# ENERGY STATEMENT

# FOR

# RESIDENTIAL DEVELOPMENT, BALLINDERRY ROAD, MULLINGAR, Co. WESTMEATH

| | |
|---|---|
| **Project:** | Residential Development, Ballinderry Rd, Mullingar Co. Westmeath |
| **Client:** | Consdorf Investments ICAV |
| **Architects:** | Coughlan Associates, 60 Austin Friars St, Mullingar.Co. Westmeath |
| **Date Prepared:** | March 2022 |
| **Revision Ref:** | 3 |
| **Date Of Issue:** | 10th March 2022 |
| **Prepared By:** | John Walsh, MSc, BSc, MIEI |

**Contents**

## 1.0 INTRODUCTION

This document provides an overview of the developments energy strategy report relates to the sustainability and energy targets proposed for the project and possible technologies that might be applied subject to further detailed design. The development must approach the energy design in an efficient manner that reduces energy demand initially through passive strategies such as an efficient envelope which in turn reduces the energy demands relating to items such as the heating system. This initial approach in reducing the energy demand significantly aids the project in obtaining the required energy goals. Performance criteria relating to the development's envelope are set out in the following document.

The energy systems design must also focus on specifying energy efficient equipment to ensure the day to day running of the energy systems are optimized to further enhance energy savings and the related energy cost. Specifications relating to efficient heating, lighting and auxiliary equipment are set out in the document.

The report sets out to demonstrate a number of methodologies in Energy Efficiency, Conservation and Renewable Technologies that will be employed in part or in combination with each other for this development. These techniques will be employed to achieve compliance with the building regulations Part L and NZEB standards currently in public consultation.

## 2.0 PROPOSED DEVELOPMENT

The proposed works involve a residential development 130 dwelling with a mixture of, open space and play areas, associated internal roads, pedestrian paths, landscaping, lighting, car parking, connectivity works, infrastructure and site services.

## 3.0 BUILDING ENERGY RATING

As of 2006 all domestic buildings that were newly built and existing buildings that are for sale or rent require a BER (Building Energy Rating) certificate. The actual building energy rating is based on the primary energy used for one year and is classified on a scale of A1 to G with A1 being the most energy efficient. It also gives the anticipated carbon emissions for a year's occupation based on the type of fuel that the systems use. In order to identify Primary energy consumption of the building, the BER assesses energy consumed under the following headings:

- Building type (house, apartment)
- Building orientation
- Thermal envelope (insulation levels of the façade, roofs, ground floor etc)
- Air Permeability (how much air infiltrates into the building through the façade)
- Heating systems (what type of heat source is used and how efficient)
- Ventilation (what form of ventilation is used. Natural vent, mixed mode mechanical ventilation)
- Fan and pump efficiency (how efficient are the pumps and fans)
- Domestic hot water generation (is a high efficiency boiler used)
- Lighting systems (how efficient is the lighting in the building

Through the specification of an energy efficient façade and HVAC systems, the energy consumption of the building will be reduced compared to a set baseline. This ensures the environmental and economic impact of the operation of the building is reduced. The key philosophy of this plan is to reduce energy consumption by firstly limiting the energy needed by improving the buildings insulation. The second step is to utilize energy in the most efficient way through the selection and installation of energy efficient plant and equipment. The final step is to introduce energy from renewable sources to reduce the burden on Fossil Fuels.

## 4.0 UTILITIES

Initial discussions have taken place with the ESB regarding existing infrastructure in the locality. The preliminary loading for the site is estimated to be in the region of 300-400 kVA. (This is subject to change dependent on final renewable considerations etc. A number of sub stations will be required to ensure the electrical demand is met and these will be evenly distributed around the site. Overhead lines will be required to be downed and the MV network employed to feed these substations. The overhead 38kV lines will not be undergrounded. An indicative plan to serve the development from the MV network, subject to detailed discussions with the ESB, has been included with this report. Also, included are existing infrastructure networks for Gas networks Ireland, Eircom and Virgin media.

