

Appendix 1: Wind and Ground-mounted Solar Constraints

Table 49: Summary of high-level constraints used in the wind assessment

Constraint (areas excluded from “Less Constrained Areas”)	Comments and data sources
Wind resource: Areas with estimated wind speeds less than 6.0m/s at 45m are excluded.	Wind speeds greater than 6.0m/s at 45m height are considered more likely to result in a financially viable wind scheme. Met Office (no date) data providing 1.5km ² resolution average wind speed data at 45m height for the period 1984-2014 was used (Welsh Government, 2015) Whilst this data source provides an indication of wind speed, the low geographic resolution and underlying assumptions means that site specific wind assessments are required to understand the energy potential and associated financial viability of individual sites. Ideally, sites for wind developments will experience wind speeds much greater than 6.0m/s at 45m height, but given the resolution of the wind data used, 6.0m/s is considered an appropriate cut-off for this high-level assessment.
Environmental/Landscape designations: The following land designations are excluded: <ul style="list-style-type: none"> > Areas of Outstanding Natural Beauty (AONB) > Local Nature Reserves (LNRs)* > National Nature Reserves (NNRs) > Ramsar sites > Special Areas of Conservation (SACs) > Sites of Special Scientific Interest (SSSIs) > Special Protection Areas (SPAs) 	Whilst it may be possible to install wind turbines within designated areas, depending on the nature of the individual site and designation, for a high-level assessment, these areas are considered less suitable. The latest datasets available on the Welsh Government’s Geo-Portal in February 2020 (Welsh Government, 2020b) are used in the assessment. *Local Nature Reserves are included in the constraints list in addition to the other designations included within the Toolkit (Welsh Government, 2015) suggestions. The Toolkit states the following; “It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration.” (Welsh Government, 2015, p. 138) The Brecon Beacons National Park Authority were contacted with regard to this assessment to enquire whether a specific exclusion zone should be included around the National Park. Rather than specify a specific exclusion distance the National Park Authority advised that a landscape-based approach should be taken when considering a site’s impact on the National Park. Carbon Trust consider that this approach should be taken on a site-by-site basis to ensure that the site specific nature is considered.
Heritage designations: The following land designations are excluded: <ul style="list-style-type: none"> > Scheduled Monuments with exclusion zone of tip height plus 10% (132m) > Registered Historic Parks and Gardens and their settings* (“Historic Landscape Areas”) > Landscapes of Outstanding Historic Interest* > World Heritage Sites (WHS)* 	The latest datasets available on the Welsh Government’s Geo-Portal in February 2020 are used for Scheduled Monuments, Landscapes of Outstanding Historic Interest (historic landscape areas) and World Heritage Sites in the assessment (Welsh Government, 2020b). At the time of writing (March 2020), Cadw are preparing a statutory register of Registered Parks and Gardens which is due for completion in 2020. In preparation of the statutory register, all boundaries are being reviewed by Cadw in consultation with the owners and occupiers of the designated sites. In the absence of the statutory register Cadw has provided non-statutory data for use in the assessment (Cadw, 2020). * Registered Historic Parks and Gardens and their settings, Landscapes of Outstanding Historic Interest and World Heritage Sites are included in addition to Scheduled Monuments which are included within the Toolkit (Welsh Government, 2015) suggestions. The Toolkit states the following; “It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration.” (Welsh Government, 2015, p. 138). An exclusion zone of tip height plus 10% (132m) is included around Scheduled Monuments, due to their small footprint and to provide further protection from construction.
Domestic properties: An area 500m around domestic properties (based on LLPG domestic data points, and regional boundary) is excluded.	Whilst it may be possible to install wind turbines closer than 500m to domestic properties, Welsh Government’s (2015) suggested exclusion zone for providing protection from noise and visual impact is used for this assessment. Domestic properties point location data contained within the Local Land and Property Gazetteer (LLPG) for Monmouthshire, Newport, Torfaen, Blaenau Gwent and Caerphilly, is excluded and an area 500m around the regional boundary (boundary of Monmouthshire, Newport, Torfaen, Blaenau Gwent and Caerphilly) is excluded as per the Toolkit (Welsh Government, 2015) suggestion.
Other infrastructure: Areas within tip height plus 10% (132m) around buildings and secondary roads are excluded. (Restricted Local Access roads are not considered)	Ordnance Survey Vector Map District data (Ordnance Survey, 2020c) for buildings and the Ordnance Survey Open Roads data (Ordnance Survey, 2020a) for the secondary road network are used in the assessment.
Other infrastructure: Areas within tip height plus 50m (170m) around railway tracks and primary roads are excluded.	Vector Map District data (Ordnance Survey, 2020c) for railways, Open Roads data (Ordnance Survey, 2020a) and data identifying the proposed M4 relief road (and associated exclusion zone) for the primary road network are used in the assessment
Other environmental data: Areas within 50m of woodland and water bodies are excluded.	Ordnance Survey Vector Map District data (Ordnance Survey, 2020c) for woodland and surface water area*, tidal water and Natural Resources Wales’ (NRW) National Forestry Inventory (NFI) data (NRW, 2016) are used. An additional exclusion zone of 50m is included to provide further protection to ecology in both construction and operation. *Vector Map District Surface Water Area (identifying larger waterbodies) is used in the assessment for wind, whereas Surface Water Line data (identifying smaller waterbodies) is not. This is because the wind development will not impact the entire potential area identified and as such there is some flexibility with respect to siting both the turbine and associated infrastructure in order to not impact or be impacted by the smaller waterbodies.

Table 50: Summary of high-level constraints used in the ground mounted solar assessment

