APPENDIX 15.2: CLIMATE CHANGE ASSESSMENT METHODOLOGY

1.1.1 The method of baseline data collection and assessment is in accordance with current guidance and industry best practice. Full details are provided within this Appendix.

Baseline Conditions

1.1.2 The baseline scenario does not consider a 'do nothing' scenario. It assumes that there is demand for housing and supply is required for housing targets to be met. Therefore, the assessment baseline scenario can be considered to be a 'typical' development which:

- Delivers the same outputs as the Proposed Development.
- Is built to standard building regulations using normal construction practice.
- Is constructed in a nominal location.

1.1.3 A 2019 technical note from European Bank for Reconstruction and Development (ERBD) states that this type of baseline is appropriate since *"it is recognised that 'something' must be done"* and allows for a comparison of relative effect(s).

Assessment

1.1.4 The assessment considers the CO_2 emissions associated with fossil fuel and electricity use within those buildings forming the Proposed Development, with specific exclusions detailed in the subsequent sections.

1.1.5 The energy demand of for the Use B2 General Industrial buildings are calculated using the energy benchmarks in CIBSE Guide F – Energy Efficiency. This assessment will use best estimates for the predicted energy consumption for these building types to provide an overall projection of the Proposed Development's energy demands.

1.1.6 The assessment considers the operational CO_2 emissions over a 60-year period. It is not possible to fully understand, at this time how energy and emissions use will change within buildings during this period. As such, it has been assumed that energy use will remain the same, year on year, throughout the assessment period.

Defining Parameters

1.1.7 The overall area within the application redline boundary for the Site is approximately 25 ha in size and the triangular area of land that forms Phase Two of IAMP ONE is approximately 6.85 ha in size.

1.1.8 The Proposed Development consists of a single, three-storey industrial unit (Class B2 General Industrial) that is to house an electrode and battery manufacturing facility with a maximum capacity of up to 9 GWh / annum, comprising of two battery manufacturing plants separated by a central spine of offices. Included within the unit will be an integral electrode manufacturing plant.

1.1.9 A series of plans have been prepared to support the detailed planning application and define the proposed form of the IAMP ONE Phase Two development. These were used to inform the assessments. The Climate Change Impact Assessment is based on the results of the Energy Strategy that was completed separately to the EIA Chapter. It considers two scenarios:

- Scenario A allows for the inclusion of low temperature hot water (LTHW) gas boilers, high temperature hot water (HTHW) boilers (steam plant), and gas powered dehumidifiers.
- Scenario B allows for the inclusion of electric heating. In this scenario the LTHW gas boilers and the steam plant would be replaced by equivalent electrical plant.

1.1.10 Although detailed design for the building is well progressed, there is still currently a degree of flexibility in the specification of plant that will supply the heat and power, which will only be determined fully once planning consent is obtained and the principal contractors are formally appointed. To that end there is a degree of uncertainty regarding whether gas boilers or electric alternatives will be used to supply the plant and the impact of both scenarios has been assessed.

Scope of Assessment

1.1.11 Scope 1 and 2 emissions, which are quantifiable and within the Applicant's reasonable control, will be assessed. In this instance, these emissions are taken to be that associated with the combustion of fossil fuels, such as natural gas in building heating systems and the generation of electricity associated with lighting and ventilation, during the operational phase of the built development.

1.1.12 The assessment will provide an assessment of emissions arising from construction. However, it will not formally assess the carbon emissions with the use of vehicles, nor those emissions produced during the production of building materials. The construction emissions associated with the Proposed Development include the emissions associated with on-site machinery, plant equipment and welfare facilities typically being the emissions associated with diesel fuel combustion.

1.1.13 Decommissioning emissions include those associated with the removal, transportation and disposal of waste materials either in landfill or to sites for recycling/re-use. The contribution of these emissions is small when compared with the Proposed Development's operational lifetime emissions. However, this assessment evaluates the information available at detailed design stage to estimate emissions associated with deconstruction and demolition.

