Sunderland City Council

Wind Energy Development Study

December 2020

Contents

Figures

Tables

1. Purpose of this document

Introduction

1.1. Government guidance suggests that in order to manage new wind energy development each Local Authority should consider designated areas which are potentially suitable for wind energy development in their Local Plan[1].

1.2. Sunderland's Local Plan consists of three parts:

- Core Strategy and Development Management Plan (CSDP); –The CSDP was adopted in January 2020 and sets the overarching development strategy, strategic policies and strategic allocations and designations for the future change and growth of Sunderland. This Plan also includes local policies for Development Management purposes. This Plan covers the plan period 2015 to 2033 and is for development within Sunderland's administrative boundaries.
- Allocations and Designations Plan (A&D); – Will set out local policies including site-specific policy designations and allocations for the development, protection and conservation of land in the city in order to deliver the overall strategy as set out within the CSDP.
- International Advance Manufacturing Park Area Action Plan (IAMP AAP). – The IAMP AAP was adopted by Sunderland City Council and South Tyneside Council in November 2017. This part of the Local Plan sets out site-specific policies for the comprehensive development of the IAMP and covers the period 2017-2032.

1.3. Having adopted the CSDP and IAMP AAP, Sunderland City Council (the Council) is preparing the first draft of the A&D Plan for consultation in December 2020. This plan provides the opportunity to identify and designate areas with potential suitability for wind energy developments.

Purpose of this Report

1.4. The purpose of this report is to set out the Council's proposed methodology to identifying potential suitable areas for wind energy development. The methodological approach will provide a high-level assessment of the extent and distribution of planning and environmental considerations that affect the suitability of areas for onshore wind turbines.

1.5. The methodology outlined in this document, responds to national policy and guidance regarding wind energy. The National Planning Policy Framework (NPPF) states that a proposed wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan. Sunderland therefore needs to consider whether there are potential, suitable locations for new wind turbines in the city and if so, allocate these in the Allocations and Designations Plan (A&D Plan).

[1] This would not apply to small wind turbines which benefit from permitted development rights.

1.6. The Council is consulting on this report, alongside the Draft A&D Plan, following this consultation, the Council will determine if it is appropriate to designate potential area for wind energy development.

1.7. There are no established wind turbine size ranges. Renewable UK defines small-medium wind turbines as those below 55 metres, that power many UK homes, farms and businesses. They define medium height turbines as those up to 55m tall including the blades. Larger-scale wind turbines are defined as those which consist of turbines with towers/hubs up to 75m with rotor blades 30-80m in diameter[2]. Previous commissioned work undertaken for Sunderland Council established different height ranges to Renewable UK. As there are no set wind turbine height ranges adopted, the height range parameters of previous evidence base work will be used, in the interests of continuity and review (Table 1).

Wind Turbine Height Range Name	Wind Turbine Height Ranges used in this report
Micro	11 – 30m
Small	31 – 50m
Medium	51 – 100m
Large	100m +

Table 1 Wind Turbine Height Ranges

1.8. The Council has therefore prepared this report to determine if there are any potential locations in Sunderland which could be designated as potentially suitable for wind energy development using the height ranges identified above.

Structure of this Report

1.9. This report will set out the context for the identification of potential suitable areas for wind energy development from a climate change and policy perspective (Sections 2 & 3 respectively). A background of existing wind energy development delivered across Sunderland will be provided with an overview of previous studies of wind energy undertaken (Section 4). Section 5 will outline the methodology used for the constraints mapping process, providing a justification for the buffers and separation distances used to identify areas with potential suitability for wind energy development. Section 6 outlines the constraint mapping outcomes as a result of a two staged, refinement process.

[2] (http://www.renewableuk.com/page/OnshoreWind)
(http://c.ymcdn.com/sites/www.renewableuk.com/resource/resmgr/Docs/small_mediu m_wind_strategy_r.pdf p6-8)

2. Climate Change

National

2.1. At national level, in June 2019, the UK Parliament adopted the target of achieving Net Zero[3] by 2050. This follows on from the Climate Change Act of 2008 which committed the UK to drive policies towards the aim of reducing climate emissions by 80% on this timeline. The Climate Change Act also established the Committee of Climate Change (CCC) as an independent advisor on the policies and approaches which are required in the UK to achieve climate change objectives, and to monitor progress.

2.2. The CCC have

- published evidence about the key sources and progress of climate change gases across the economy (see figure 1)
- identified a priority mix of policies which need to be driven to achieve these aims across transport, energy supply, housing stock and retrofit, agriculture and land use, waste management, changing industrial processes and removing carbon emissions through, for example, carbon capturing and storage, tree planting and carbon retention in natural assets.
- published evidence on progress made to date in the UK across these areas which demonstrates significant progress in the area of energy generation, but that there is much more to do to accelerate towards the target across the economy

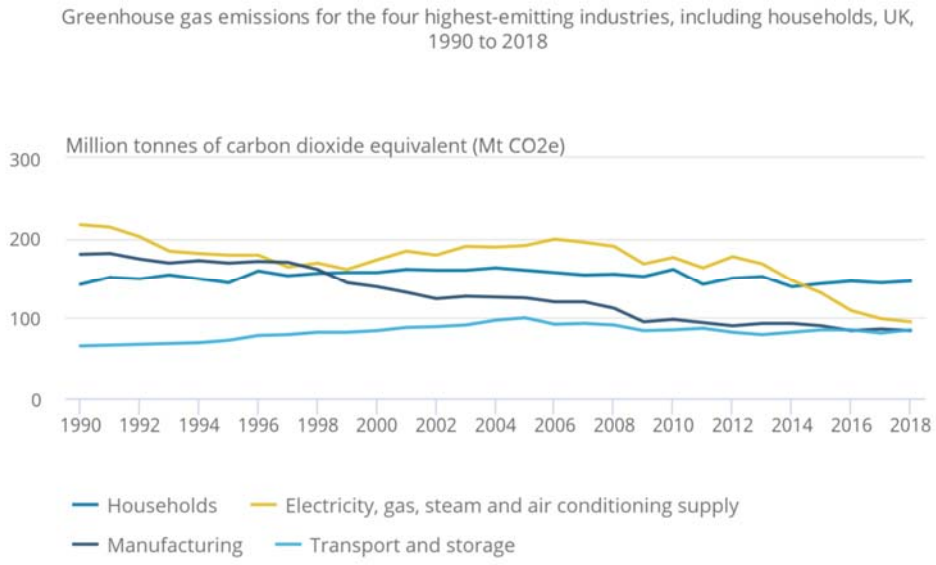

Figure 1 Source: ONS Environmental accounts 2020

[3] The target is to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels by 2050. Prior to this, the UK was committed to reducing net greenhouse gas emissions by at least 80% of their 1990 levels, also by 2050. Net zero refers to achieving a balance between the amount of greenhouse gas emissions produced and the amount removed from the atmosphere. There are two different complementary routes to achieving net zero: reducing existing emissions and actively removing greenhouse gases. The target recognises that there will be some emissions but that these need to be fully offset, predominantly through natural, and potential artificial, carbon sinks such as oceans and forests.

Sunderland's Low Carbon Agenda

2.3. In recognition of the Paris Accord, in March 2019 Sunderland City Council declared a climate emergency and agreed to the following motion:

"In recognition of the threat posed to our environment by climate change Sunderland City Council will declare a climate emergency. Numerous local authorities around the country have declared climate emergency and it is important for the Council to show it takes the issue seriously. Recent weather and changes in ecosystems show that we are already seeing changes as a result of climate change so it is important to join other councils in giving the issue suitable attention and clearly setting out how we will meet our targets on cutting emissions."

2.4. In addition, the Council has also signed the UK 100 Pledge, which is a commitment to shifting to 100% clean energy by 2050. It is therefore likely that the energy system will need to be decarbonised by 2050.

2.5. The Council with its partners is currently preparing a Low Carbon Framework and a Council Action Plan. These documents will establish how Sunderland will play its part in address the impacts of Climate Change.

3. Policy Context

3.1. When identifying an appropriate methodology for the identification of suitable locations for wind energy development, it is essential that the national and local policy frameworks and planning guidance requirements are understood.

National Planning Policy

3.2. A Written Ministerial Statement was issued by the Secretary of State for Communities and Local Government on 18 June 2015, regarding wind turbine development. The statement required that local planning authorities should only grant planning permission for wind energy development proposals if the development site is in an area identified as suitable for wind energy development, as identified in a Local or Neighbourhood Plan. This statement was then transposed into national policy.

3.3. The NPPF promotes a proactive approach to mitigating and adapting to climate change, with an overall goal to help increase the use and supply of renewable and low carbon energy. Paragraphs 151 to 154 set out the policy requirements for Local Plans and the determination of planning applications. The NPPF states that plans should:

- Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

3.4. The NPPF (paragraph 154) further sets out the approach to determining planning applications for renewable and low carbon development, citing that local planning authorities should:

- Not require applicants to demonstrate the overall need for renewable or low carbon energy and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
- Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

3.5. However, the NPPF makes clear at footnote 49, that there are exceptions to approvals. These include:

- applications for the repowering of existing wind turbines;
- a proposed wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan; and
- following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing.

- applications for the repowering of existing wind turbines;
- a proposed wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan; and
- Following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing.

3.6. The NPPF makes explicit reference to the approach local planning authorities should take through their plans with regard to potential wind energy development. Paragraph 148 of the NPPF states that the planning system should "*support the transition to a low carbon future in a changing climate…it 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.*"

Planning Practice Guidance

3.7. The National Planning Practice Guidance (PPG) Renewable and Low Carbon Energy (updated June 2015) suggests that when identifying suitable areas for renewable energy and in considering locations, local planning authorities will need to ensure they take into account the requirements of the technology and critically, the potential impacts on the local environment, including from cumulative impacts.

3.8. The PPG provides guidance to the approach that local planning authorities should take when identifying potential suitable areas. However, it makes clear that "*there are no hard and fast rules about how suitable areas for renewable energy should be identified".* The PPG suggests that when considering potential suitable locations, planning authorities should "*ensure they take into account the requirements of technology and critically, the potential impacts on the local environment, including cumulative impacts. The views of local communities likely to be affected should be listened to.*"[4]

3.9. The Department of Energy and Climate Change provides a methodology to assist local planning authorities when assessing capacity for renewable energy development which can be used along with existing local assessments. However, the PPG acknowledges that the impacts of some types of renewable energy technologies, such as wind turbines, may have changed since they were drawn up. Therefore, impact considerations should use tools to assess where impacts are likely acceptable. For example, landscape character areas could form the basis for considering which technologies at which scale may be appropriate in different types of location.

3.10. The NPPF and PPG are clear that when assessing planning applications for wind turbines, a planning application "*should not be approved unless the proposed development site is an area identified as suitable for wind energy development in a Local or Neighbourhood Plan*"[5]. It goes

[4] PPG Renewable and Low Carbon Energy - Paragraph: 005 Reference ID: 5-005-20150618
[5] PPG Renewable and Low Carbon Energy - Paragraph: 032 Reference ID: 5-032-150618

on to state that "*Suitable areas for wind energy development will need to have been allocated clearly in a Local or Neighbourhood Plan. Maps showing the wind resource as favourable to wind turbines or similar will not be sufficient*"[6].

3.11. The views of local communities likely to be affected should also be listened to (para 005). The PPG suggests that in considering impacts, assessments can use tools to identify where impacts are likely to be acceptable. For example, landscape character areas could form the basis for considering which technologies at which scale may be appropriate in different types of location (para 005). The PPG states that suitable areas for wind energy development will need to have been allocated clearly in a Local or Neighbourhood Plan. Maps showing the wind resource as favourable to wind turbines or similar will not be sufficient. Para 006 of the NPPG also sets out technical considerations for wind energy developments such as proximity to grid connections and air safeguarding.