Constraint (areas excluded from “Less Constrained Areas”)	Comments and data sources
<p>Slope/Aspect: The following areas are excluded:</p> <ul style="list-style-type: none"> > Inclinations between 3-15° outside of south-west to south-east facing > Inclinations above 15° facing all directions (Welsh Government, 2015) 	<p>Ordnance Survey Terrain 50 (Ordnance Survey, 2020b) data is used to determine the slope and aspect of the terrain.</p>
<p>Environmental/Landscape designations: The following land designations are excluded:</p> <ul style="list-style-type: none"> > Areas of Outstanding Natural Beauty > Local Nature Reserves* > Marine Nature Reserves > National Nature Reserves > RAMSAR sites > Special Areas of Conservation > Sites of Special Scientific Interest > Special Protection Areas 	<p>Whilst it may be possible to install solar farms within the designated areas, depending on the nature of the individual site and designation, for a high-level assessment, these areas are considered less suitable.</p> <p>The latest datasets available on the Welsh Government’s Geo-Portal in February 2020 (Welsh Government, 2020b) are used in the assessment.</p> <p>*Local Nature Reserves are included in addition to the other designations included within the Toolkit suggestions. The Toolkit states the following; <i>“It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration.”</i> (Welsh Government, 2015, p. 138).</p> <p>The Brecon Beacons National Park Authority were contacted with regard to this assessment to enquire whether a specific exclusion zone should be included around the National Park, they confirmed that the solar constraints assessment did not require an additional exclusion zone around the National Park.</p>
<p>Heritage designations: The following land designations are excluded:</p> <ul style="list-style-type: none"> > Scheduled Monuments with exclusion zone of 50m > Registered Historic Parks and Gardens and their settings* (“Historic Landscape Areas”) > Landscapes of Outstanding Historic Interest* > World Heritage Sites* 	<p>The latest datasets available on the Welsh Government’s Geo-Portal in February 2020 are used for Scheduled Monuments, Landscapes of Outstanding Historic Interest (historic landscape areas) and World Heritage Sites in the assessment (Welsh Government, 2020b). At the time of writing, Cadw are preparing a statutory register of Registered Parks and Gardens which is due for completion in 2020. In preparation for the statutory register, all boundaries are being reviewed by Cadw in consultation with the owners and occupiers of the designated sites. In the absence of the statutory register Cadw have provided non-statutory data for use in the assessment (Cadw, 2020). *Registered Historic Parks and Gardens and their settings, Landscapes of Outstanding Historic Interest and World Heritage Sites are included in addition to Scheduled Monuments which were included within the Toolkit suggestions. The Toolkit states the following; <i>“It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration.”</i> (Welsh Government, 2015, p. 138).</p> <p>An exclusion zone of 50m is included around Scheduled Monuments, due to their small footprint and to provide further protection from construction.</p>
<p>Infrastructure/Environmental constraints: The following areas are excluded:</p> <ul style="list-style-type: none"> > Areas within 10m of railway tracks > Areas within 10m of primary/secondary road network > Areas within 10m of buildings > Areas within 10m of water bodies > Areas within 10m of woodland 	<p>Ordnance Survey Open Roads data (Ordnance Survey, 2020a), Vector Map District data* (Ordnance Survey, 2020c), NFI data (NRW, 2016), and spatial data identifying the proposed M4 relief road used (and associated exclusion zone). A 10 m exclusion zone is applied to all features (except the M4 relief road data) as the factor used to translate the land area available into a MW solar PV capacity assumes that the full footprint is used. In reality the areas identified will include areas that will not be suitable for PV modules – for example hedgerows, but the assessment provides a high-level indicative potential capacity.</p> <p>*Vector Map District Tidal Water, Surface Water Area (larger waterbodies) and Line (smaller waterbodies) data is used in the assessment for solar PV, whereas just the Tidal Water and Surface Water Area data is used in the assessment for wind. Solar developments have a greater footprint and therefore less flexibility with respect to siting, and inclusion of the surface water line data allows at a high level further break down of the potential sites. As solar equipment is much more at ground level, there is also greater importance than in the wind assessment to account for presence of waterbodies given the potential risks posed in both construction and operation.</p>

Appendix 2: Waste Data

Table 51: MCC current waste management processes

Waste stream	Current waste destination	Current management process	Current waste management contract end date (year)	Anticipated waste destination in 2033
Residual waste	Viridor Waste Management Ltd, Trident Park, Cardiff, CF24 5EN	Energy to Waste Facility	2041	Viridor Waste Management Ltd, Trident Park, Cardiff, CF24 5EN
Recycled waste	Bulked and sent to reprocessors across the UK	Recycled		
Food waste	Severn Trent (Agrivert), Stormy Down, Bridgend, CF33 4RS	Anaerobic digestion	2033	
Green waste	Abergavenny Green Waste Company, Maindiff Court Farm, Abergavenny, NP7 8AY	Composting	2021	

Appendix 3: Use of Local Land and Property Gazetteer Data

Data contained within the Local Land and Property Gazetteer (LLPG) has been used to inform several parts of this assessment, as detailed in Table 52.

Table 52: Summary of LLPG data use within Renewable and Low Carbon Energy Assessment

Assessment section	How the data was used
Section 2	The energy demand of the entire county is reduced to the ratio of commercial data points (except those detailed in Table 53) and residential datapoints (except those detailed in Table 54) in the study area in comparison to the county as a whole, to estimate the energy demand of the study area.
Section 3	The capacity of biomass (heat), solar PV (roof-top) and heat pumps in the entire county is reduced to the ratio of commercial datapoints (except those detailed in Table 53) and residential datapoints (except those detailed in Table 54) in the study area in comparison to the county as a whole, to estimate the capacities of the study area.
Section 4	The location of residential datapoints (except those detailed in Table 54) is used in GIS with a 500m exclusion zone applied, to provide the domestic property constraint for the wind resource assessment.
Section 5	The commercial and residential datapoints present within the study area (except those detailed in Tables 53 and 54) are assumed to represent the current number of commercial and residential buildings and inform the heat pump and roof-top PV assessment. The location of the datapoints is used with information relating to gas network extent at the Lower Super Output Area level to estimate the number of properties off the gas network and inform the heat pump assessment.
Section 6	The locations of commercial properties (except those detailed in Table 53) are used to inform the location of the identified anchor heat loads, and identify the number of other commercial properties in close proximity to the anchor heat loads.

Before use, the data was reviewed and any duplicates were removed. Commercial properties were identified from the primary Basic Land and Property Unit (BLPU) class “C: Commercial”, residential properties were identified from the primary BLPU class “R: Residential”. The full BLPU classes contained within these primary classifications were reviewed. Commercial data entries that were not considered to have a specific heat load or building associated with them were removed; the BLPU classes which relate to this are provided in Table 53. Residential data entries that were identified as non-dwellings were also removed; Table 54 provides the BLPU classes identified.

Table 53: Commercial BLPU classes removed from the dataset

BLPU code	BLPU description	BLPU code	BLPU description
CR11	Commercial, Retail, Automated Teller Machines (ATMs)	CU	Commercial, Utilities
CS	Commercial, Storage land	CU01	Commercial, Utilities, Electricity sub-stations
CS01	Commercial, Storage land, General storage land	CU02	Commercial, Utilities, Landfill
CS02	Commercial, Storage land, Builders' yards	CU03	Commercial, Utilities, Power stations/energy production
CT	Commercial, Transport	CU04	Commercial, Utilities, Pumping Stations/Water Towers
CT01	Commercial, Transport, Airports	CU06	Commercial, Utilities, Telecommunications masts
CT02	Commercial, Transport, Bus shelters	CU07	Commercial, Utilities, Water/sewage treatment works
CT03	Commercial, Transport, Car parks	CU08	Commercial, Utilities, Gas and Oil Storage and Distribution
CT04	Commercial, Transport, Goods freight handling	CU09	Commercial, Utilities, Other utility use
CT06	Commercial, Transport, Moorings	CU10	Commercial, Utilities, Waste management
CT07	Commercial, Transport, Railway assets	CU11	Commercial, Utilities, Telephone boxes
CT08	Commercial, Transport, Stations and interchanges	CZ	Commercial, Information
CT09	Commercial, Transport, Transport tracks and ways	CZ01	Commercial, Information, Advertising Hoardings
CT10	Commercial, Transport, Vehicle storage	CZ02	Commercial, Information, Tourist Information
CT11	Commercial, Transport, Transport Related Infrastructure	CZ03	Commercial, Information, Traffic Information Signage
CT13	Commercial, Transport, Harbours, ports, docks, slipways, landing stages and piers		

Table 54: Residential BLPU classes removed from the dataset

BLPU code	BLPU description
RB	Residential, Ancillary Buildings
RC	Residential, Car Park Space
RC01	Residential, Car Park Space, Allocated Parking
RG	Residential, Garages
RG02	Residential, Garages, Lock-Up Garages and Garage Courts

Section 5 of the assessment separates the residential properties into terraced, flats and other residential dwellings. Table 55 shows how the BLPU classes were grouped into these categories.