## 5.0 STRUCTURE AND BUILDING ELEMENTS

While the construction works will incur an initial investment, the lifetime running cost of the building must be considered to reduce water, fuel and electrical energy consumption. To that end methods will be explored to further improve the building's energy rating and reduce the carbon emissions. This includes decreasing the thermal conductivity (heat losses) of the building fabric, take advantage of passive solar gain to reduce the heating demand in the space and increase day lighting to reduce artificial lighting. Natural ventilation may be employed or if deemed as a requirement mechanical ventilation and heat recovery techniques will be employed to recover energy in the exhausted air. The following are some outline u-value specifications which will achieve the required energy specification:

### 5.1 Fabric 'U' Values Dwellings

- Walls - 0.16-0.18 W/m2.K
- Window - 1.2 W/m2.K (solar fraction (g factor) of 0.7, frame factor of 0.7 or better)
- Roof - 0.15W/m2.K (Flat roof)
- Doors - 1.4 W/m2.K (This is to include frame)
- Ground Floor slab - 0.15 W/m2.K
- Thermal Bridging - Factor of 0.08, with junctions details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"

### 5.2 Air Permeability (Air Tightness against infiltration)

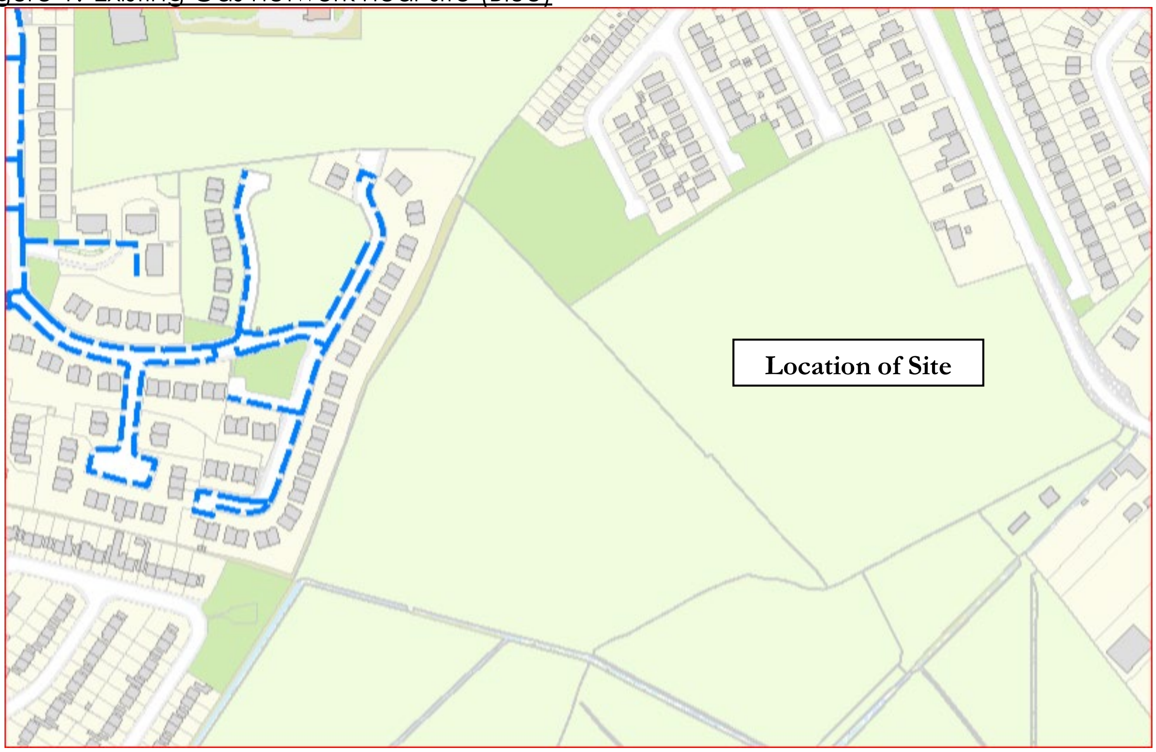
One of the most significant heat loss factors in any buildings is through controlled and uncontrolled ventilation through the introduction of ambient/outside air into the heated space. The apartments are to be constructed with a high degree of air tightness to a possible value of $3m^3/m^2/hr$ or 0.15 Air Changes with a permeability test conducted post construction to demonstrate this level in accordance with the TGD's.