1.1.14 Emissions associated with the transport movements of site workers and visitors once the Proposed Development becomes operational are not included in the assessment as these are largely tied to actions outside the Applicant's direct control.

1.1.15 The assessment considers CO_2e emissions, but in practice is limited to consideration of Carbon Dioxide (CO_2) and Nitrous Oxide (N_2O) only. It is understood that there are other emissions that contribute to climate change such as those found in refrigerants (e.g. CFCs). These emissions are considered to be minimal in volume by comparison to the operational CO_2e emissions and have therefore not been included in the analysis.

Baseline Calculation

1.1.16 Detailed SBEM assessment has not been undertaken at this stage, but a model of the of energy (both regulated and unregulated) required to operate the plant, and the associated emissions has been developed to help inform the decision-making process. Scenario A (without additional mitigation) is considered to be an appropriate baseline scenario. The use of gas-fired boilers and steam plant is typical for a manufacturing development of this type.

1.1.17 The baseline annual energy demand of the scenario outlined in paragraph 1.1.7 was calculated using the energy benchmarks given within the CIBSE Guide F. Given this guidance was issued in 2012, and building standards and practices have since improved, 'Good practice' energy consumption benchmarks were used instead of those given for 'Typical practice'.

Proposed Development Calculation

1.1.18 Once a baseline scenario has been established, the absolute emissions (Ab) of the Proposed Development are calculated.

1.1.19 The energy demand from the development is split between regulated energy to operate the building facilities and unregulated energy which is used for running the manufacturing processes. Regulated energy use within the development relates to space-heating, hot water, lighting, pumps and fans and this would be controlled by

Building Regulations.

Electric Vehicle (EV) Infrastructure

1.1.20 It is envisaged that EV charging would be deployed across the site to meet the needs of site users. It is proposed to provide a 7kW EV charging point for at least 10 % of the available car parking spaces, which equates to around 40 vehicles. Provision for additional 50kW fast chargers is also being considered. This aims to support the rapid uptake in EV deployment by the time the site becomes operational and during the operational period.

1.1.21 Although EV chargers provide considerable environmental benefits in driving the uptake of low carbon transport, they do not provide measurable benefits at the development level as driving mode and distance are outside of the developers ultimate control. As such, the energy consumption from EV charging has not been included when assessing the carbon benefits of the measures in the energy strategy for the Proposed Development, nor the associated emissions in the Climate Change Impact Assessment.

Emission Calculation

1.1.22 There are currently limited resources able to give the annual energy demand of given building types and uses with improvements made in their energy efficiency. Therefore, this assessment models an increase in energy efficiency of the Proposed Development based upon recognised standards as well as our experience of what is sensible.

1.1.23 Once the operational electricity and fossil fuel use have been calculated for the Proposed Development as a whole, the CO_2e emissions can be projected. The emissions are projected each year for the modelled operational period of 60 years. It is noted that the Proposed Development does not have a predetermined end of life or demolition plan, however, for the purpose of the assessment a defined time period had to be selected. The RICS guidance (2017) recommends 60 years as the assessment lifespan for non-residential development.

1.1.24 The projection relies upon CO_2e conversion factors for grid electricity and fossil fuels provided by The Department for Business, Energy and Industrial Strategy (BEIS).

1.1.25 The CO_2e conversion factor for grid electricity is likely to decline over time due to the decommissioning of coal fired power stations and the continuing deployment of renewable energy technologies, natural gas generation and nuclear generation. Therefore, the CO_2e conversion factor for grid electricity is based on the long term grid

average projection. It should be reiterated that this projection is itself based on a large number of assumptions and could considerably under or overestimate the rate of decarbonisation, which will have a significant effect on the overall emissions associated with the development over its lifetime.

1.1.26 Emissions are calculated by multiplying the total energy demand in kWh by the associated electricity/natural gas conversion factor.

1.1.27 In terms of GHG emissions, the Proposed Development is assessed for its "relative emissions (Re)" or net emissions which is expressed as the difference between absolute emissions generated by the Proposed Development and the baseline emissions.