Table 55: BLPU class groupings for Buildings Integrated Renewables (BIR) assessment

Dwelling category for BIR assessment	BLPU class	BLPU description
Other residential dwellings	R	Residential
	RD	Residential, Dwellings
	RD01	Residential, Dwellings, Caravans
	RD02	Residential, Dwellings, Detached
	RD03	Residential, Dwellings, Semi-Detached
	RD07	Residential, Dwellings, House Boats
	RD10	Residential, Dwellings, Privately owned holiday caravan/ chalet
Terraced properties	RD04	Residential, Dwellings, Terraced House
	RH	Residential, Houses in Multiple Occupation
	RH01	Residential, House in Multiple Occupation, HMO Parent
	RH02	Residential, House in Multiple Occupation, HMO Bedsit / Other Non Self Contained Accommodation
	RH03	Residential, House in Multiple Occupation, HMO not further divided
Flats	RD06	Residential, Dwellings, Flat
	RD08	Residential, Dwellings, Sheltered Accommodation
	RI	Residential, Residential Institutions
	RI01	Residential, Residential Institutions, Care / Nursing Home
	RI02	Residential, Residential Institutions, Communal residences
	RI03	Residential, Residential Institutions, Residential education (e.g. halls of residence)

Appendix 4: Figures

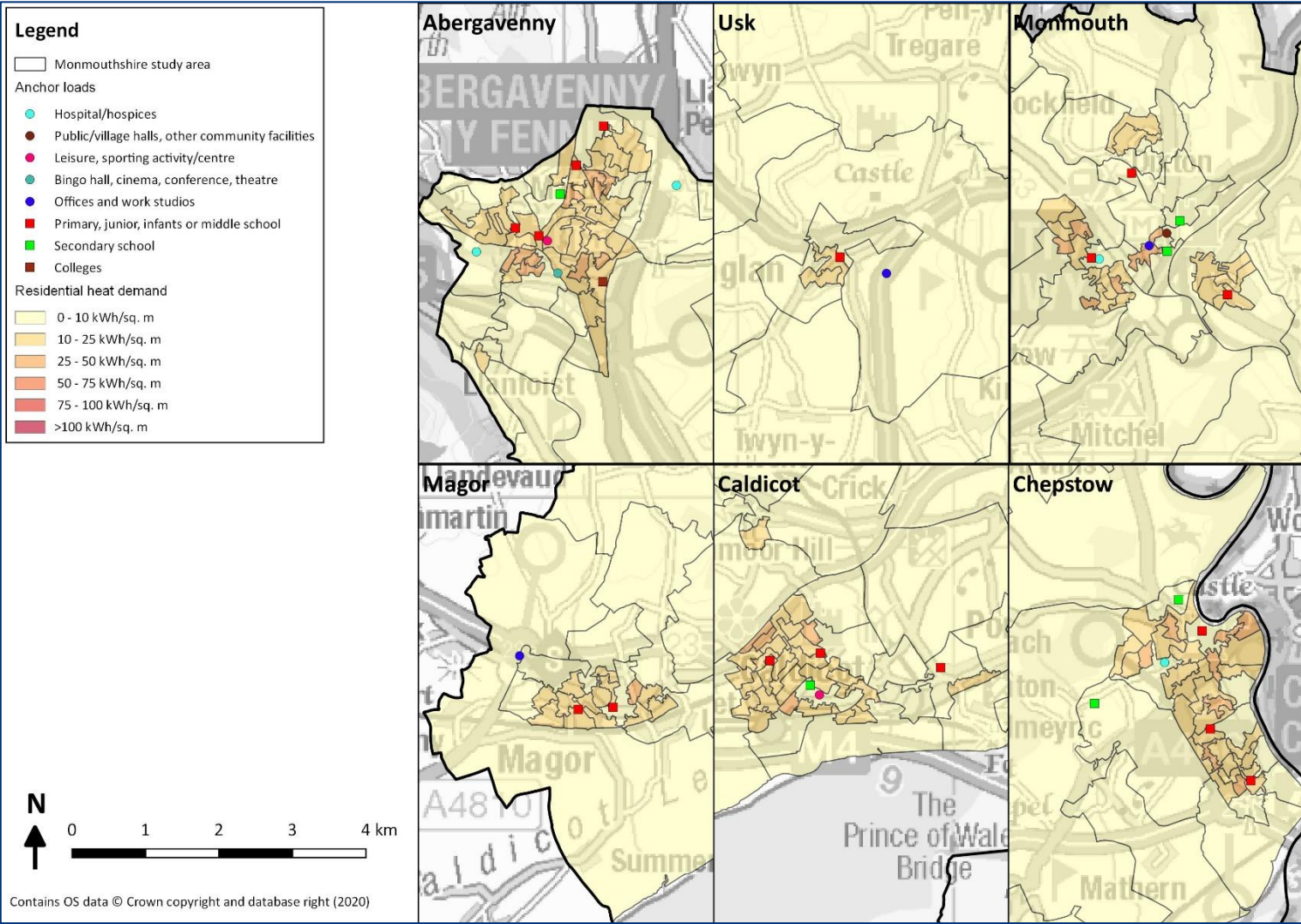


Figure 54: Anchor heat loads and residential heat demand

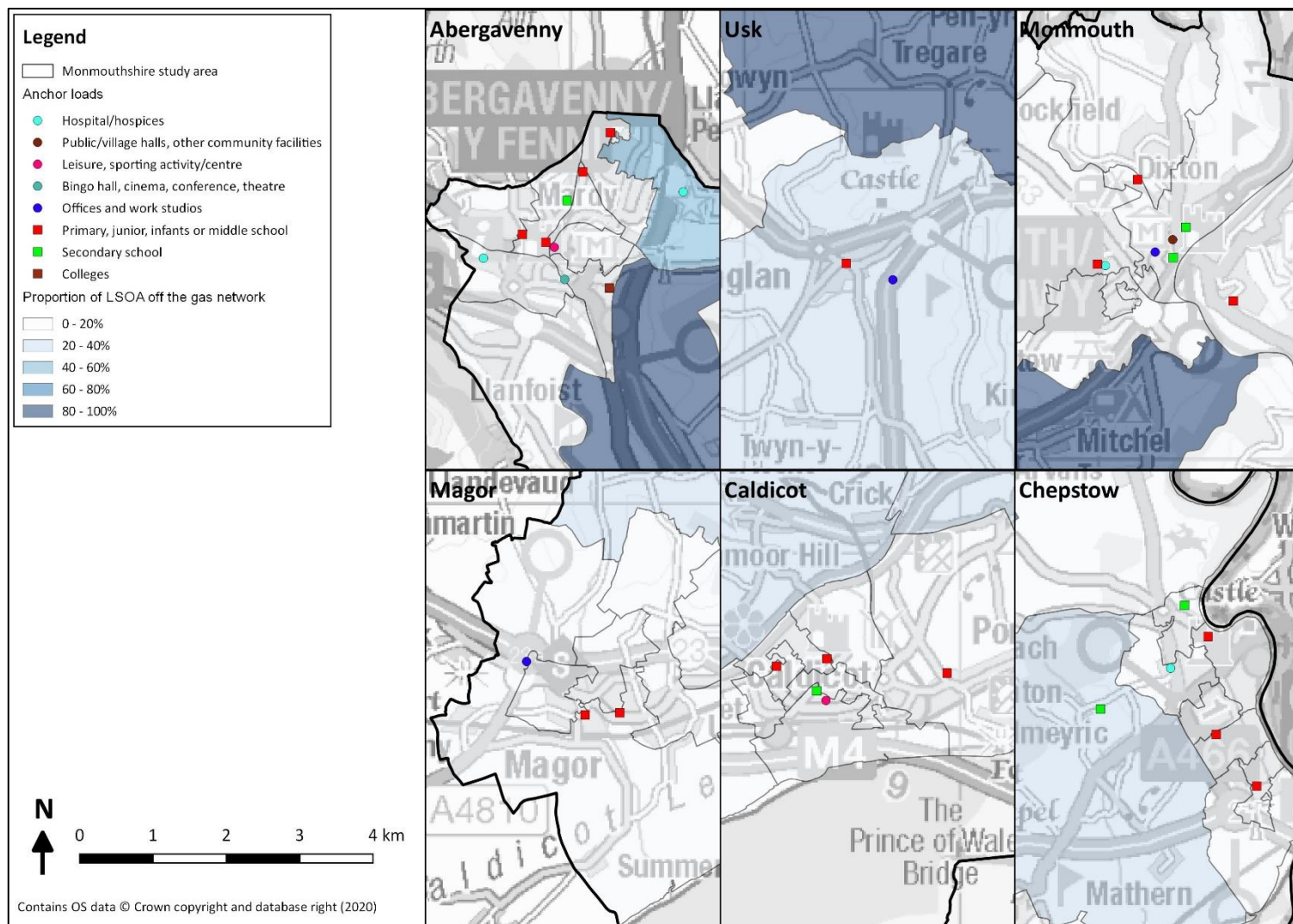


Figure 55: Anchor heat loads and gas network coverage

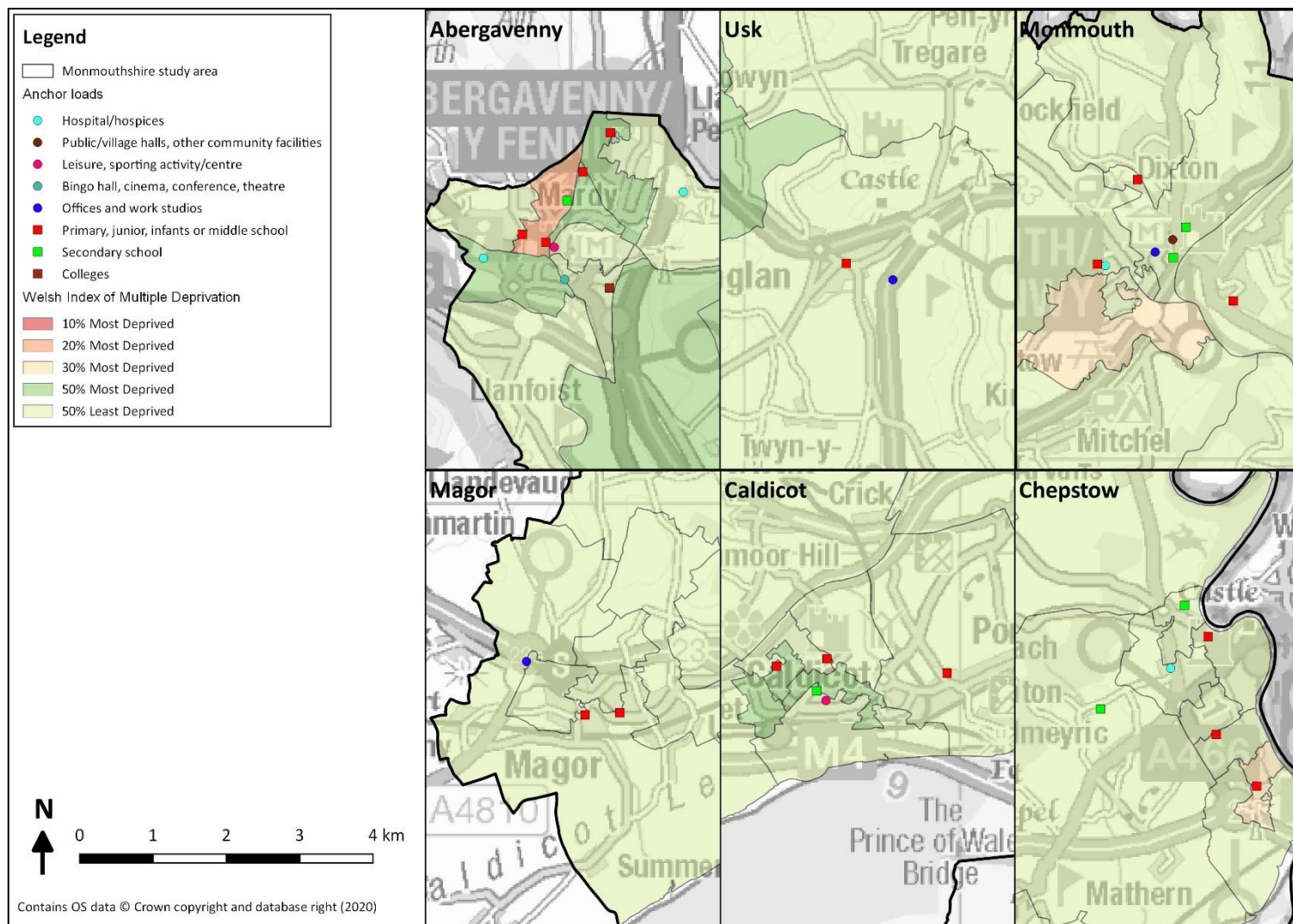


Figure 56: Anchor heat loads and the Wales Index of Multiple Deprivation

(Welsh Government, 2020b)