### 5.3 Secondary Heat Source

The apartments and dwellings do not contain a secondary heat source therefore this is not applicable.

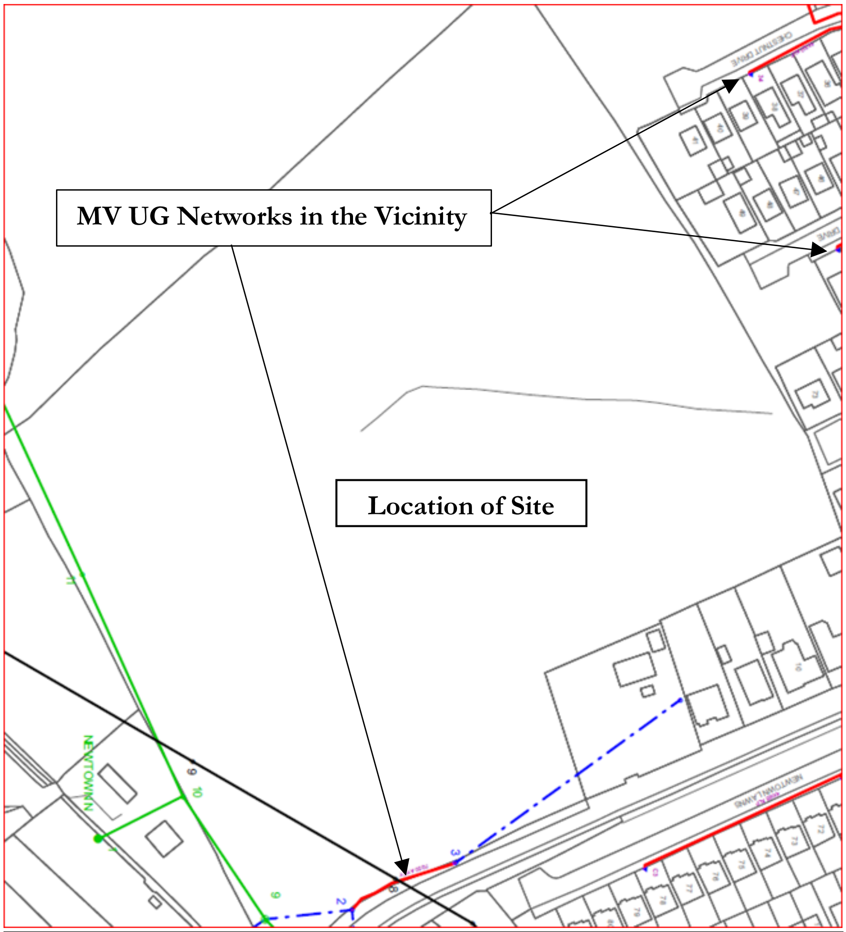
## 6.0 UTILITIES

Figure 1: Existing Gas network near site (Blue)




The development is located adjacent to good network utilities, with a 4 bar natural gas main which could possibly be extended into the site if required for cooking purposes and or for primary heating in to work in conjunction with the renewable elements proposed for hating and hot water. Also. It is unlikely however as the cost of extending the gas line may require permission to pass through adjacent lands and may realize a significant capital contribution.

Figure 2: Existing ESB network near/On site




ESB Legend:

COLOUR CODE:

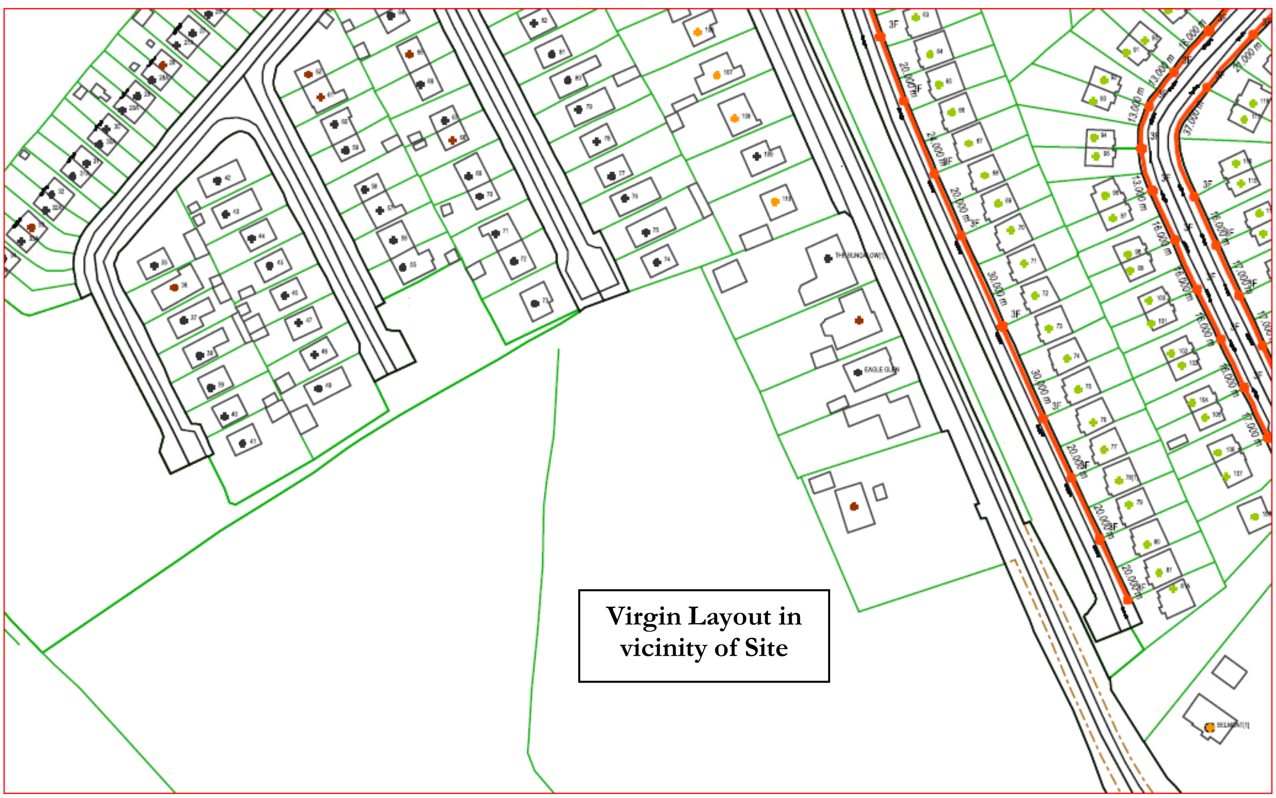
- BLACK - 38KV & HIGHER VOLTAGE OVERHEAD LINES
- GREEN - MV(10KV/20KV) OVERHEAD LINES
- BLUE - LV (400V/230V) OVERHEAD LINES
- CYAN - 38KV & HIGHER VOLTAGE UNDERGROUND CABLE ROUTES
- RED - MV/LV (10KV/20KV/400V/230V) UNDERGROUND CABLE ROUTES

The ESB has also forwarded details of the network in their vicinity and there are overhead LV lines which served the existing dwelling to be demolished. These will be removed as the development progresses. In addition there are 38kV lines to the west of the development which will need careful consideration where working in the vicinity with guidance provided in the ESB's advice "***ESB GUIDANCE FOR WORKING NEAR OVERHEAD ELECTRICITY WIRES AND UNDERGROUND CABLES***". There is a number of underground MV networks which can be utilized to the East of the Site on Chestnut avenue and also close to the site entrance to the south.

Similarly, there is a good communications network in the area with each of Virgin, Siro and Eircom with communication networks in the vicinity. Virgin have indicated in writing to us that they are currently planning to bring Fibre to the Home (FTTH) to this development if requested. See figures 3 and 4 overleaf.