3.12. Para 007 of the PPG highlights the positive role criteria based policies on renewable energy can play. Paragraphs 014-032 of the PPG set out the main planning considerations for wind energy developments and the approach to public consultation required for such proposals.

3.13. Overarching National Policy Statement for Energy (EN-1) and National Policy Statement for Renewable Energy Infrastructure (EN-3) also set out a range of impacts which should be considered in relation to energy infrastructure and in particular to onshore wind turbines. These considerations have been taken into account when establishing the methodology for determining the strategically designated areas which are potentially suitable for wind energy development and also in the criteria contained within the supporting draft Local Plan policy which will help to assess these key considerations at a localised level.

3.14. In summary, the NPPF and PPG advocate the identification of potential suitable sites for wind energy development to ensure onshore provision of wind turbines can be facilitated and secured through the planning system. This will assist to secure the maximum renewable energy capacity possible for a local authority area.

Sunderland Local Plan

3.15. The CSDP sets out the strategic policies for renewable energy developments. Policy WWE1: Decentralised, renewable and low carbon energy, seeks to encourage and support renewable and low carbon energy development across Sunderland. However, it does not identify potential suitable areas for such technologies to be erected. The supporting text of policy WWE1 specifies that the A&D Plan will identify potential areas, where appropriate. This report will assist the Council to determine whether it is appropriate to identify potential areas for wind energy development in the A&D Plan.

[6] NPPG Renewable and Low Carbon Energy - Paragraph 032 Reference ID: 5-032-150618

4. Background

4.1. This section of the report provides a narrative of the wind energy development delivered or in the pipeline in Sunderland and the progress and studies undertaken into wind energy potential in Sunderland to date.

Current wind energy development in Sunderland

4.2. There are two operational wind farms within Sunderland authority area. These are Nissan Wind Farm and Great Eppleton Wind Farm. Nissan Wind Farm accommodates 10 turbines at 73m (blade to tip) and Great Eppleton accommodates 4 turbines at 115m in height (blade to tip). Over the last 12 years Sunderland Council has approved eleven planning applications for 14 wind turbines ranging in height from 15m to 100m (as shown on Figure 2). Consented wind turbines have historically not been monitored through to their completion. Therefore it is assumed that the turbines consented since 2008 have been built and are also operational.

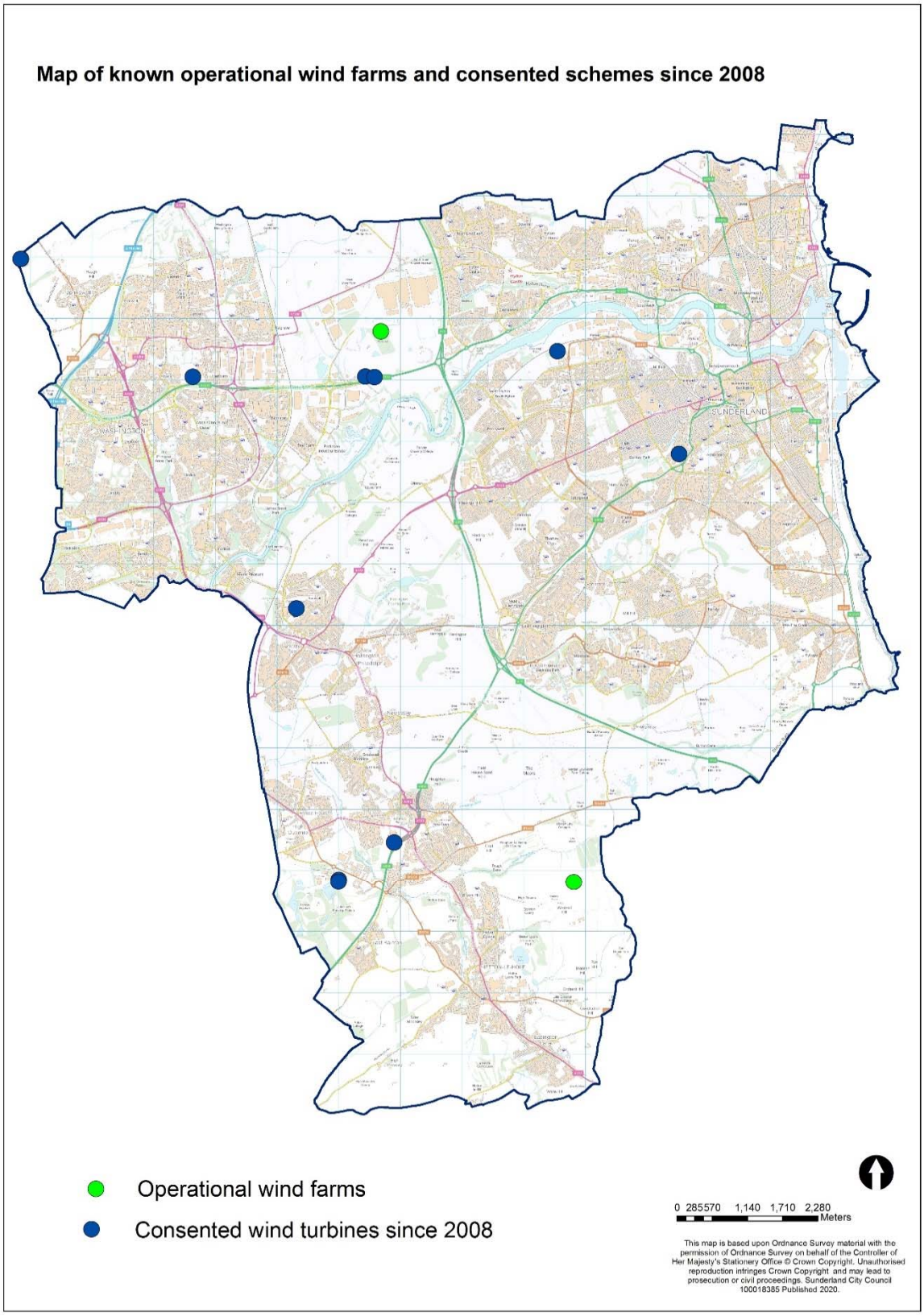

Figure 2 Map of known operational wind farms and consented schemes since 2008.

4.3. The wind turbines range in size from small micro turbines providing electricity for individual properties to large turbines supplying electricity to the national grid.

Previous approaches to identifying capacity

4.4. A detailed assessment of the potential for commercial scale wind energy was carried out as part of the North East Renewable Energy Strategy (NERES) which informed the development of spatial policies for onshore wind in the now revoked North East Regional Spatial Strategy 2008 (NERSS)[7]. This assessment included a landscape sensitivity study, the Landscape Appraisal for Onshore Wind (GONE, 2003) undertaken by the Landscape Research Group at the University of Newcastle (LRG), a GIS based constraints mapping exercise undertaken by the Centre for Environmental and Spatial Analysis at the University of Northumbria (CESA) and a grid capacity study undertaken by PB Power.

4.5. The Landscape Appraisal (GONE 2003) assessed the sensitivity of the landscape to onshore wind development in respect of a range of physical and perceptual criteria. The appraisal was based on landscape types identified in the National Landscape Typology (draft) produced by the Countryside Agency (now Natural England), modified in places to reflect local landscape character assessments.

4.6. Informed by these studies, the North East Regional Spatial Strategy (NERSS) identified a number of 'Broad Areas of Least Constraint' across the region which were identified in Policy 41 and shown as W symbols on the accompanying maps. Sunderland was identified as an area where small wind farms would be supported in urban areas and on the urban rural fringe. However, the NERSS left the specifics of the locations of small wind farms for the Sunderland Local Development Framework to identify.

4.7. In 2015, Sunderland City Council commissioned a Wind and Solar Landscape Sensitivity Report[8]. This report identified the landscape sensitivities of different landscape typologies to new wind turbine development within the city and looked at wind turbines of 30 metres and above. It specifically considered the suitability in terms of landscape sensitivity in line with the NPPF (2012) and while it made broad conclusions where development may be considered suitable, it caveated this by stating that individual applications would need to be considered in more detail in terms of other potential constraints (individually and/or cumulatively).

4.8. It concluded that the majority of the Sunderland is of moderate or higher landscape sensitivity to wind energy development, particularly at larger scales. This reflects the generally smaller scale of the landscapes in and around Sunderland and the high visibility and visual prominence of large wind turbines from residential areas. When considering large turbines (over 100m to tip), only the Clay Plateau typology was considered to have less than high sensitivity. However, the report noted that there was limited scope for further development in this area due to operational turbines and the potential for cumulative effects.

4.9. The report concluded that when considering medium turbines (50-100m to tip) it was assessed that the Coalfield Lowland Terraces and Urban Limestone Gorge typologies were of moderate sensitivity in part due to the strong human influence in these landscapes. Locally, this human influence also lowered the sensitivity of the Sunderland Docks, although other parts of the Limestone Coast typology are more sensitive.

[7] The North East of England Plan Regional Spatial Strategy to 2021 (Government Office for the North East, July 2008)
[8] Sunderland Wind and Solar Sensitivity Report (2015) https://www.sunderland.gov.uk/media/20446/Sunderland-Wind-and-Solar-Landscape-Sensitivity-Assessment-2015-/pdf/55_Sunderland_Wind_and_Solar_Landscape_Sensitivity_Assessment_(2015).pdf?m=636646148167630000

4.10. Several areas of moderate or lower sensitivity to small wind turbines (30-50m) were identified. The report concluded that this was due to the reduced potential for conflict between smaller turbines and the medium-scale landscapes. Typologies including the Incised Lowland Valley, Limestone Escarpment and Limestone Coast are of high-medium sensitivity to small turbines, due to their more intricate character and greater visual prominence (See Figures 3 & 4).