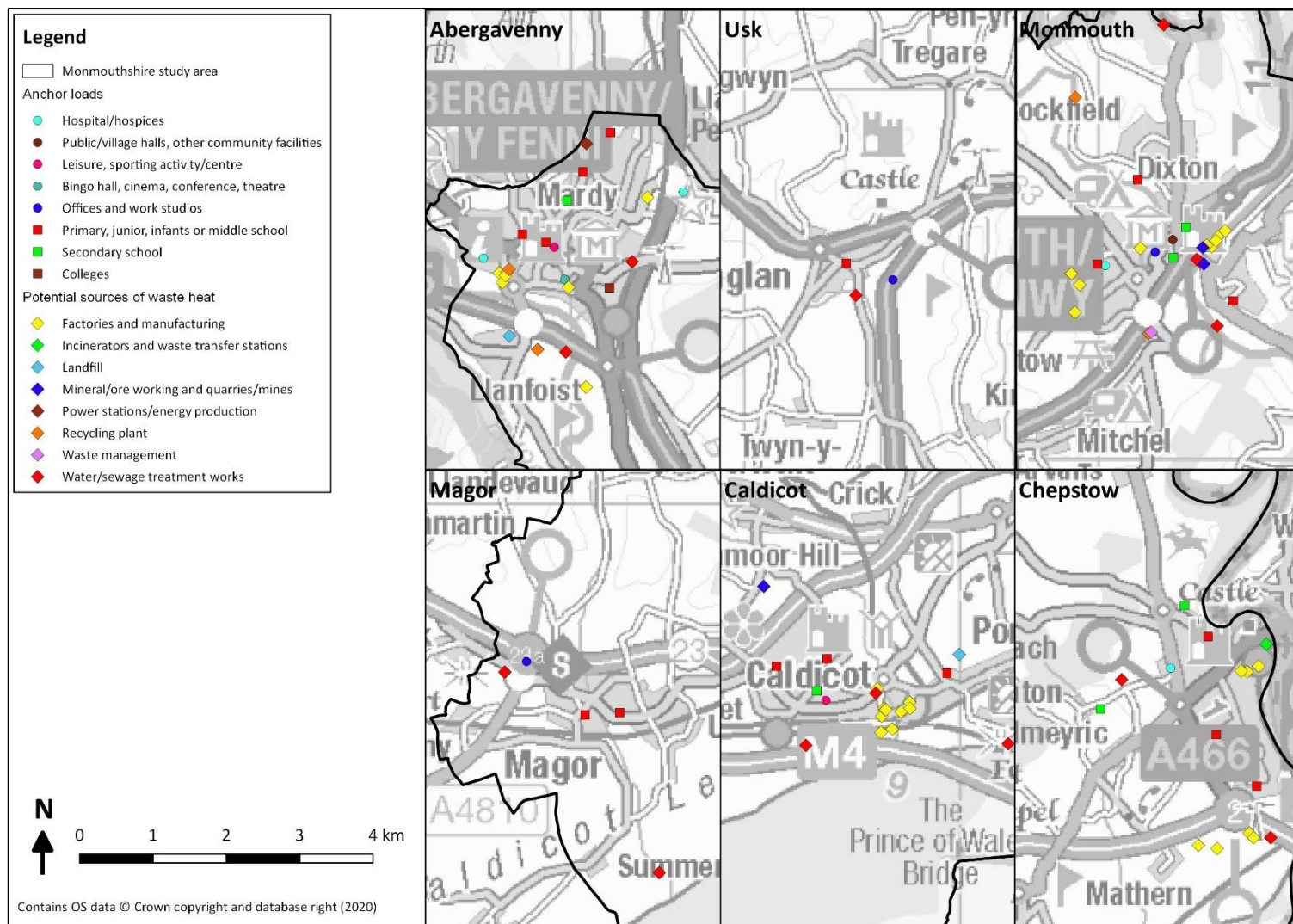


Figure 57: Anchor heat loads and potential sources of waste heat and existing heat sources

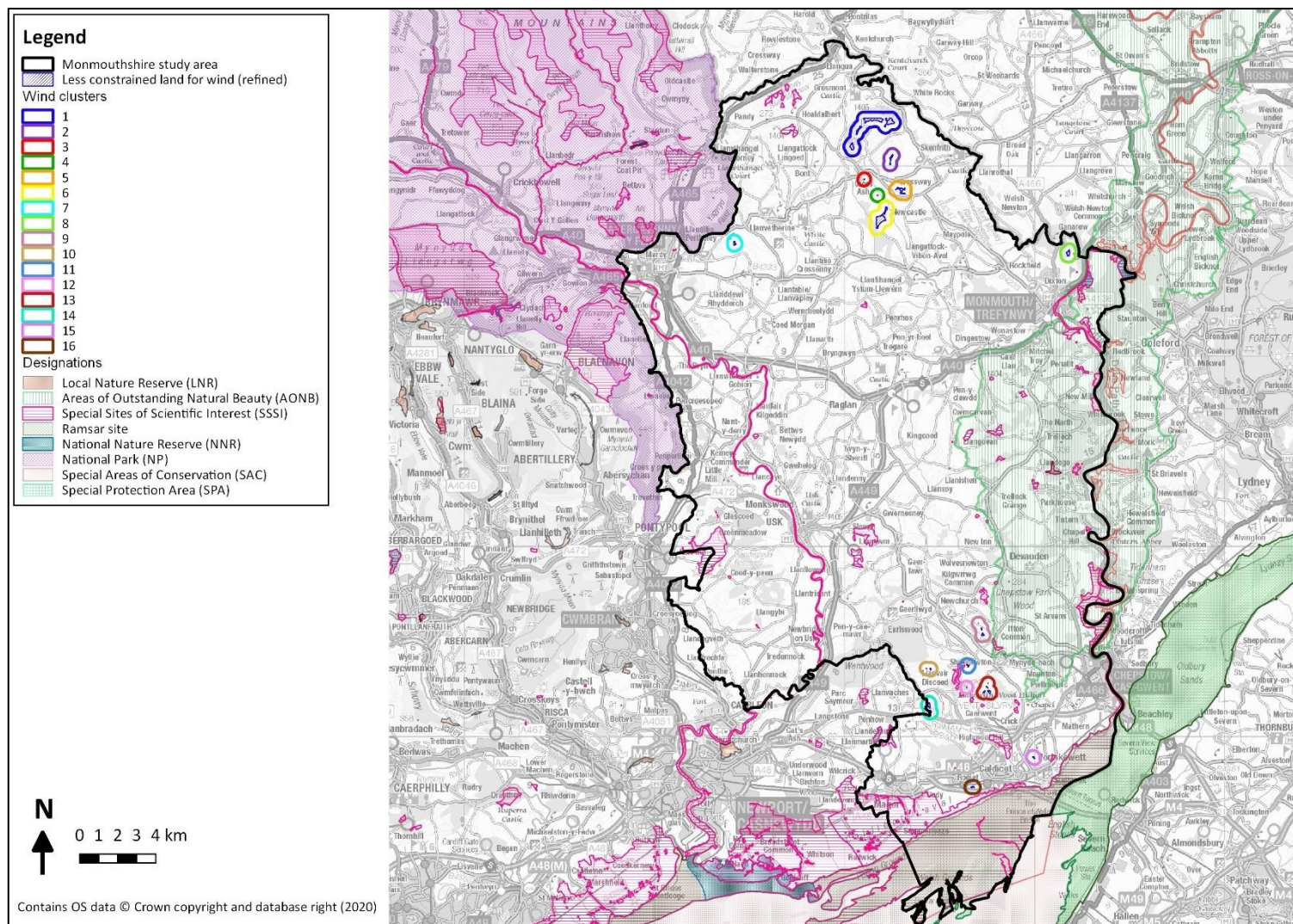


Figure 58: Less constrained land for wind (refined) and landscape designations

(Welsh Government, 2020b)