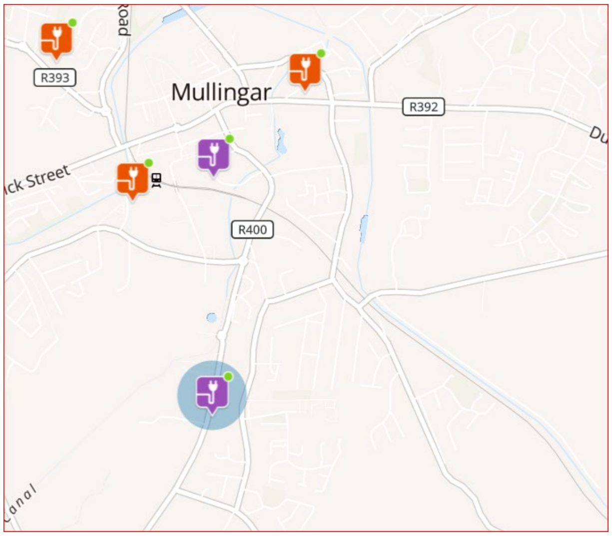
Figure 3: Existing Eircom network near/On site


Figure 4: Existing Virgin network near/On site



## 7.0 ELECTRIC CAR CHARGEING POINTS

Figure 5: Current EV points in Mullingar.




There are presently approximately 5 electric car charging points in the town of Mullingar with the closet at Lynn Rd Circle K Service station. In line with government policy and share of projection of annual sales grows to 42% by 2020, enabling Ireland to meet the 10%i EV penetration target, and to 60% by 2050, resulting in 1.8m EVs in a total car stock of 2.9m vehicles, the development incudes for a minimum of 10% capacity of carparking spaces in both the public realm and on individuals dwellings for the development.

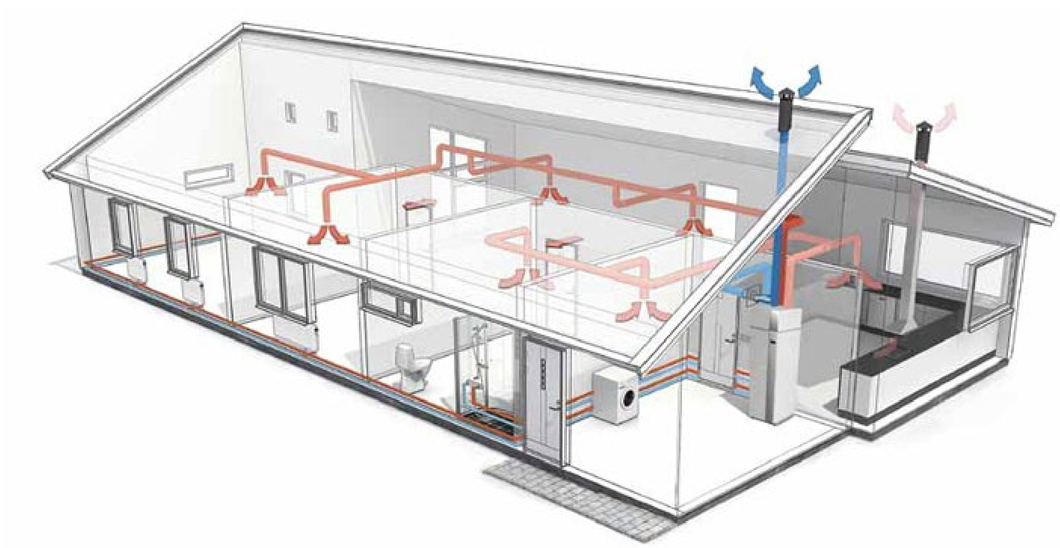
In addition, the publication of Part L 2021 requires the provision of infrastructure for electric vehicle charging points including ducting etc for possible EV in the future as indicated in the drawings submitted.

## 8.0 BUILDING SERVICES (M&E) OVERVIEW

### 8.1 Heating & Ventilation systems apartments

It is proposed to consider various options for heating of apartments and dwelling to include possible heat pumps or exhaust air heat pumps.

Figure 6: Typical Exhaust Air Source HP arrangement



Air source heat pumps utilize low grade heat from external ambient air and transfer heat to heating system pipework. These systems operate with very high efficiencies (>400%) which provides significant carbon reductions in comparison to a traditional boiler system.