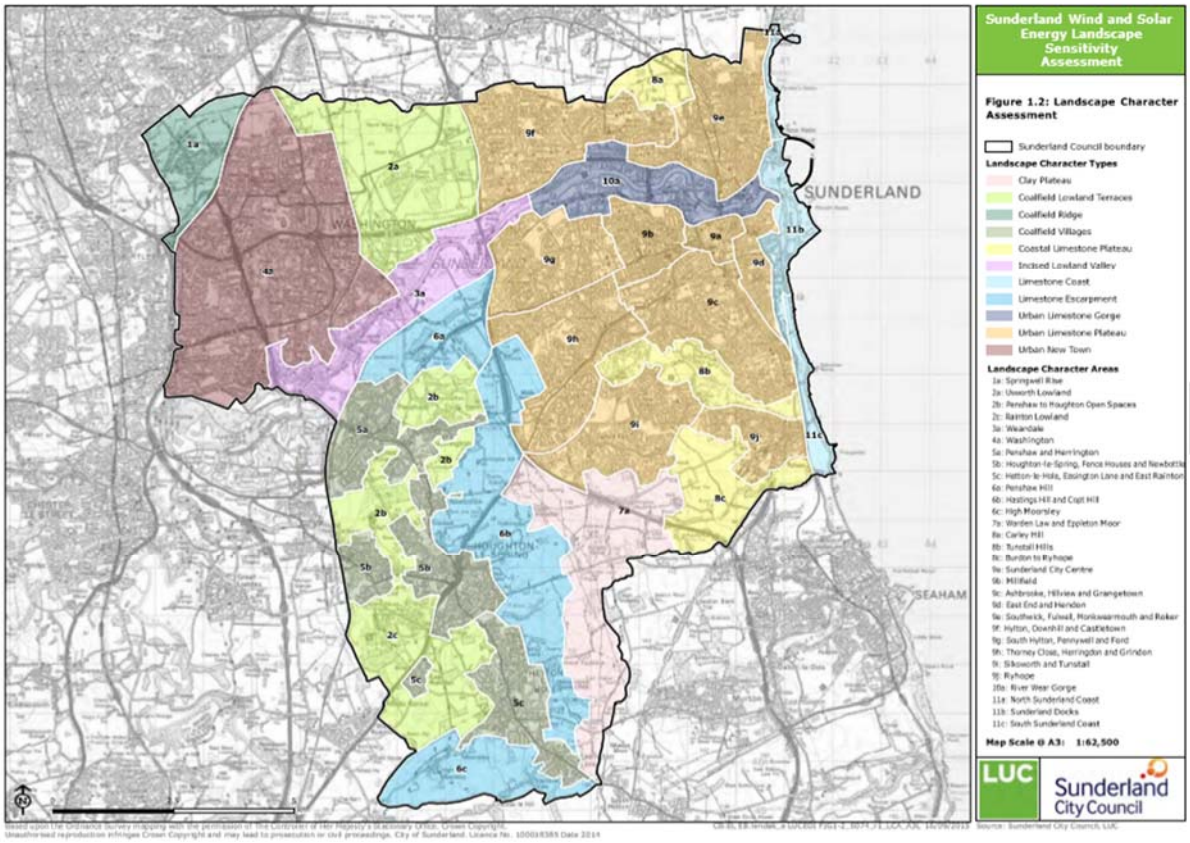

Figure 3 Sunderland Wind and Solar Energy Landscape Sensitivity Assessment

LCT	Sensitivity to small wind turbines (30-50m)	Sensitivity to medium wind turbines (50-100m)	Sensitivity to large wind turbines (over 100m)
1. Coalfield Ridge	M	H	H
2. Coalfield Lowland Terraces	ML	M	H
3. Incised Lowland Valley	HM	H	H
6. Limestone Escarpment	HM	H	H
7. Clay Plateau	M	M	HM
8. Coastal Limestone Plateau	M	H	H
10. Urban Limestone Gorge	ML	M	H
11. Limestone Coast	HM	H	H

L: Low **ML**: Moderate-low
M: Moderate **HM**: High-moderate
H: High

Figure 4 Sunderland Wind and solar Energy Landscape Sensitivities

4.11. Whilst the Wind and Solar Landscape Sensitivity Report made recommendations regarding the landscape sensitivity relative to the landscape types in Sunderland, it did not go as far as to map out further specific constraints that may also impact on wind turbine locations suitability. Therefore, in line with current PPG it is necessary to build on this evidence base through the use of constraints mapping to establish suitable potential sites for onshore wind energy schemes.

5. Methodology

5.1. This section outlines the methodological approach applied to establish the potential suitable locations for wind turbines in Sunderland, through the application of constraints mapping.

Constraints

5.2. The location and design of wind energy development can be constrained by a wide range of factors. Some of these can be readily mapped using data and modelling in Geographic Information Systems (GIS). Other factors are more difficult to model or can only be assessed on the basis of detailed site-specific investigations. Mapping data in GIS has its technical limitations but can give a useful understanding of the spatial distribution of development constraints. Constraints mapped in this study are shown in Table 2 and are further justified below.

5.3. Please note that constraints have been modelled based on a mid-point height for a range of wind turbine heights. The mid-point height should not be used instead of the recommended calculation, which should always be applied for each turbine proposal that is being determined. For the purposes of large 100m+ turbines, a mid-point of 115m has been applied for mapping purposes.

Constraint	Mapped Feature	Justification
Railways, motorways and trunk roads	1.5 turbine height from feature.	Reflects Department of Transport guidance. This reflects the potential consequences of toppling and debris scatter to nationally important infrastructure.
A, B roads	Turbine height +10% from feature.	The value of turbine height + 10% for A, B and C class roads reflects previous government advice (Planning for Renewable Energy: A companion Guide to PPS22, paragraph 53) of 'at least fall over distance'.
High voltage power lines	Turbine height +10% from feature.	Reflects the utilities provider recommendations.
High pressure gas pipelines	1.5 x turbine hub height from feature.	Reflects the utilities provider recommendations.
Public rights of way (Bridleways & footpaths) and council designated multi user routes	1.5 x turbine height from bridleways and Multi-User Route (MUR).	The value of 1.5 x turbine height from routes is influenced by the advice of the British Horse Society and safety measures required for public rights of way which usually adopt the value of rotor radius plus set back, to avoid rotors over sweeping paths. This is modelled for public bridleways, multi-user paths and public rights of way.
Residential address	4 X turbine height from address point.	Distance is based on previous planning decisions and the approaches taken by other urban authorities such as Hull Council. Large moving structures that are in close proximity to a residential property can be overbearing or oppressive and may render a property an unattractive place to live and this will be a material planning consideration. The specific

		impact may be in respect of noise, shadow flicker and visual dominance.
Protected wildlife areas (international, national and local)	Avoid designated features.	Variety of protections including Wildlife & Countryside Act 1981, Natural Environment & Rural Communities Act 2006 and the 2019 National Planning Policy Framework.
Watercourses	Avoid rivers and waterbodies and include a 50m buffer.	A 50m buffer has been applied around all rivers and waterbodies to take account of good practice such as pollution control during construction.
Conservation Areas, Historic Parks and Gardens, Scheduled Ancient Monuments	Avoid designated features.	National Planning Policy Framework.
Areas identified for landscape protection (higher landscape value)	Avoid areas of landscape protection.	Sunderland Core Strategy and Development Plan acknowledges that areas designated for landscape protection are classed as representing higher landscape value.
Wind speed	Exclude sites below 5m/s 45m above ground level.	The Department of Energy and Climate Change Methodology (2010) recommends using 5m/s.
Additional constraint considerations		
Green Belt	Avoid designated Green Belt for all wind turbines >25m in height.	The National Planning Policy Framework states that development of wind turbines can affect the openness of the Green Belt and may constitute inappropriate development. This is to be considered on a case-by-case basis.
MOD metrological radar at High Moorsley	MOD must be consulted on potential wind turbine activity, on any site within 1km of radar and dependent upon the scale of turbine proposed across the city.	On higher ground, MOD consultation is required for turbines over 15m in height. Elsewhere, consultation may be required for 45m high turbines, or 91m high turbines at the lowest altitude locations in the city. This will be considered as part of this study, but not act as a showstopper to development**.**
30km zone Newcastle Airport	This affects parts of northern Washington only.	This will be considered as part of this study, but not act as a showstopper to development.
Protected wildlife species	Need to be considered on a case-by-case basis.	To be considered on a case-by-case basis.

Table 2 Constraints to wind energy development

Wind Speed

5.4. In order for a wind turbine to be economically viable, it is necessary that these sites are in locations where the wind speed is sufficient to rotate the rotary blade. With wind turbines the mean wind speed at hub height will determine the energy captured at a site.

5.5. The PPG does not prescribe wind speed limits to apply in the assessment of potential locations for wind turbine development, so it is necessary to establish a limit for Sunderland through a review of previous guidance and methodologies.

5.6. The Department of Energy and Climate Change produced a methodology in 2010[9] which recommended applying a lower limit of 5m/s measured at 45m above ground level to ensure optimum wind speeds and turbine scheme feasibility. Combined with data mapped by the Government's Numerical Objective Analysis Boundary Layer (NOABL) Wind Map[10] local authorities can observe estimated predictions for wind speeds at 45 metres above ground level, across 1km distances within the UK. This data is not presented at local authority level but does provide an indication of wind speeds within a 1km boundary.

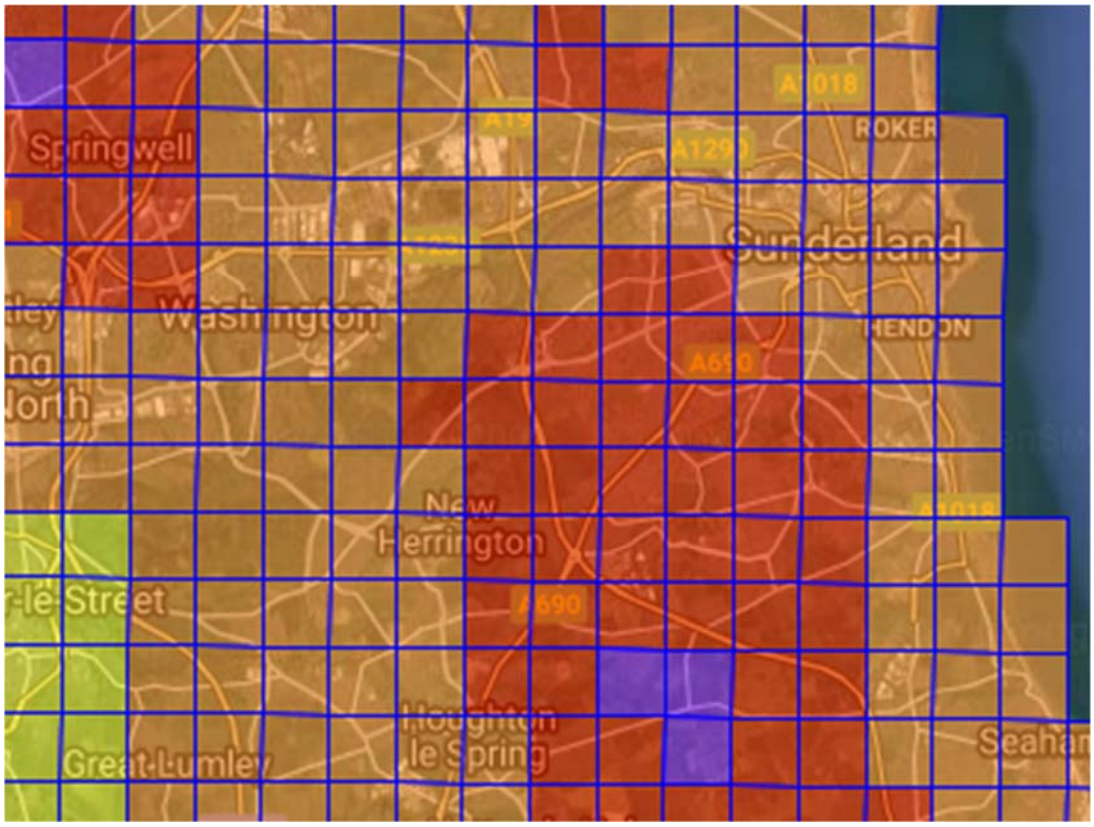

Figure 5 Constraints to onshore wind energy development

5.7. Figure 5 presents a screenshot from the NOABL Wind Map, which demonstrates that the 5m/s wind speed limit can be observed across the Sunderland local authority area, with higher wind speeds sustained in the Coalfield, South Sunderland and Washington areas identified in red. When postcode data is entered into the NOABL Wind Map for areas located within locations coloured orange, there is a seasonal variation in windspeed which observes mean wind speeds above 5m/s during Autumn and Winter and below this limit of 4m/s during the Spring and Summer. Therefore, whilst the mean wind speed limit can be achieved there may be seasonal variation impacts which determine whether a developer considers the site suitable and

[9] DECC Renewable and Low-carbon Energy Capacity Methodology: Methodology for English Regions. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/226175/renewable_and_low_carbon_energy_capacity_methodology_jan2010.pdf

[10] https://www.rensmart.com/Maps#NOABL

economically viable for wind turbines. However, given that there are operational wind turbines within these zones at present, orange areas do not warrant identification as a constraint at this point in time. This would be a matter for a developer to consider when assessing the suitability of sites for wind turbines at the planning application stage. Thusly, there are no locations within Sunderland that can be excluded solely on the basis of wind speed feasibility.