Relative Emissions (Re) = Absolute Emissions (Ab) – Baseline Emissions (Be)

Significance Criteria

1.1.28 For the purpose of this assessment, effects that are deemed to be significant are those described as minor, moderate or major in adverse scenarios, and in beneficial scenarios that exceed the local policy. This goes beyond the standard EIA practice and represents a strict and conservative approach, which aligns with the magnitude of climate change as an issue, and local policy targets to reduce carbon emissions beyond Building Regulations. The significance criteria are provided in **Error! Reference source not found.**.

Table 1: Significance Criteria

Relative Emissions Compared to Baseline	Impact	Effect	Significance
Over 25% higher	Negative	Major Adverse	Significant
Up to 25% higher	Negative	Moderate Adverse	Significant
Up to 15% higher	Negative	Minor Adverse	Significant
Up to 5% lower or no higher		Neutral	Not Significant
Up to 15% lower	Positive	Minor Beneficial	Not Significant
Up to 25% lower	Positive	Moderate Beneficial	Significant
Over 25% lower	Positive	Major Beneficial	Significant

1.1.29 All emissions that have an adverse impact are significant because this outcome would indicate that the Proposed Development will fail to meet the minimum requirements set out in Building Regulations. Emissions from a Proposed Development that fall below the baseline can be classed as beneficial as this would indicate that building efficiency and energy use exceeds statutory regulation requirements. The beneficiary impact only becomes significant when the requirements of local policy are exceeded

demonstrating the Applicants commitment to sustainable development.

1.1.30 To avoid misinterpretation, it is important to understand the justification, but also the limitation, behind the use of this significance criteria. It leads to a robust method for comparing likely emissions arising from the Proposed Development, relative to the baseline of a similar 'typical' development. For planning purposes, where it is important to weigh the benefits of one development against another this is a useful and practical approach. The alternative approach, which arguably holds to a stricter interpretation of the absolute effects of the Proposed Development, is to take the baseline to be the 'no development' scenario. If this latter approach were to be adopted then almost any form of development would result in increased levels of carbon emissions and would be considered to cause adverse (and most likely significantly adverse) impacts. As such, it would be much more difficult to identify whether a particular developer was making a genuine attempt to reduce emissions beyond the requirements of standard regulatory policy.

Characterisation of Impact

1.1.31 The categorisation of impact in relation to the following criteria is explained below:

- **Positive or Negative** – The impact overall can only be negative due to the guaranteed release of GHG emissions from development. However, the purpose of this assessment is to consider the efforts of the Applicant to minimise the negative impact. Therefore, in the context of this assessment, the impact has been considered 'positive' if the Applicant has gone beyond the minimum requirements of national and local policy to reduce or minimise emissions.
- **Extent** – The release of GHGs may occur on a local extent, however, the associated impact (i.e. contribution to global warming and climate change) is a global issue.
- **Magnitude** – Any single development has an infinitesimal impact on global climate change overall, but the assessment is still important to assess a Development's contribution to local and national targets. Additionally, the assessment considers magnitude in the context of emission reduction compared to baseline scenarios. For the purposes of determining the magnitude of effects of climatic variables on the Proposed Development, a combination of the probability and consequence of likely events are used.
- **Probability** – This takes into account the chance of the climatic effect occurring over the relevant time period (e.g. lifespan) of the development and the likely

impact of this if the risk is not mitigated.

- **Consequence** – This reflects the geographical extent of the climatic effect or the number of receptors affected (e.g. scale), the complexity of the effect, degree of harm to those affected and the duration, frequency and reversibility of effect.
- **Duration and Timing** – The duration of the impacts extends from construction, through operational and decommissioning phases of the Proposed Development. Research has shown that the operational phase typically accounts for around 90-95% of emissions across the lifetime of a development. The duration and timing of a future climatic event will affect resilience.
- **Frequency** – Emissions are likely to occur continuously across the lifetime of the site as a result of fossil fuel combustion, electricity use, transportation and natural processes. However, when assessing the resilience of the Proposed Development to future climate, the frequency of projected events is used to determine the likelihood and consequence of impacts.
- **Reversibility** – Once emitted into the atmosphere, GHGs are circulated and interact with different processes and reactions to create different molecules, with varying lifespans and effects. This is essentially irreversible. However, it is possible to take actions which can limit the emissions released. It is also possible to sequester certain gases and remove them from the atmosphere, such as the use of green infrastructure and tree planting.
- **Likelihood** – Any form of activity or process will result in the release of GHGs to some degree. This includes activity associated with positive climate change action, such as the development of renewables or low carbon technology. The likelihood of future climate risks is determined by the level of probability. This assessment aims to consider how the inevitable impact of emissions is minimised and reduced, as well as how the resilience to future climate change is increased, in the design and planning of the Proposed Development.