Exhaust air heat pumps utilize an exhaust air heat pump type system for heating, hot water and ventilation of the apartment units. This will re-cycle the heat from your house's ventilation system. These machines are ideal for apartments and more compact air-tight low energy or passive homes. Air is drawn through ducts to the heat pump from the bathrooms, utility and kitchen areas. The cold waste air is discharged to outside through another duct, and condensation to a drain. Additional heat generated internally from lighting, people & domestic appliances is also utilized through heat recovery.

For every unit of electricity used to operate the heat pump, up to four to five units of heat are generated. Therefore for every unit of electricity used to generate heat, 4-5 (400-500%) units of heat are produced. Efficiencies in order of 600% may also be achieved depending on ambient conditions.  It is proposed to utilize radiator heating in the apartment units as heating emitter. These can be employed with gas boilers or heat pumps which utilize the low heating temperature from the heat pump. A central time clock and separate time and temperature controls to each zone is to provided (e.g. via 2-port valves). Such zones may consist of:

- living areas,
- Bedrooms
- Domestic Hot water

8.2 Heating & Ventilation Systems-Dwellings.

It is proposed to consider various options for heating and hot water of the dwellings, particularly Air to Water heat pumps (AWHP). This can be either mono-block where the heating is plumbed externally from the condenser to the dwelling or split where the refrigerant pipework passes between the condenser and evaporator in the dwelling.  Air source heat pumps utilize low grade heat from external ambient air and transfer heat to heating system pipework. These systems operate with very high efficiencies (>400%) which provides significant carbon reductions in comparison to a traditional boiler system.

Figure 7: Typical Air Source HP arrangement for proposed dwellings

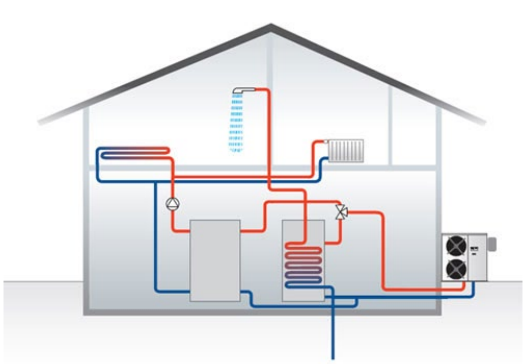


Figure 8: Typical Photovoltaic Arrangement

Photovoltaic panels are best suited to sites which have an unobstructed southerly and south-easterly elevations. PV is particularly suitable due where there is a simultaneous requirement for heating, hot water and electrical demand. these may be considered by the developer The on-site generation of electricity can supplement the electrical requirement for lighting, motors, etc & reduce the electrical demand and from the grid.

Utilizing this technology would considerably reduce the demand from the grid and consequently reduce losses and emissions from power stations. Such is the benefit of on site or distributed generation, the DEAP model determines that each kWh offset from PV equates to circa 2.5 times the thermal equivalent and reduces CO2 emissions by some 0.47Kg/kWh generated.

Figure 9: Roof Mounted Photovoltaics

## 8.3 Lighting

All lighting to be energy efficient with provision made for low energy lamps such as Compact Fluorescent Lamps (CFLs) or LED lamps which use 80% less electricity and last up to 10 times longer than ordinary light-bulbs.