Railways, motorways and trunk roads

5.8. The Department of Transport (DoT) and the Highways Agency recommend set back distances for wind turbines from the highway boundary of the turbine height +50 metres, or 1.5 times the wind turbine height, whichever is the lesser. This reflects the potential consequences of toppling and debris scatter to nationally important infrastructure, even though the risks are generally considered to be low. For the purposes of the constraints mapping, a calculation of 1.5 times the turbine height has been applied using a mid-point wind turbine height from the size range. These are detailed in Table 3.

	Micro/Small (11-30m)	**Small (31-50m)**	**Medium (51 – 100m)**	**Large (100m +)**
Mid point height	20m	40m	75m	115m
Strategic Road Network Buffer	30m	60m	113m	173m

Table 3 Strategic Road Network buffer according to wind turbine size

5.9. Network Rail do not advise on set back distances from the lineside. However, given their strategic transport function, the same set back distances have been applied to rail lines, as used for the Strategic Road Network, identified in Table 3 above.

A & B Roads

5.10. The local road network requires set back distances to ensure safety for road users. The PPG does not prescribe set back distances for A and B roads. However, previous government guidance, Planning for Renewable Energy: A Companion Guide to Planning Policy Statement 22, referred to an acceptable set back distance as being "at least fall over distance"[11]. Therefore, an appropriate buffer for the local road network has been applied to the constraints mapping, which is calculated based on the turbine height plus 10%. Table 4 details the buffer applied in the constraints mapping using a mid-point wind turbine height from the size range.

	Micro/Small (11-30m)	**Small (31-50m)**	**Medium (51 – 100m)**	**Large (100m +)**
Mid point height	20m	40m	75m	115m
Local Road Network Buffer	22m	44m	83m	127m

Table 4 Local Road Network buffer according to wind turbine height

High voltage power lines

5.11. High voltage power lines can prove a constraint to the location of wind turbines. Toppling distance and wake effects need to be taken into full consideration. Whilst wind turbine toppling is a low risk, the potential siting of a turbine could cause effects to high voltage

[11] Paragraph 53

power infrastructures. Wake downwind of a turbine affects wind speeds and can have significant effects on overhead line conductors if not considered fully, potentially causing levels of motion and in extreme cases, conductor clashing.

5.12. In line with utility providers advice, high voltage power lines have been considered and a buffer calculated using the turbine height plus 10% has been applied from the mapped power line feature, using a mid point wind turbine height from the size range. Table 5 details the buffers applied for high voltage power lines.

	Micro/Small (11-30m)	Small (31-50m)	Medium (51 – 100m)	Large (100m +)
Mid point height	20m	40m	75m	115m
High voltage power line Buffer	22m	44m	83m	127m

Table 5 High voltage power lines buffer according to wind turbine height

High pressure gas pipelines

5.13. Similar to the approach taken for power lines, high pressure gas lines have incorporated a buffer based upon gas utility provider recommendation. A buffer calculated using the 1.5 times the turbine height has been applied from the mapped high pressure gas line feature, using a mid point wind turbine height from the size range. Table 6 details the buffers applied for gas lines.

	Micro/Small (11-30m)	Small (31-50m)	Medium (51 – 100m)	Large (100m +)
Mid point height	20m	40m	75m	115m
High Pressure Gas Line Buffer	30m	60m	113m	173m

Table 6 High pressure gas line buffer according to wind turbine size

Rights of Way (footpaths and Bridleways) and multi-user routes

5.14. There is no statutory separation distance or guidance issued citing best practice for separation distances from public rights of way. The value of rotor radius for public footpaths is commonly adopted, set-back to avoid rotors over-sweeping a path. This is primarily adopted to avoid intimidating footpath users rather than as a safety buffer.

5.15. In regard to bridleways, some guidance is available on the matter, however this is non statutory guidance, produced by the British Horse Society to assist developers and planners to plan for wind turbines. The guidance recommends that 3x turbine height from equestrian routes or 200m, whichever is the greater, would be appropriate separation distances to apply to equestrian routes to reduce issues such as shadow cast, blade shadow and flicker on routes and anemometer noise. However, the British Horse Society acknowledges that "every site is different and a blanket approach to all situations may be excessively restrictive for some sites[12]".

[12] https://www.bhs.org.uk/advice-and-information/free-leaflets-and-advice Wind Turbine Guidance for Developers and Planners

5.16. Taking account of the variation in guidance and the individual environmental and site considerations that should be considered when assessing a site's suitability for wind energy, the Council does not consider it appropriate to apply an overly restrictive separation distance at this stage of the process, when such matters will be considered at the detailed planning application stage. Therefore, a separation distance of 1.5x the turbine height, has been modelled for these routes to allow for safety, topple distances and animal welfare concerns, with a view that individual site considerations and separation distances from routes will be taken into account when a detailed planning application is submitted. Table 7 identifies the buffers for routes applied by using a mid point wind turbine height from the size range.

	Micro/Small (11-30m)	Small (31-50m)	Medium (51 – 100m)	Large (100m +)
Mid point height	20m	40m	75m	115m
Bridleways, MUR, PROW Buffer	30m	60m	113m	173m

Table 7 Public bridleways, MUR and PROW according to wind turbine size

Residential

5.17. In terms of buffer zones/separation distances between renewable energy development and other land uses, the PPG advises that otherwise acceptable renewable energy developments should not be ruled out through inflexible rules on buffer zones or separation distances[13]. Distance is part of the assessment but the local context such as the topography, the local environment and near-by land-uses are also very important. However, set-back distances for safety are the exception to this.

5.18. Fall over distance, the height of the turbine to the tip of the blade, is often used as a safe separation distance between buildings and wind turbines. The PPG suggests a fall over distance plus 10% as a safe separation distance[14], but it does not take into account expected noise levels or visual impact of a turbine.

5.19. The impacts of noise and visual amenity will depend on the size and scale of the wind turbine proposal. However, as a proxy for the kinds of distances within which effects of visual amenity or noise will often preclude development of turbines, a calculation of 4 times the turbine height has been applied to the constraints mapping at each address point for existing development, or from the boundary of planned development as identified in the Core Strategy and Development Plan and emerging Allocations and Designations Plan. Table 8 identifies the residential buffer applied to the size categories of wind turbine using a mid-point wind turbine height from the size range.

	Micro/Small (11-30m)	Small (31-50m)	Medium (51 – 100m)	Large (100m +)
Mid point height	20m	40m	75m	115m
Residential Buffer	80m	160m	300m	460m

Table 8 Residential Buffer according to wind turbine size

[13] Paragraph: 008 Reference ID: 5-008-20140306
[14] Paragraph: 016 Reference ID: 5-016-20140306

Protected wildlife areas (international, national and local)

5.20. European protected sites including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), nationally designated sites including Sites of Special Scientific Interest (SSSIs), Local Wildlife Sites (LWS) have been identified and modelled as constraints. In most cases potential effects would preclude development within these areas, therefore the discounted area has been applied to the designation only.

Watercourses

5.21. In order to ensure good practice and prevent pollution during the construction process effecting nearby watercourses, a buffer of 50m has been applied to all rivers and watercourses to ensure hydrology and ecology of these features is preserved.

Conservation Areas, Historic Parks and Gardens & Scheduled Ancient Monuments

5.22. The NPPF makes clear that the loss or harm to designated heritage assets from development within its setting should be resisted unless it can be demonstrated that the substantial harm or total loss is necessary to achieve substantial public benefits that outweigh the harm or loss[15]. The Core Strategy and Development Plan further supports this approach through policy WWE1, which seeks to avoid the unacceptable significant adverse impacts on heritage assets. On this basis, the designated areas of scheduled ancient monuments, conservation areas and historic parks and gardens have been accounted for as a constraint in the mapping process. However, the effects on the setting area is a matter for detailed assessment, therefore no separation distances have been identified from the boundary of the designation. Turbine effects on the setting of a heritage designation and the substantial harm or public benefit it may have, will depend on the size and scale of the wind turbine proposal, which are matters for consideration when determining a planning application. Therefore, land identified with "potential suitability" for wind energy development within the setting of these designations, is not guaranteed planning permission and must conform to policy requirements, so that no significant harm to these designated heritage assets occurs.

5.23. Listed buildings are not mapped as a constraint as an effect on their setting is a matter for detailed assessment. Parks and Gardens of Local Interest are not mapped as a constraint as the designation includes a wide range of features and effects on their fabric or setting is a matter for detailed assessment.

Areas identified for landscape protections (higher landscape value)

5.24. The Core Strategy and Development Plan through policies NE9 and WWE1 seek to avoid the unacceptable significant adverse impacts of development on landscape. Valued landscapes in Sunderland equate to those areas highlighted in the city's Landscape Character Assessment (LCA) for 'landscape protection' only, which are also identified as areas of higher landscape value. These areas are applied to the constraints mapping to ensure higher landscape values are protected from wind turbine development.

Additional Constraint Considerations

5.25. Whilst there are clear lists of constraints that require protection from wind turbine development for technical, biodiversity, environmental or safety reasons, there are also some

[15] NPPF paragraph 194-195

constraints that require additional consideration as their impacts cannot be fully determined until the point of a detailed planning application is submitted.

Green Belt

5.26. The NPPF sets out the purposes of Green Belt within paragraph 134 as:

- To check the unrestricted sprawl of large built up areas;
- To prevent neighbouring towns merging into one another;
- To assist in safeguarding the countryside from encroachment;
- To preserve the setting and special character of historic towns; and
- To assist in urban regeneration, be encouraging the recycling of derelict and other urban land.

5.27. Sunderland's Green Belt forms part of a much wider Tyne and Wear Green Belt to the north and north-west of the city, as well as adjoining County Durham Green Belt to the south and south-west of Sunderland. The Green Belt purpose in relation to Sunderland is to check the unrestricted sprawl of the existing built-up area, which has been mapped in the CSDP to show such areas as Washington, Springwell Village, Houghton, Hetton and Shiney Row and the main built-up area of Sunderland (to the east of the A19). Proposals for development in the Green Belt are assessed in accordance with the NPPF and CSDP Policy NE6 Green Belt.

5.28. The NPPF makes provision for exceptions to development in the Green Belt in paragraphs 145 - 146. Engineering operations are listed as appropriate, providing they preserve the Green Belt's openness and do not conflict with the purposes of including land within it. The NPPF further goes on to state in paragraph 147 that elements of many renewable energy projects will comprise inappropriate development. However, in such cases developers will need to demonstrate very special circumstances if projects are to proceed, including the wider environmental benefits associated with increased production of energy from renewable sources.

5.29. Given the requirement of Local and Neighbourhood Plans to identify suitable areas for wind energy development, and the NPPF's requirement for developer's to demonstrate the very special circumstances for renewable energy schemes in the Green Belt, it is considered appropriate to exclude Green Belt from the constraints mapping, to enable full analysis of the potential suitable areas for wind energy developments in Sunderland. After all, the NPPF does not regard *all* renewable energy projects as inappropriate in the Green Belt. This approach will allow developers to demonstrate the very special circumstances for renewable energy projects in the Green Belt and assess the cumulative impacts of the proposed development on a case by case basis, when submitting a wind energy planning application.

Ministry of Defence sites

5.30. Wind turbines can adversely affect a number of Ministry of Defence (MOD) operations including radars, seismological recording equipment, communications facilities, naval operations and low flying. High Moorsley weather radar station is a MOD site which is located in the south west of the Coalfield, close to the Durham County Council border.

5.31. Developers and local planning authorities must consult with the MOD on potential wind turbines within a 1km boundary of a radar station. A 1km stand-off distance has been

identified through the constraints mapping to ensure High Moorsley radar station is not adversely affected by wind turbines in close proximity to the site (Figure 4).