Treatment of Vulnerability

1.1.32 The IEMA guidance (2020) explains how our climate is changing, but there remains uncertainties in the magnitude, frequency and spatial occurrence, either as changes to average conditions or extreme conditions, which generally makes it difficult to assess the impacts of climate change in relation to a specific project. Therefore, scientific assumptions must be made in order to assess the resilience of new developments to any future changes in climate.

1.1.33 Climate Change projections for the UK (UKCP18) are based on global climate simulation models to explore regional responses to climate change. UKCP18 considers the effects arising from a series of emissions scenarios and Representative Concentration Pathways (RCP) which project how future climatic conditions in the UK are likely to change at a regional level, taking account of naturally occurring climate variations. Probabilistic projections provide a range of possible climate change outcomes and their relative likelihoods (ranging across 10th to 90th percentiles).

Climate Scenarios and Timelines Considered

1.1.34 The Proposed Development was assessed against a low, medium, and high emissions scenario to allow for comparisons between best and worst case across the projected 60-year 'lifetime' of the project. The Representative Concentration Pathways (RCP) show how the climate could change up to the year 2100, compared to a 1982-2000 baseline.

1.1.35 UKCP18 climate projections for the 2030s, 2050s, 2070s and 2090s time periods were selected to correspond with the proposed timescales for the Proposed Development's construction and operational phases. The conservative approach recommended as best practice by the IEMA guidance (2020) is to use the central estimate (50th percentile) for the high emissions scenario (RCP8.5) to establish the likely worst-case changes to climatic conditions. This assessment considers the regional variations in Central Southern England during these periods. A reference range is provided in each case, using the 10% probability level as a lower limit and the 90% probability level as an upper limit. These scenarios and probability levels were used to provide credible projected changes including an indicative level of uncertainty.

Future Climate Baseline

1.1.36 A summary of a range of projected changes to climate variables will be provided which can be used to build up a holistic view of future climate and assess potential impacts. According to UKCP18, relative probabilities for specific outcomes are typically much higher near the 50% cumulative probability level (median) of the distribution, than for outcomes lying either below the 10% cumulative probability level or above the 90% cumulative probability level.

Climate Vulnerability and Sensitivity of Receptors

1.1.37 Potential receptors within elements of the project relevant to the location, nature and scale of the development have been identified and receptor groups include:

- Buildings and infrastructure receptors (including equipment and building operations).
- Human health receptors (e.g. construction workers, occupants and site users).
- Environmental receptors (e.g. habitats and species).
- Climatic systems.

1.1.38 The IEMA guidance (2020) describes the sensitivity of the receptor/receiving environment as *"the degree of response of a receiver to a change and a function of its capacity to accommodate and recover from a change if it is affected."*

1.1.39 Therefore, in line with the IEMA guidance, the following factors have been considered to ascribe the sensitivity of receptors in relation to potential climate change effects:

- Value or importance of receptor.
- Susceptibility of the receptor (e.g. ability to be affected by a change).
- Vulnerability of the receptor (e.g. potential exposure to a change).

1.1.40 The susceptibility of the receptor is determined using the following scale:

Susceptibility	
Low	Receptor has the ability to withstand or not be altered much by the projected changes to the existing/prevailing climatic factors.
Medium	Receptor has some limited ability to withstand or not be altered by the projected changes to the existing/prevailing climatic conditions.
High	Receptor has no ability to withstand or not be substantially altered by the projected changes to the existing/prevailing climatic factors.