Table 1: Summary of Part L compliance for Dwellings

| | |
|---|---|
| **U-values** | |
| | [w/m2.k] |
| **Floor [Max, Part L 2011 = 0.21]** | 0.1 |
| | *Floor to have minimum 100mm PIR with thermal conductivity of 0.022 w/m2.k* |
| | |
| **Roof [Max, Part L 2011 = 0.16 Insulation on Ceiling/rafter]** | 0.12 |
| | *400mm Insulation, 200mm between Joists and 200mm Over ceiling insulation to be minimum thermal conductivity 0.04 wm2.k* |
| | |
| | |
| **Wall [Max, Part L 2021 = 0.18]** | 0.18 |
| | Wall insulation to comprise 125mm PIR board with thermal conductivity 0.022 w/m2.k |
| | |
| | |
| **Door [Max, Part L 2011 = 1.6]** | 1.4 |
| | |
| | |
| **Window [Max Av, Part L 2021 = 1.6** | 1.2, solar factor 0.73 |
| | *Windows to have minimum solar factor of 0.7* |
| | |
| **Mechanical plant** | |
| **Heating source** | Air to Water air heat pump. |
| **Heating controls** | Time and temperature control of heating/hot water with individual heating zones |
| **Heat emitters** | Oversized radiators with mean water temperature 40 Deg C |
| **Solar requirements** | Up to 4 No. 330w PV panel per unit if required dependent on orientation and heating system utilised. |
| **Hot water cylinder** | 180 litre cylinder |
| **Ventilation** | Centralised ducted extract system serving heat pump. Specific fan power 0.33 w/l/s minimum |
| | |
| **Additional requirements** | |
| **Lighting** | 100% energy efficient lighting |
| **Air permeability** | Air permeability @ 3 $m^3$/hr/m2 |
| **Thermal bridging** | Factor of 0.08, junctions details to conform with “Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details” |
| **Secondary heating** | N/A |