5.32. The MOD may also require consultation for wind turbines located outside of the 1km stand off distance, for turbines which exceed specific height limits, across Sunderland. Figure 4? identifies the height limits and locations for turbines which would require MOD consultation. The requirement for MOD consultation is not a showstopper to wind turbine development per se, but a requirement to ensure MOD operations are not impacted. Therefore, no further buffers or areas of discount have been applied at this stage of the capacity assessment and will be dealt with during the consultation process should a planning application for wind turbines be submitted.

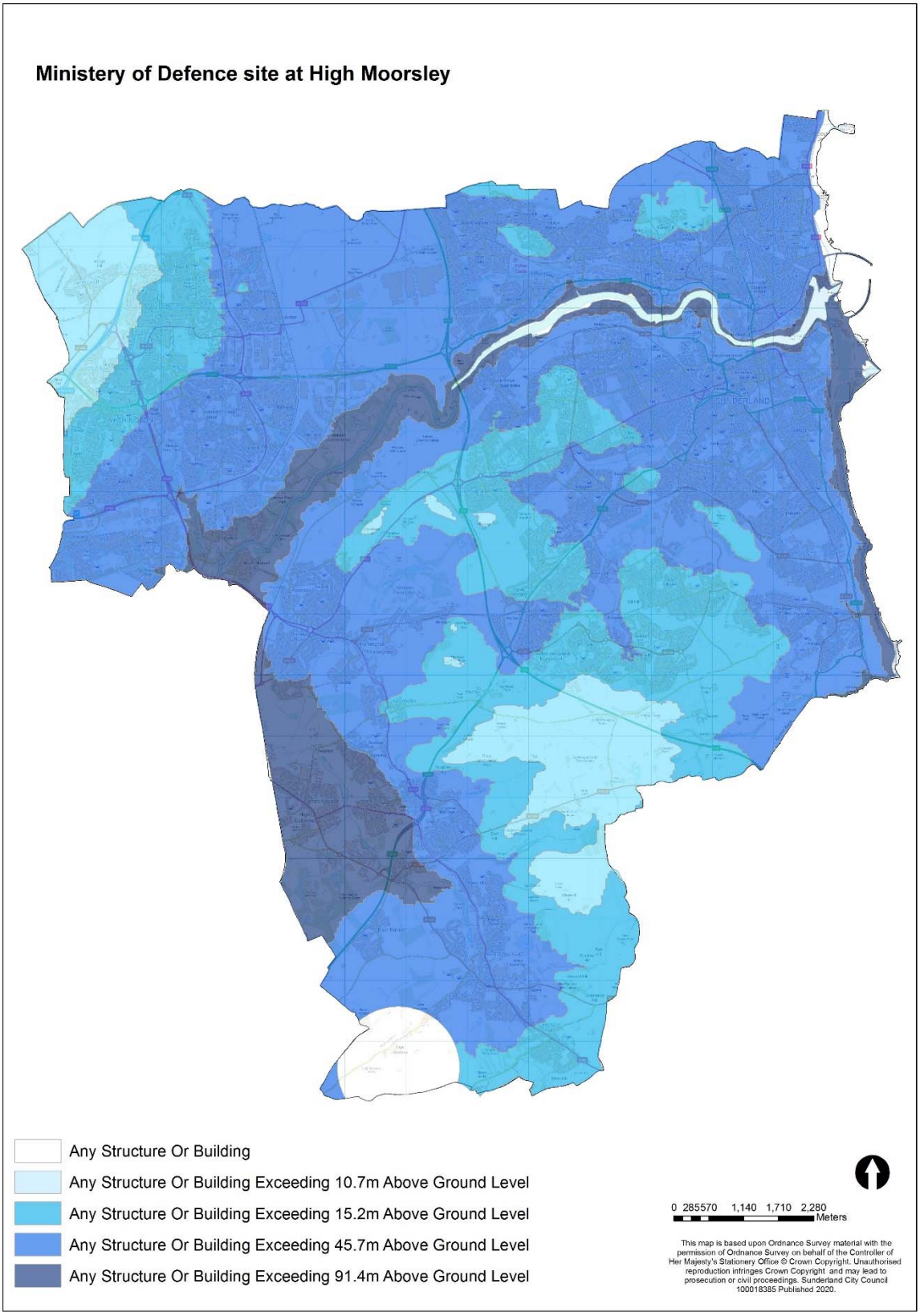

Figure 6 Ministry of Defence – High Moorsley 1km Zone

Newcastle Airport

5.33. Wind turbines may have an adverse effect on air traffic movement and safety. Firstly, they may represent a risk of collision with low flying aircraft and secondly, they may interfere with the proper operation of radar by limiting the capacity to handle air traffic and aircraft instrument landing systems. There is a 15 kilometre (km) consultation zone and 30km or 32km advisory zone around every civilian air traffic radar, although objections can be raised to developments that lie beyond the 32km advisory zone.

5.34. A 30km advisory zone has been digitised to identify the coverage across the local authority area and where consultation with Newcastle Airport would be required, should a wind turbine application be submitted. As can be seen from Figure 5 the 30km zone provides extensive coverage of the authority area. This constraint does not constitute a showstopper for wind turbine development in Sunderland, but has been mapped to show the extent of its coverage and highlight that wind turbine applications within this advisory zone, will require consultation with Newcastle Airport to avoid adverse impacts on air traffic movement and safety and radar operations.

Figure 7 Newcastle Airport 30km Advisory Zone

Protected wildlife species

5.35. Protected species are not mapped, as comprehensive data is unavailable and the consequences for any development would be a matter for detailed assessment as part of any subsequent planning application.

6. Constraints Mapping Outcomes

6.1. This section will outline the constraints mapping outcomes through a two staged, refinement process.

Combined Constraints Mapping Outcomes (Stage 1)

6.2. Building on the 2015 Wind and Solar Energy Landscape Sensitivity Assessment, sensitive landscapes were excluded as suitable areas for wind turbines. The combined effects of the constraints identified in section 5 of this report were then applied to the four wind turbine size groups for consideration and presented below (Figures 7 to 10). Tables 9 to 12 identify the constraints mapping buffers applied to each constraint. Visual impacts and potential cumulative effects of wind turbine development have not been modelled with the constraints.

6.3. The wind turbine size grouping from the 2015 Wind and Solar Landscape Sensitivity Report has been used with the addition of a smaller grouping of wind turbines ranging from 11 metres to 30 metres in size. This is in accordance with the PPG.

6.4. Wind turbines below 11.1 metres are exempt from this analysis. Sensitivity and constraints for micro turbines have not been assessed as building-mounted and stand-alone wind turbines of this size (<11.1m) benefit from permitted development rights other than in particular circumstances including within the curtilage of a Listed Building, within a site designated as a Scheduled Monument or on designated land (including Areas of Outstanding Natural Beauty and World Heritage Sites) other than Conservation Areas.

Micro Turbines (11m – 30m)

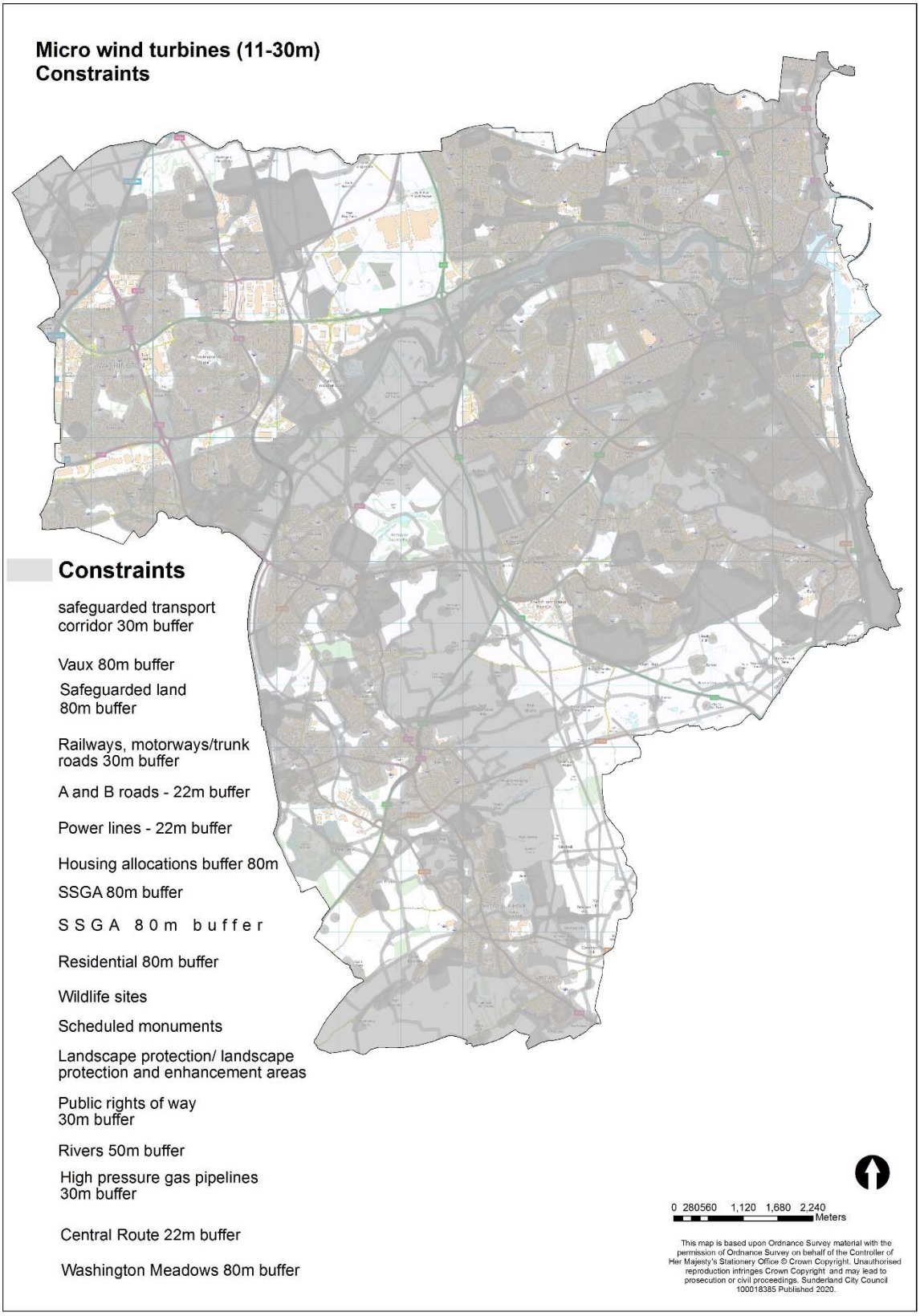

Figure 8 Micro Turbines Stage 1 Mapping

Constraint	Assumption	Micro Turbine Buffer (midpoint 20m)
Railways, motorways and trunk roads	1.5 turbine height from feature	30m
A and B roads	Turbine height +10% from feature.	22m
High voltage power lines	Turbine height +10% from feature.	22m
High pressure gas pipelines	1.5 x turbine hub height from feature	30m
Public bridleways and multi-user routes and PROW	1.5 x turbine height	30m
Residential address	4 X turbine height from address point	80m
Protected wildlife areas (international, national and local)	Avoid designated features	0m (designation only)
Watercourses	Avoid rivers and waterbodies and include a 50m buffer.	50m
Conservation Areas, Historic Parks and Gardens, Scheduled Ancient Monuments	Avoid designated features	0m (designation only)
Areas identified for landscape protection (higher landscape value)	Avoid areas of landscape protection	0m (designation only)

Table 9 Micro Turbines Constraint Buffers

Small Wind Turbines (31m - 50m)