1.1.41 The vulnerability of a receptor is defined using the following scale:

Vulnerability	
Low	Climatic factors have little influence on the receptors.
Medium	Receptor is dependent on some climatic factors but able to tolerate a range of conditions.
High	Receptor is directly dependent on existing/prevailing climatic factors and reliant on these specific existing climate conditions continuing in future or only able to tolerate a very limited variation in climate conditions.

1.1.42 In line with the IEMA guidance, a combination of probability and consequence is used to reach a reasoned conclusion on the magnitude of the effect of Climate Change on the Proposed Development. The IEMA guidance states that magnitude is based on a combination of:

- Probability, which takes into account the chance of the effect occurring over the lifespan of the development if the risk is not mitigated.

- Consequence, which reflects the geographical extent of the effect or the number of receptors affected (e.g. scale), the complexity of the effect, degree of harm to those affected and the duration, frequency and reversibility of effect.

1.1.43 Definitions of likelihood and magnitude will vary between schemes and are tailored to the specific project. Project lifetime is considered to include construction and operational stages and is taken to be 60 years for this assessment of climate risk. A likelihood category is assigned from the table below based on the probability of the regional climate effect identified using the future climate baseline. From this the consequence of impact is determined as indicated in the table below.

Likelihood Category	**Description (Probability and Frequency of Occurrence)**
Very High	The event occurs multiple times during the lifetime of the project (assumed 60 years), e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years), e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years), e.g. approximately once every 12 years, typically 5 events.
Low	The event occurs twice during the lifetime of the project (60 years), e.g. once in 30 years.
Very Low	The event may occur once during the lifetime of the project (60 years).

Consequence of Impact	**Description of Impact**
Extreme Adverse	National-level (or greater) disruption lasting more than 1 week.
Major Adverse	National-level disruption lasting more than 1 day but less than 1 week. OR Regional-level disruption lasting more than 1 week.
Moderate Adverse	Regional-level disruption lasting more than 1 day but less than 1 week.
Minor Adverse	Regional-level disruption lasting less than 1 day.
Negligible	Isolated disruption to the immediate locality lasting less than 1 day.

Magnitude of Effects

1.1.44 An assessment of the magnitude of impacts includes the following factors:

- The acceptability of any disruption in use if the project fails.
- Its capital value if it had to be replaced.
- Its impact on neighbours.
- The vulnerability of the project element or receptor.
- If there are dependencies within any interconnected network of nationally

important assets on the new development.

1.1.45 The magnitude assigned to the effect will also consider control mechanisms that may already be in place (e.g., due to legislation and commonly occurring standards) which would reduce the probability or the consequence of the effect and therefore the overall magnitude. The IEMA guidance denotes that it is likely that if the probability and/or consequence of the effect is high that the magnitude of the effect would also be high.

Significance Matrix

1.1.46 The significance of the impact on the Proposed Development will be determined using the Significance Matrix for Climate Resilience below and assessed in conjunction with the Significance Criteria for determining the impact of the Proposed Development on Climate Change.

Significance Matrix for Assessing Climate Resilience						
Climate Resilience Significance Matrix		**Measure of Likelihood**				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Measure of Consequence (Impact)	**Negligible**	Negligible (Not Significant)	Negligible (Not Significant)	Negligible (Not Significant)	Minor (Not Significant)	Minor (Not Significant)
	Minor	Negligible (Not Significant)	Minor (Not Significant)	Minor (Not Significant)	Moderate (Significant)	Moderate (Significant)
	Moderate	Minor (Not Significant)	Minor (Not Significant)	Moderate (Significant)	Moderate (Significant)	Moderate (Significant)
	Major	Minor (Not Significant)	Moderate (Significant)	Moderate (Significant)	Substantial (Significant)	Substantial (Significant)
	Extreme	Minor-Moderate (Not Significant)	Moderate (Significant)	Moderate-substantial (Significant)	Substantial (Significant)	Substantial (Significant)