## Figure 10: ESB Network Map in the Locality

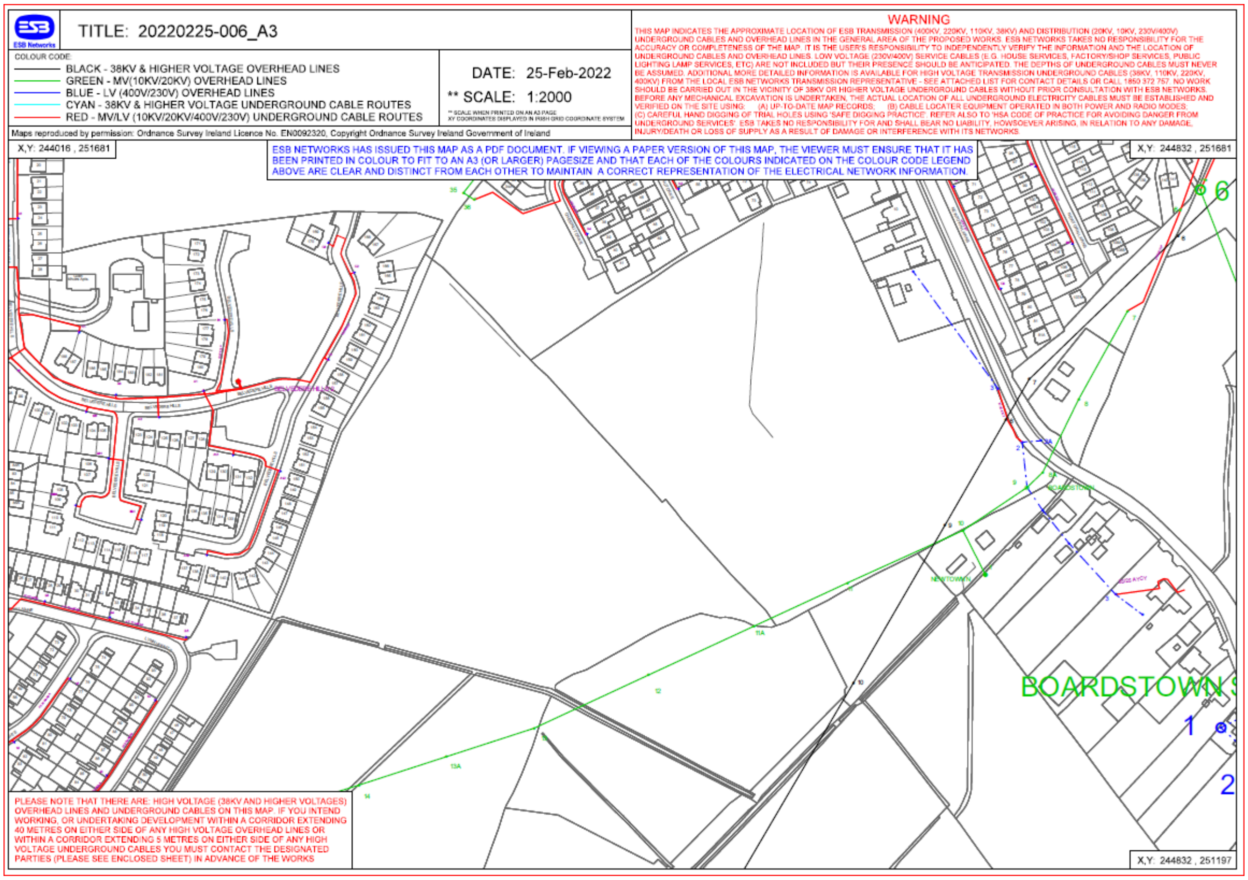


Figure 11: GNI Map of Gas infrastructure in vicinity of Site

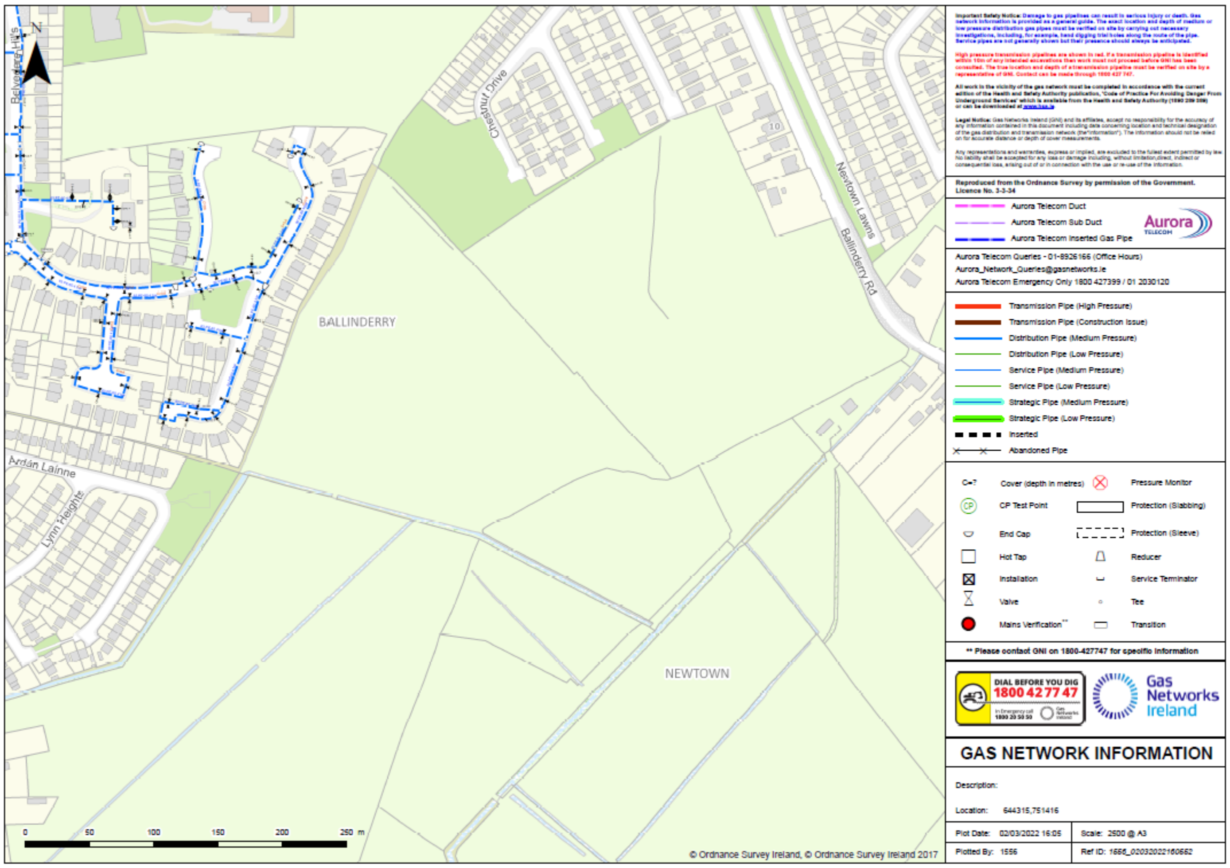


Figure 12: Eircom & Virgin infrastructure in vicinity of Site