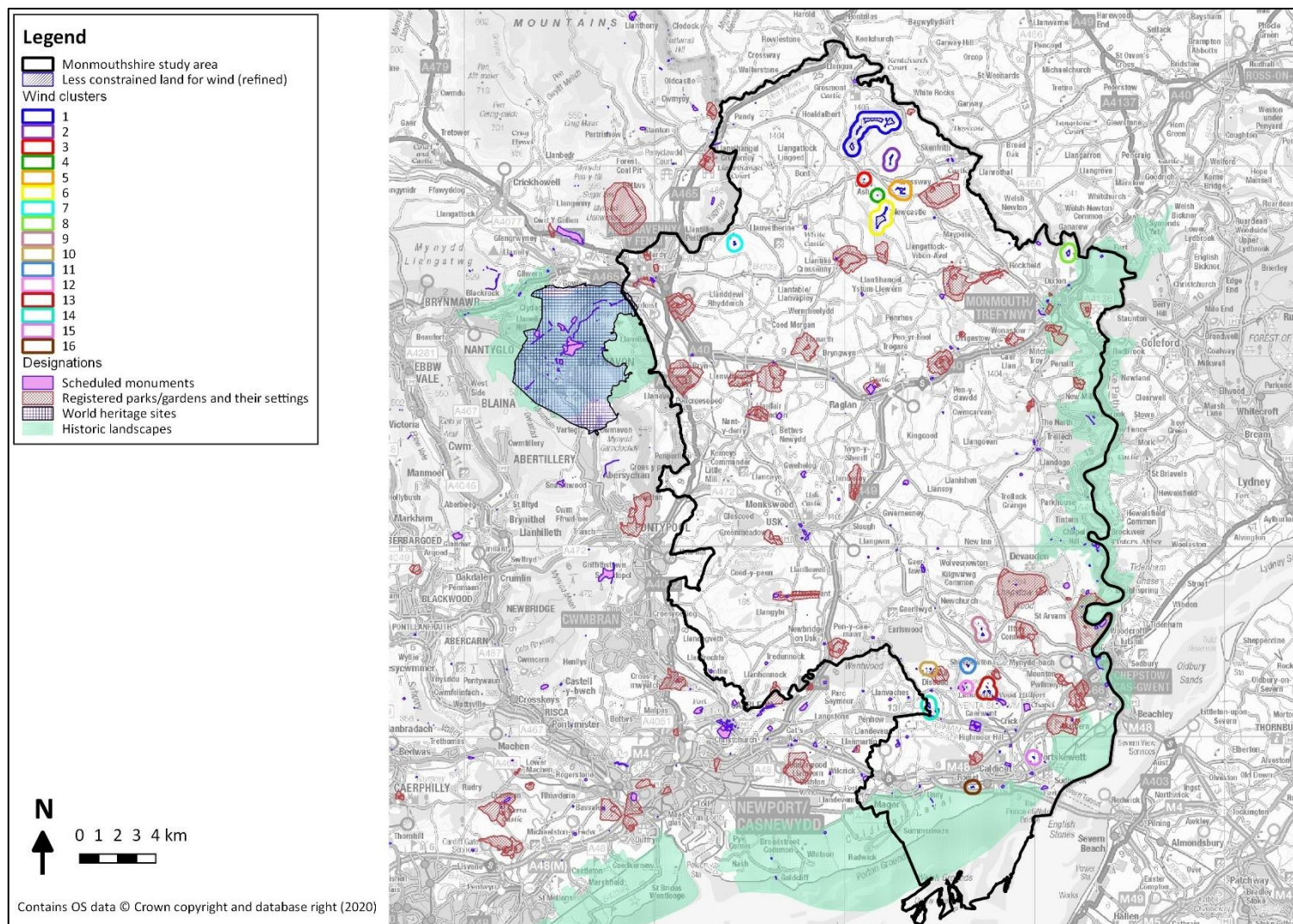


Figure 59: Less constrained land for wind (refined) and historic designations

(Welsh Government, 2020b, Cadw, 2020)

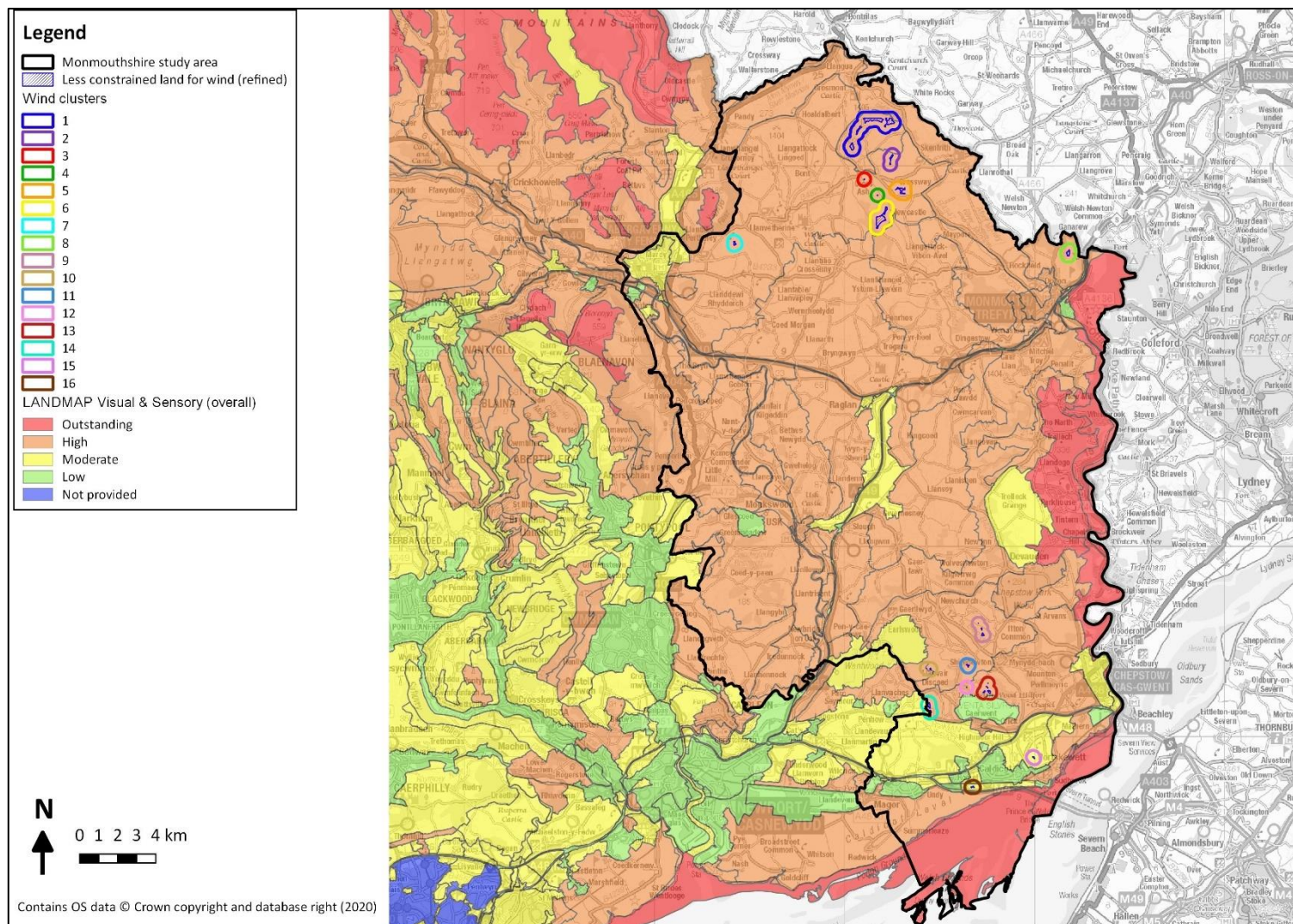


Figure 60: Less constrained land for wind (refined) and LANDMAP visual and sensory overall rating

(Welsh Government, 2020b)

