposed Development. In addition, biomass is a bulky product that requires additional space for infrastructure (including storage and delivery space).

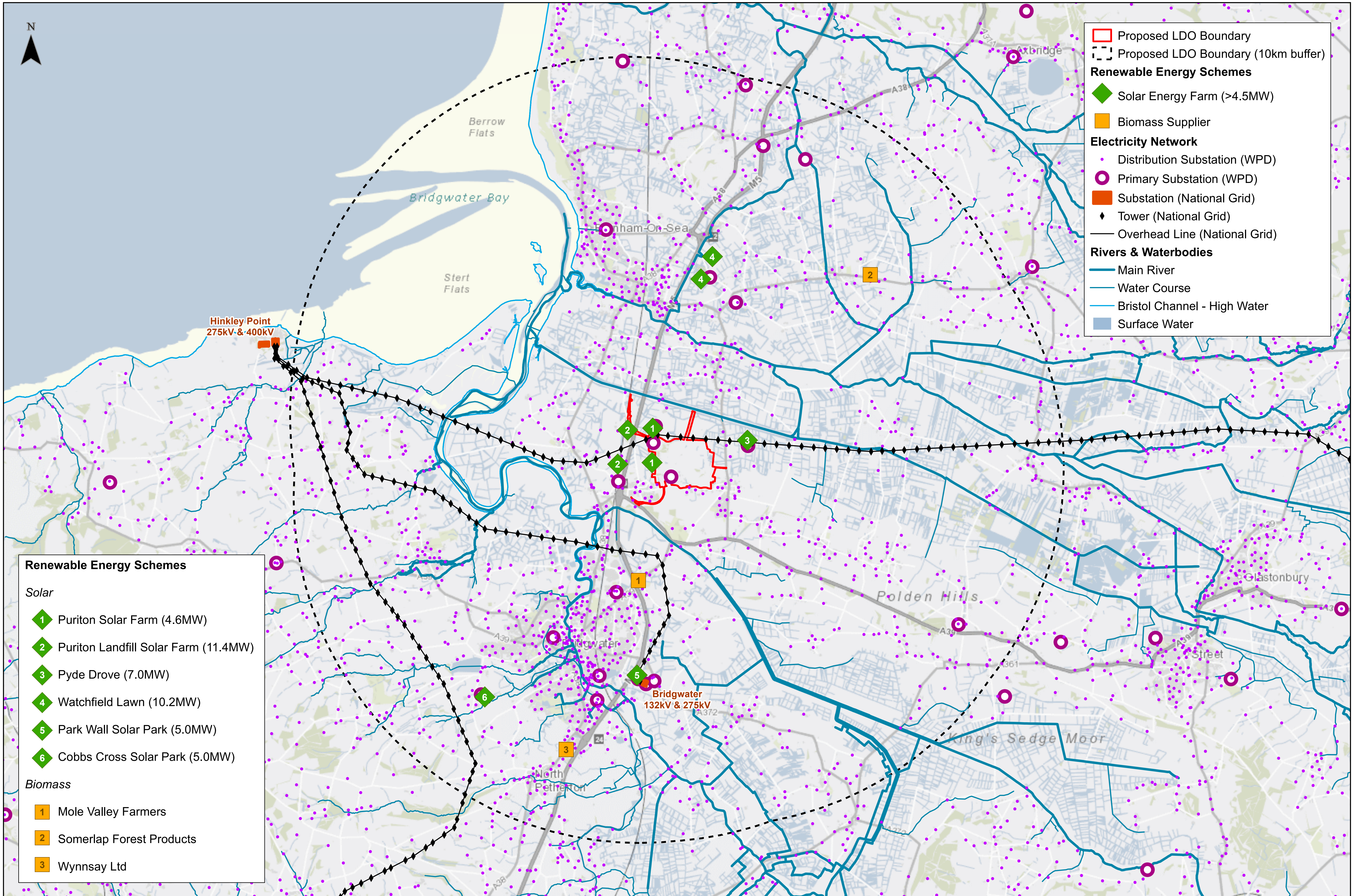
E.10.6 Stoves are becoming a popular, stylish choice to be incorporated into homes. It is a renewable and sustainable source of energy that uses combustion to create heat. Either biomass pellets, or pieces of wood can be used in stoves. However widespread use could have detrimental impacts on local air quality.

Appendix F Strategic Energy Framework



Stantec	Client: This is Gravity Ltd.	**GRAVITY** Energy Opportunities	Contains OS data © Crown Copyright and database right 2020	1:15,000 @ A3	Date: 08/09/2021
				Drawn: HC	Checked: JE
				Figure XXX	Rev A

Document Path: C:\Users\hecole\Documents\PBA_GIS\Projects_Temp\Gravity\EnergyMapping\49102_XX_Energy_Opportunities_Rev1.mxd



Stantec	Client This is Gravity Ltd.	**GRAVITY** Local Energy Infrastructure	0 — 5 — 10 km Contains OS data © Crown Copyright and database right 2020; WPD, 2021 (Open Government Licence v3.0); © National Grid UK, 2021.	1:100,000 @ A3 / Date: 07/07/2021 Drawn: HC / Checked: JE Figure XXX / Rev A

Document Path: C:\Users\hecole\Documents\PBA_GIS\Projects_Temp\Gravity\EnergyMapping\49102_XX_Energy_LocalEnergyInfrastructure.mxd