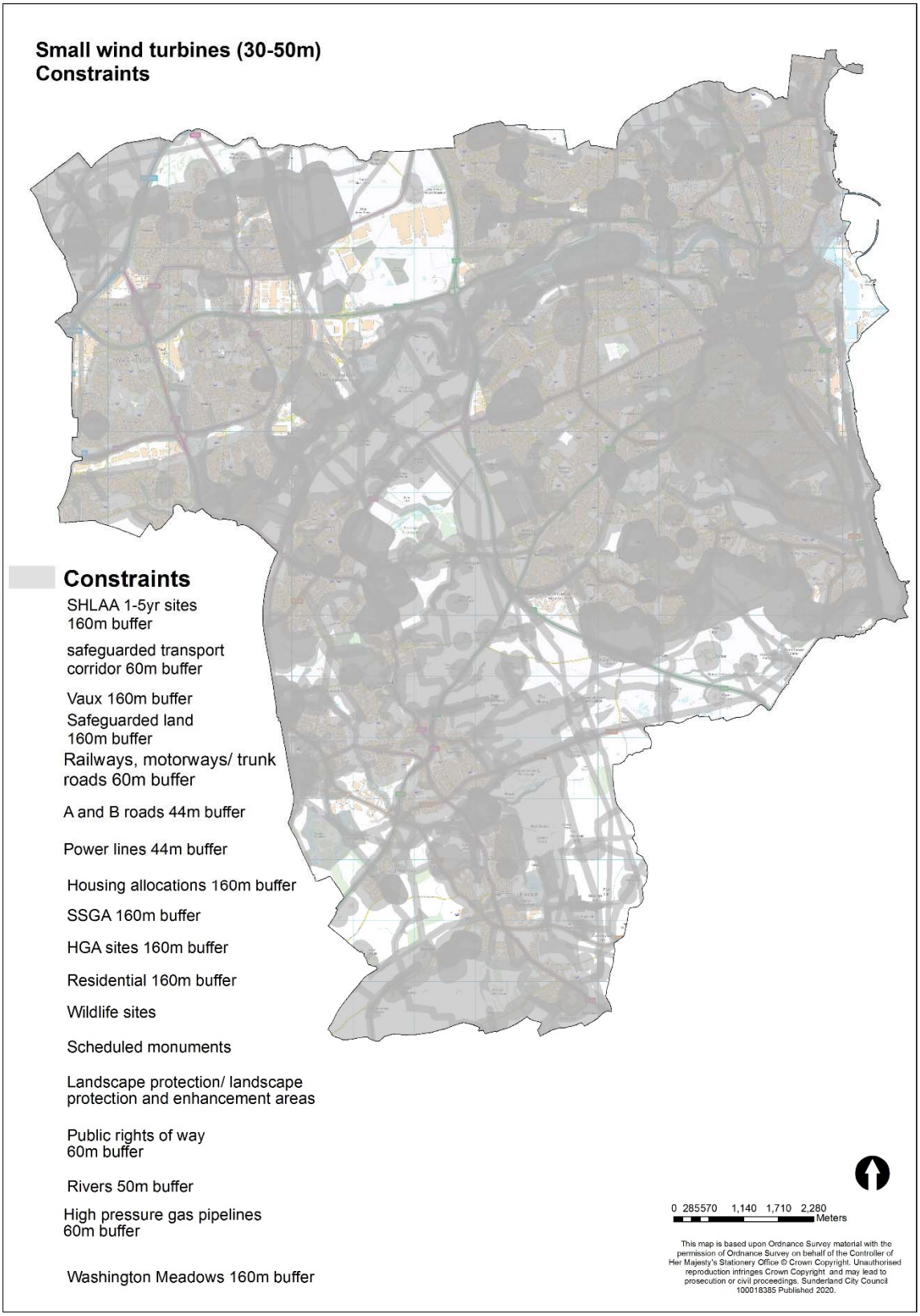

Figure 9 Small Turbines Stage 1 Mapping

Constraint	Assumption	Small Turbine Buffer (mid Point 40m)
Railways, motorways and trunk roads	1.5 turbine height from feature	60m
A and B roads	Turbine height +10% from feature.	44m
High voltage power lines	Turbine height +10% from feature.	44m
High pressure gas pipelines	1.5 x turbine hub height from feature	60m
Public bridleways and multi-user routes and PROW	1.5 x turbine height	60m
Residential address	4 X turbine height from address point	160m
Protected wildlife areas (international, national and local)	Avoid designated features	0m (designation only)
Watercourses	Avoid rivers and waterbodies and include a 50m buffer.	50m
Conservation Areas, Historic Parks and Gardens, Scheduled Ancient Monuments	Avoid designated features	0m (designation only)
Areas identified for landscape protection (higher landscape value)	Avoid areas of landscape protection	0m (designation only)

Table 10 Small Turbines Constraint Buffers

Medium Wind Turbines (51m - 100m)

Figure 10 Medium Turbines Stage 1 Mapping

Constraint	Assumption	Medium Turbine Buffer (mid point 75m)
Railways, motorways and trunk roads	1.5 turbine height from feature	113m
A and B roads	Turbine height +10% from feature.	83m
High voltage power lines	Turbine height +10% from feature.	83m
High pressure gas pipelines	1.5 x turbine hub height from feature	113m
Public bridleways and multi-user routes and PROW	1.5 x turbine height	113m
Residential address	4 X turbine height from address point	300m
Protected wildlife areas (international, national and local)	Avoid designated features	0m (designation only)
Watercourses	Avoid rivers and waterbodies and include a 50m buffer.	50m
Conservation Areas, Historic Parks and Gardens, Scheduled Ancient Monuments	Avoid designated features	0m (designation only)
Areas identified for landscape protection (higher landscape value)	Avoid areas of landscape protection	0m (designation only)

Table 11 Medium Turbines Constraint Buffers

Large Turbines (100m +)

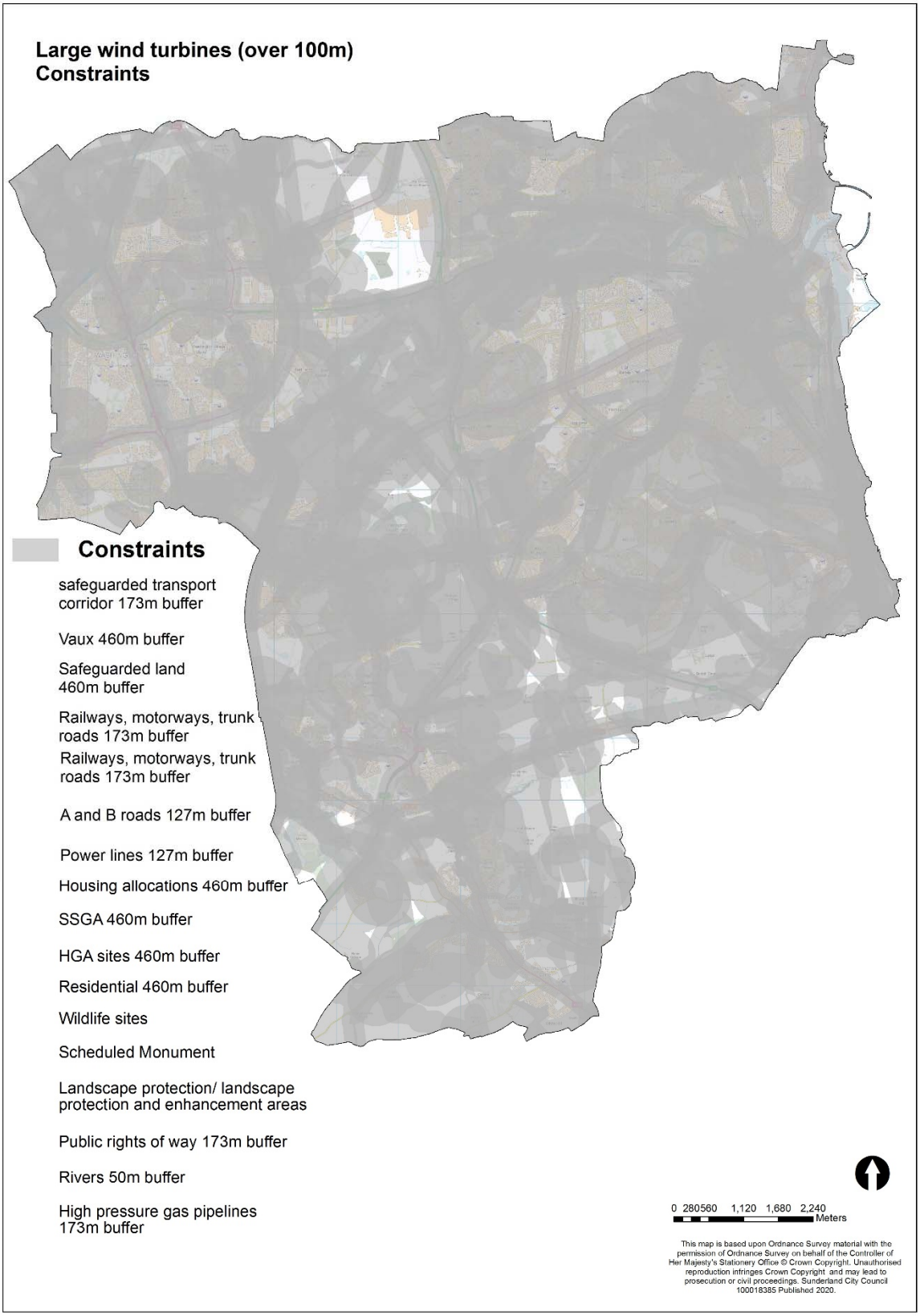

Figure 11 Large Turbines Stage 1 Mapping

Constraint	Assumption	Large Turbine Buffer (mid point 115m)
Railways, motorways and trunk roads	1.5 turbine height from feature	173m
A and B roads	Turbine height +10% from feature.	127m
High voltage power lines	Turbine height +10% from feature.	127m
High pressure gas pipelines	1.5 x turbine hub height from feature	173m
Public bridleways and multi-user routes and PROW	1.5 x turbine height	173m
Residential address	4 X turbine height from address point	460m
Protected wildlife areas (international, national and local)	Avoid designated features	0m (designation only)
Watercourses	Avoid rivers and waterbodies and include a 50m buffer.	50m
Conservation Areas, Historic Parks and Gardens, Scheduled Ancient Monuments	Avoid designated features	0m (designation only)
Areas identified for landscape protection (higher landscape value)	Avoid areas of landscape protection	0m (designation only)

Table 12 Large Turbines Constraint Buffers

Constraints Mapping Outcomes (Stage 2)

6.5. This section will outline the constraints mapping outcomes through a two staged, refinement process.

6.6. As can be seen in Figures 6, 7, 8 and 9 above, a significant number of sites are small in size and incidental to the constraints mapping process. A second stage sift was undertaken to identify land that was not suitable for wind energy development, this included but was not limited to, land that crossed C or estate roads, allotments, roundabouts or sites covered solely by a building which would be unable to accommodate a turbine. The Greenspace Audit was then analysed to identify parks and sports and leisure facilities that were inappropriate for wind energy development, which were subsequently removed as potential suitable areas for wind turbines.

6.7. Secondly, the map was reviewed for heritage impact. Roker Pier and its immediate area, were removed from potential suitable areas for wind energy development, as the pier is identified as a Designated Heritage Asset. Development of wind turbines on the pier would significantly affect the pier's heritage status. Its removal protects the asset from inappropriate development.

6.8. After the removal of sites where development was not physically possible, there remained a number of small and awkward shaped sites, which on planning judgement, were considered very unlikely to come forward due to their size and/or shape. In order to identify the most appropriate sites to remove, which fell into this category, the Council reviewed the land requirements for different types of wind turbines.