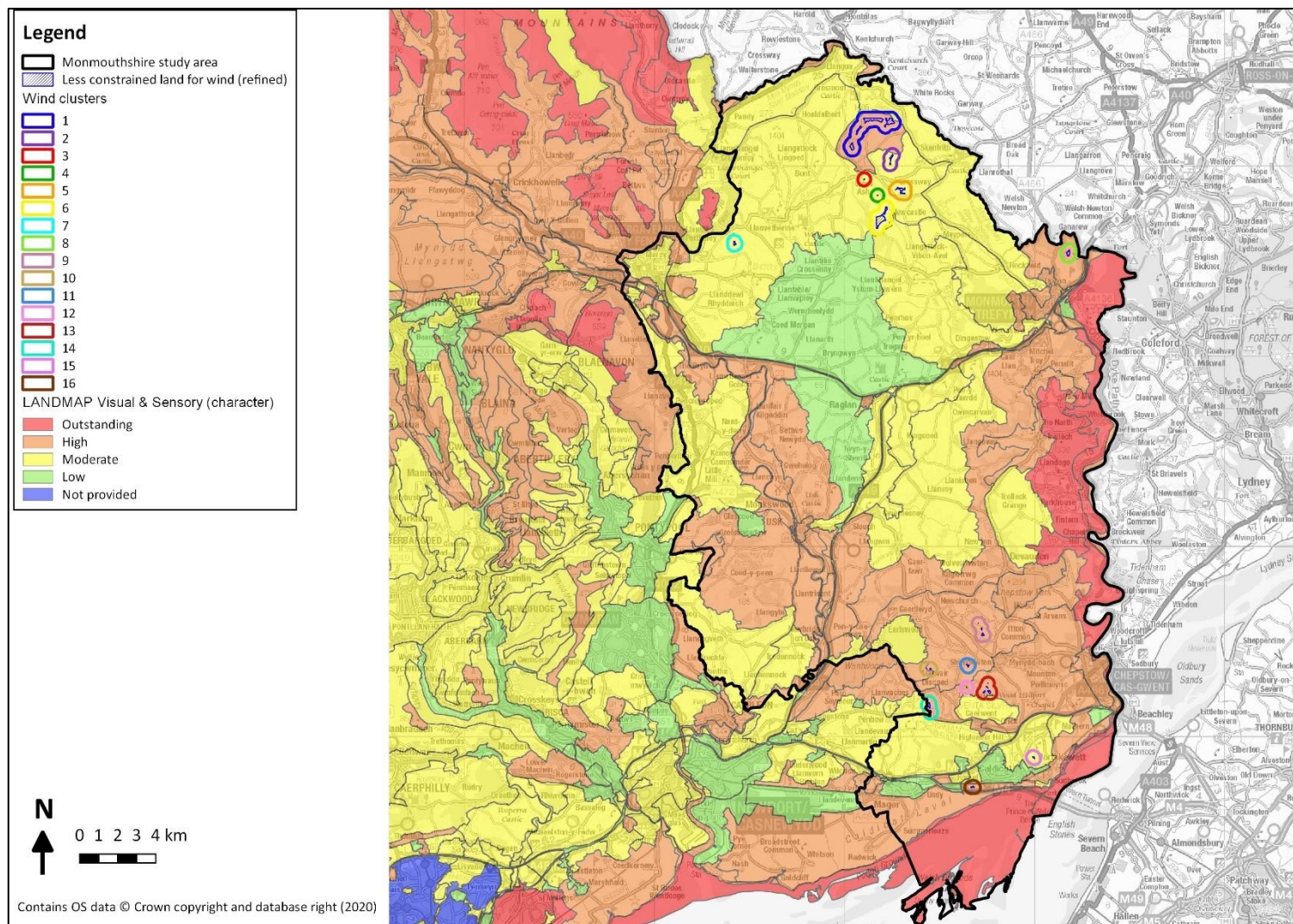


Figure 61: Less constrained land for wind (refined) and LANDMAP visual and sensory character rating

(Welsh Government, 2020b)

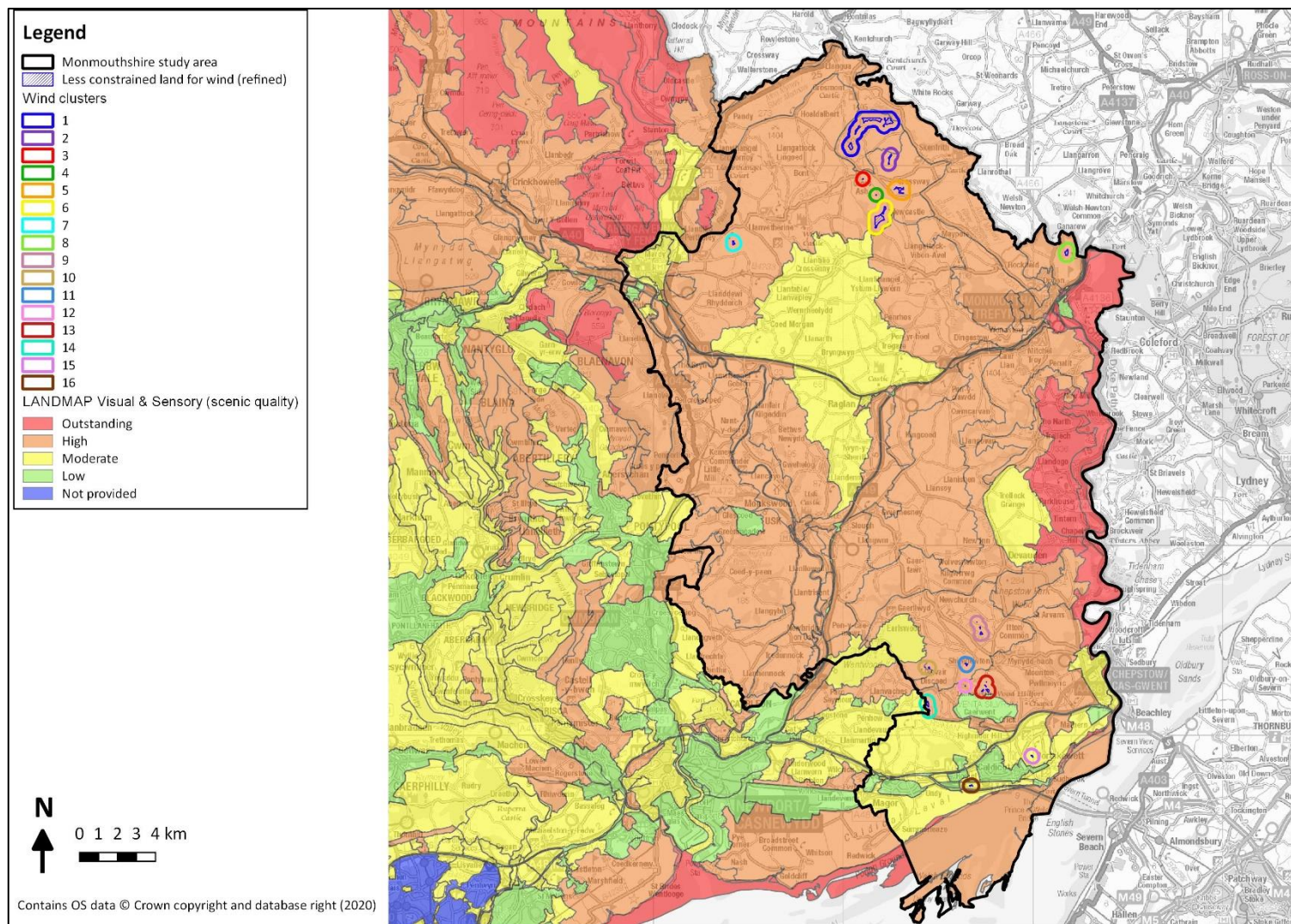


Figure 62: Less constrained land for wind (refined) and LANDMAP visual and sensory scenic quality rating

(Welsh Government, 2020b)