6.9. Unfortunately, there is no definitive guidance or statutory land requirements for wind turbines in England. The Scottish Government use a guide of 3-4 times the rotor blade height to calculate the separation distances between turbines in order to provide an estimate of the land required to build turbines[16]. Other anecdotal evidence suggests approximately 10-16 hectares per turbine is required for medium to large turbines[17]. In the absence of guidance and based on anecdotal evidence, a simple calculation of 4 times the rotor blade diameter for each category midpoint turbine height the has been applied to estimate the circumference distance around wind turbines and allow an estimated calculation to be made regarding the number of turbines that could potentially fit within a boundary (Table 13).

Category midpoint turbine height (metres)	Estimated rotor blade diameter (metres)	4x estimated rotor diameter (metres)
20m (micro)	20m	80m
40m (small)	40m	160m
75m (medium)	75m	300m
115m (large)	115m	460m

Table 13 Estimated rotor diameter to be used as a circumference separation distance between turbines

6.10. Spacing of turbines is very subjective and depends on, but is not limited to, the size of the turbine, the turbine technology available, wind direction, topology and visual impacts and will be a matter for a developer to identify the constraints of the site and the optimum number of wind turbines suited to a site. The estimated circumference distance is an approximation for the purposes of calculating an indicative number of turbines that could fit on potential suitable areas identified through the stage 1 and 2 constraints mapping process.

6.11. Analysis of the size of the remaining potential suitable areas for wind energy development indicated that land equal to or above 1.5 hectares for micro turbines and 2 hectares for small turbines, was capable of accommodating at least 1 wind turbine. Therefore, this site size threshold was applied to the constraints mapping and all sites below 1.5 hectares and 2 hectares for micro and small turbines respectively, were discounted from the constraints mapping as having potential for wind energy development. This discounted the majority of

[16] https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/
[17] https://www.renewableenergyhub.co.uk/main/wind-turbines/renting-land-for-wind-farms/

small and awkward shaped sites with potential for wind energy development within the respective turbine size categories.

6.12. Due to the significant buffers and separation distances applied at the stage 1 constraints mapping process and the removal of sites that were restricted by buildings, the number of potential areas available for medium and large turbines was significantly less compared to those available for micro and wind turbines. Those sites that remained for medium and large turbines were of sufficient size and shape, not to apply a site size threshold. Therefore, no thresholds have been applied for medium and large turbines at this point in time, although it is acknowledged that the land requirements for medium and large turbines to accommodate turbine separation distances and access requirements etc. will be significantly more than that required for micro and small wind turbines.

6.13. The results of the stage 2 constraints mapping process can be viewed in Figures 11 to 14 below, for each height category of wind turbine. An overall map displaying potential suitable areas for wind turbines is identified in Figure 15.

Micro Turbines (11m – 30m)

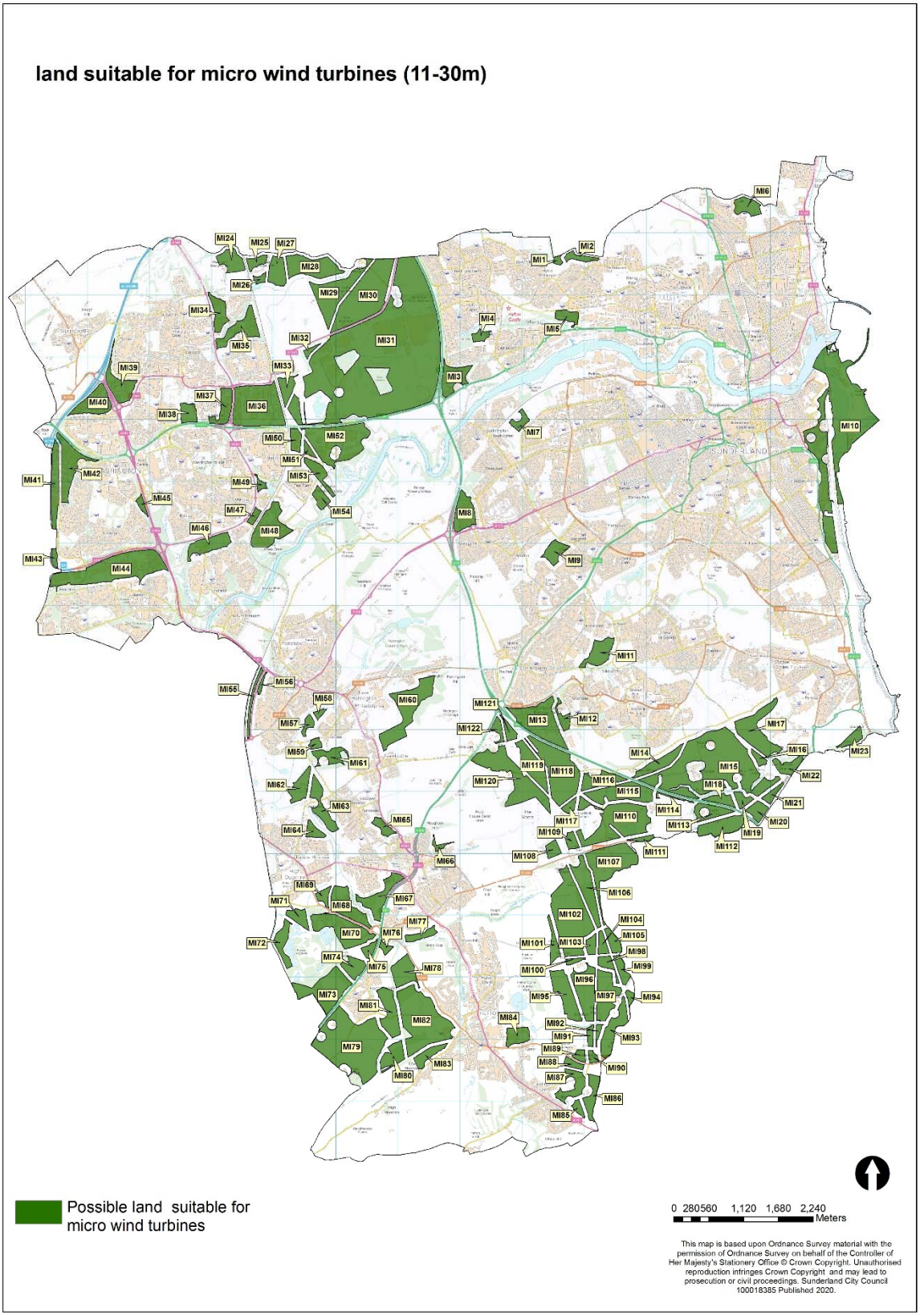

Figure 12 Land potentially suitable for micro wind turbines

Small Turbines (31m – 50m)

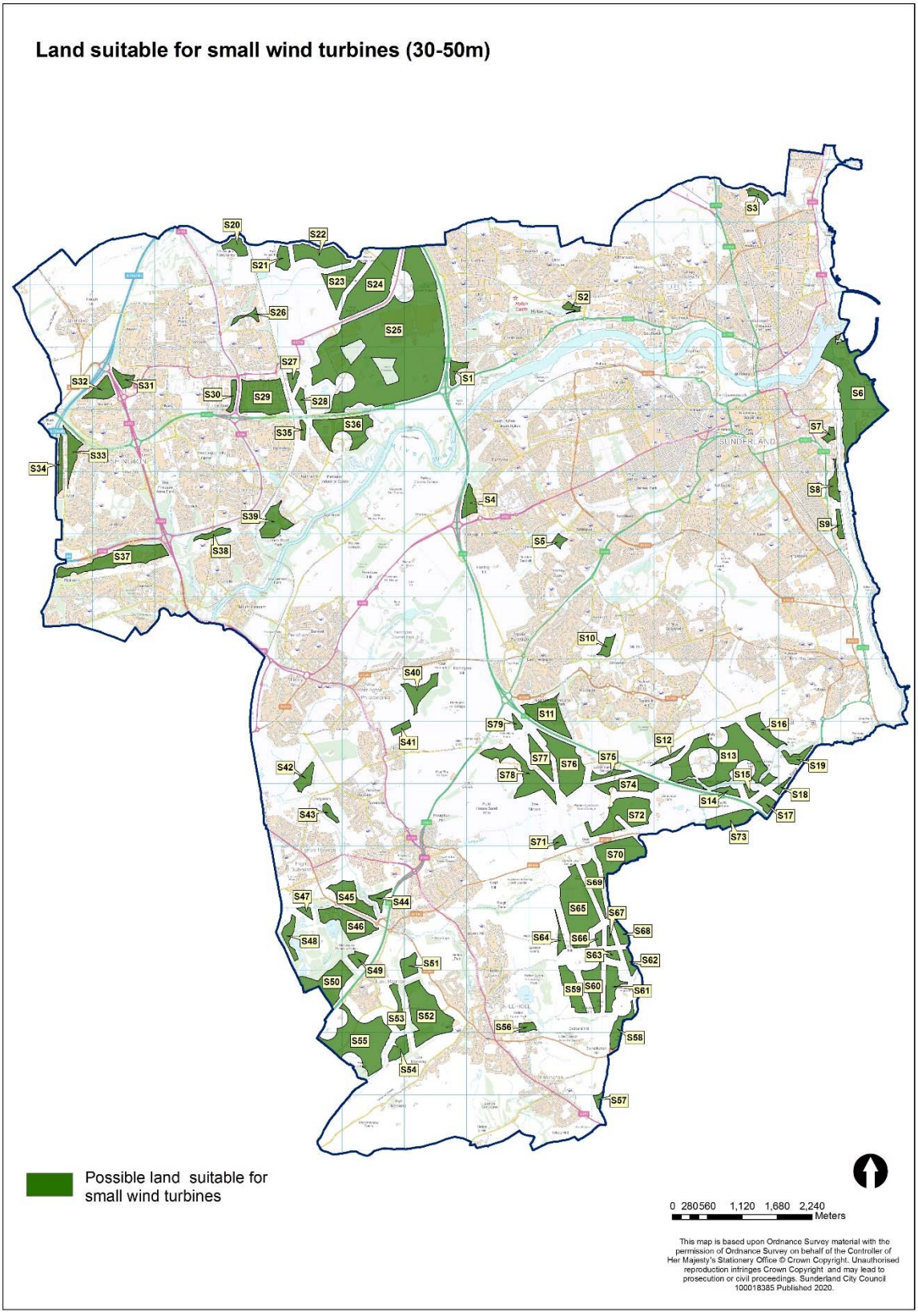

Figure 13 Land potentially suitable for small wind turbines

Medium Turbines (51m – 100m)

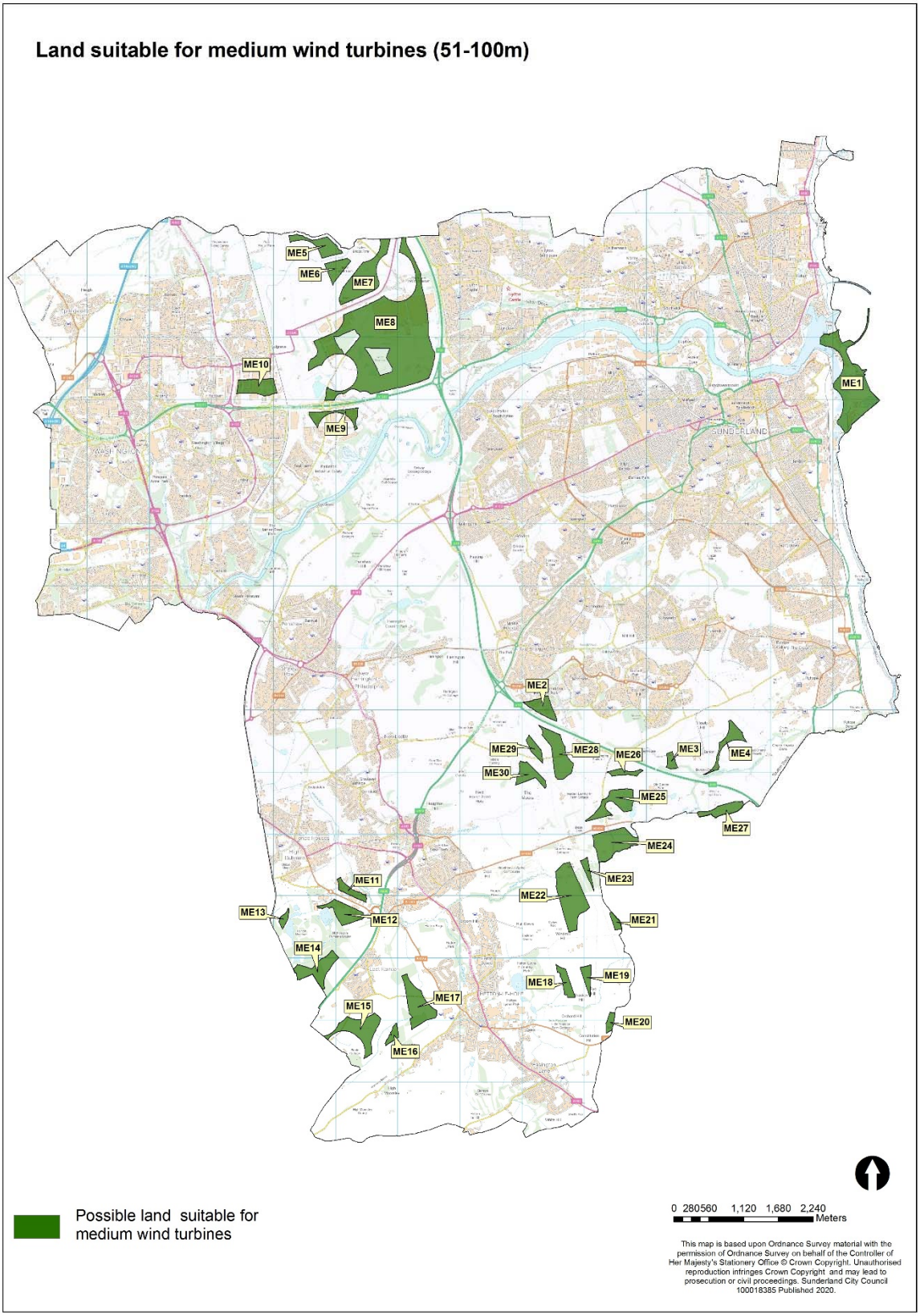

Figure 14 Land potentially suitable for medium wind turbines

Large Turbines (100m+)

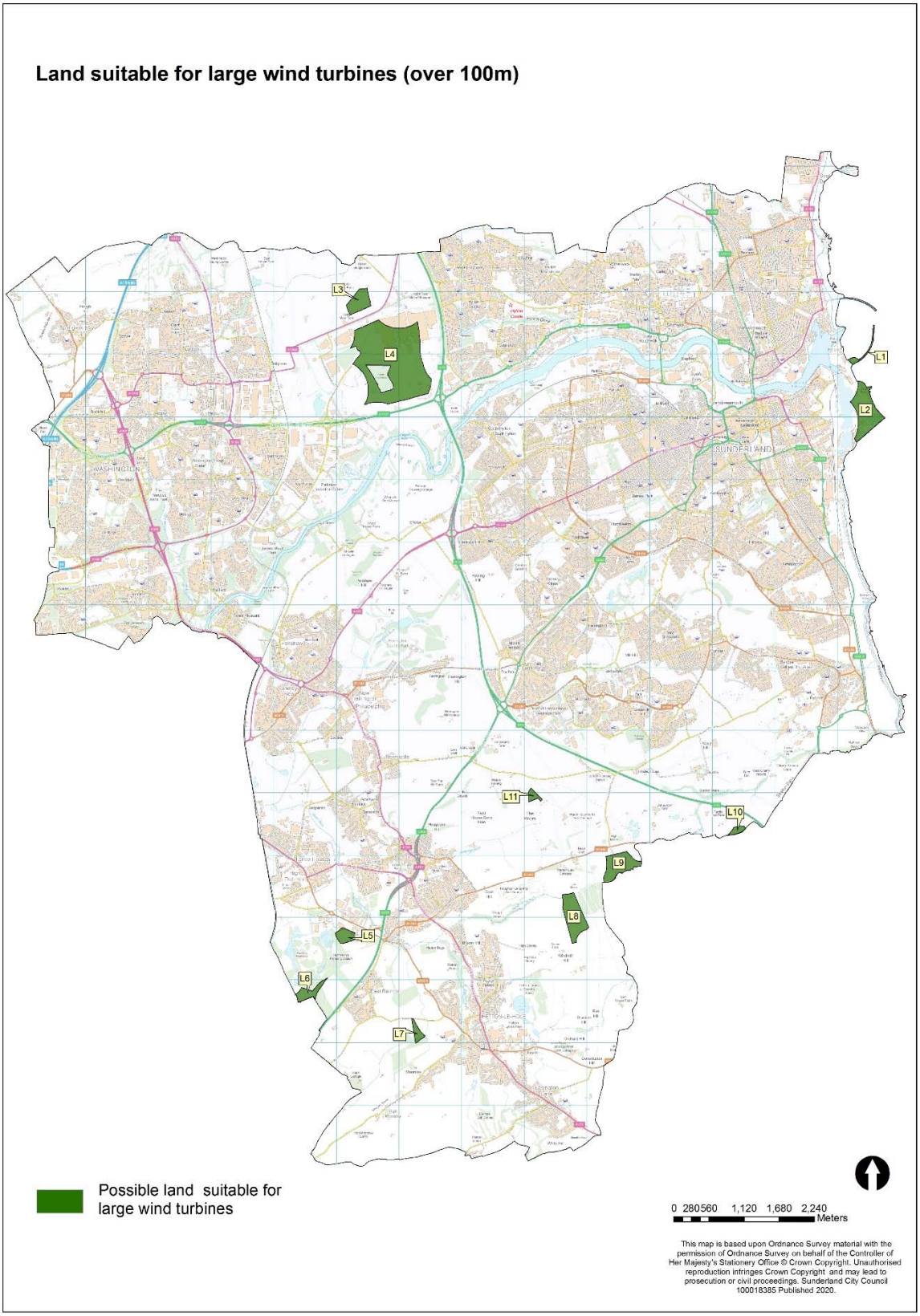

Figure 15 Land potentially suitable for large turbines

Potential Suitable Areas for Wind Energy Development

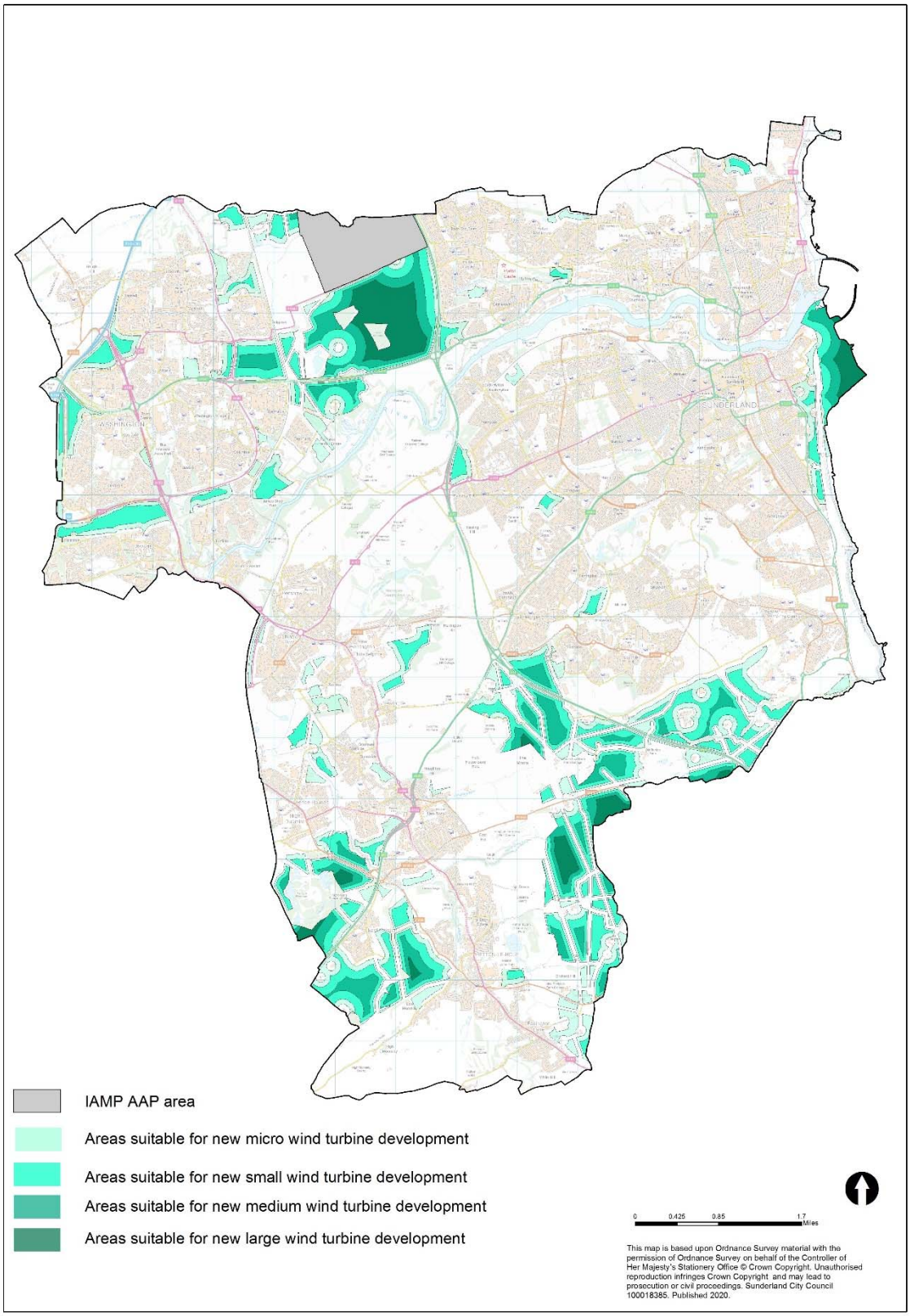

Figure 16 Land potentially suitable for micro, small, medium and large wind turbines to be identified in the Allocations and Designations Plan

Summary of potential areas for wind energy development

6.14. Applying the methodology outlined within this report has identified a range of potential suitable areas for wind energy development. Table 14 identifies the total land area of potential suitable areas according to wind turbine height categories and the number of individual sites that may have potential to site wind turbines.

Category of Wind Turbine Height	Total land area with potential suitability (hectares)	Number of individual sites with potential suitability
Micro (11m – 30m)	2160.56	122
Small (31m – 50m)	1345.83	79
Medium (51m – 100m)	576.05	30
Large (100+m)	202	11

Table 14 Potential suitable areas for wind energy development

6.15. Please note that the areas identified in this report are areas with **potential** suitability as a result of approach set out within this report. An area's identification does not suggest wind energy development will be built in this location, nor does it pre-determine the decision of a planning application in this location. All approaches and justifications outlined in this report are subject to consultation. The Council welcomes feedback on all matters set out within this report.

Sunderland
City Council

oce22128