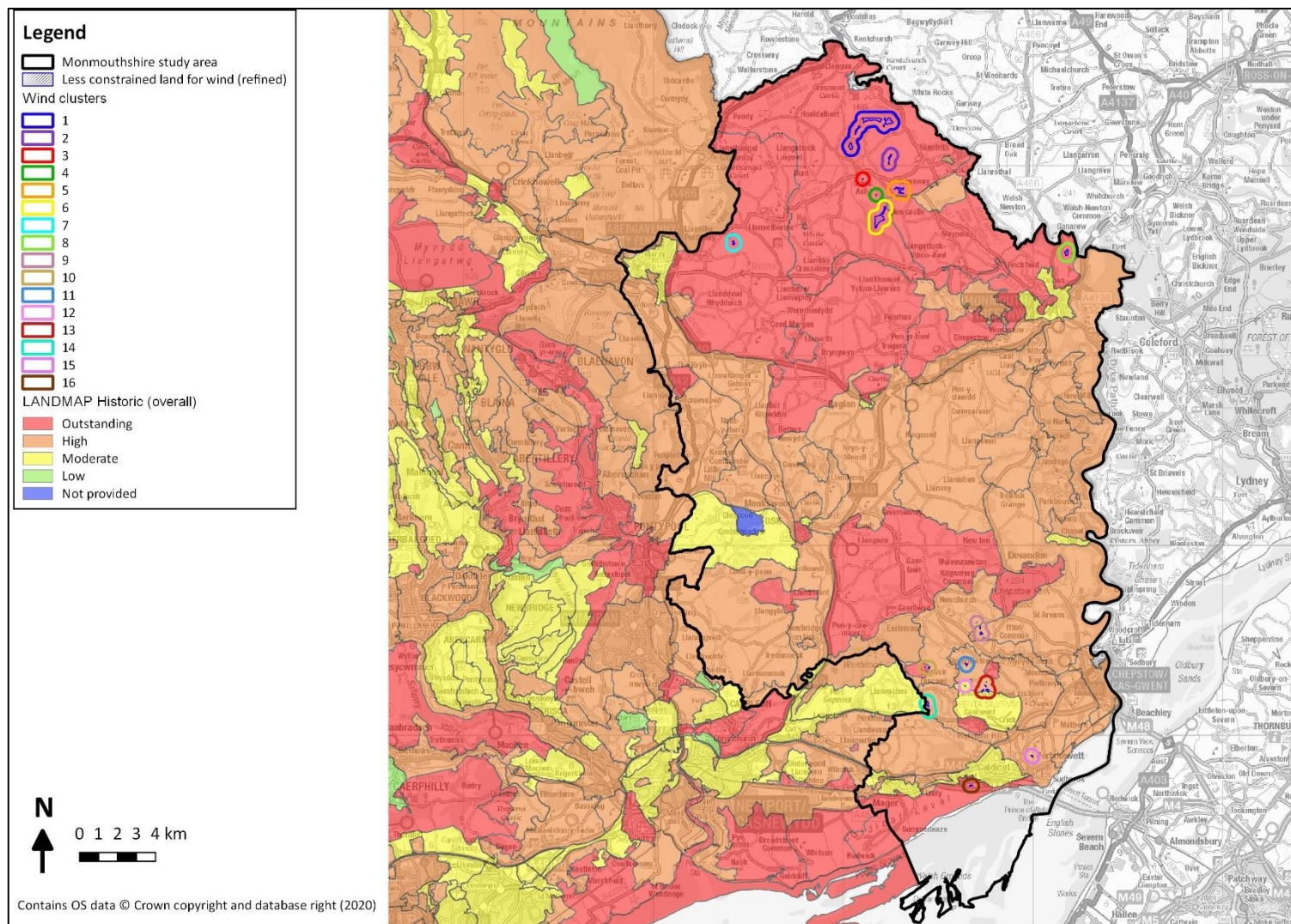


Figure 63: Less constrained land for wind (refined) and LANDMAP historic overall rating

(Welsh Government, 2020b)

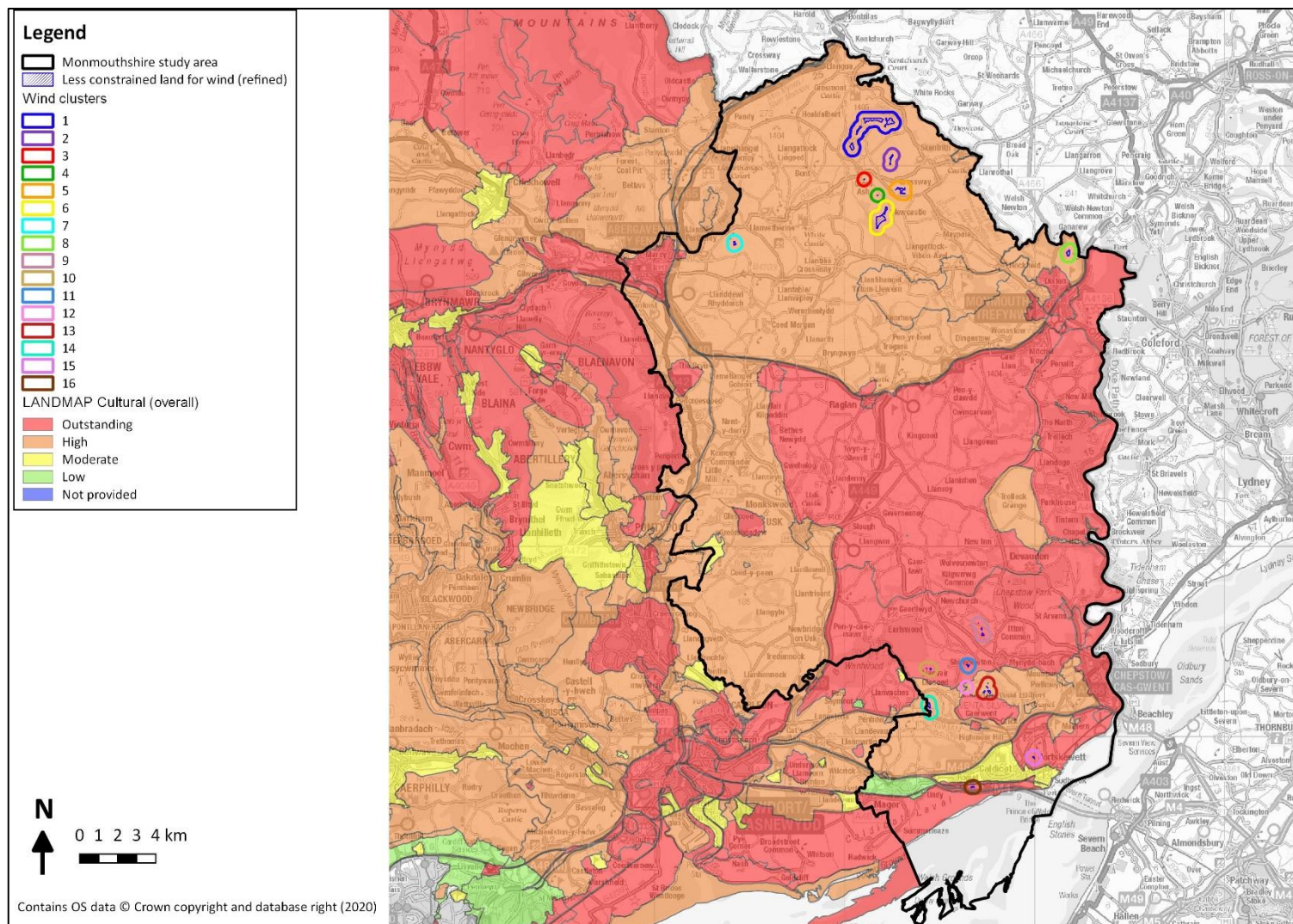


Figure 64: Less constrained land for wind (refined) and LANDMAP cultural overall rating

(Welsh Government, 2020b)

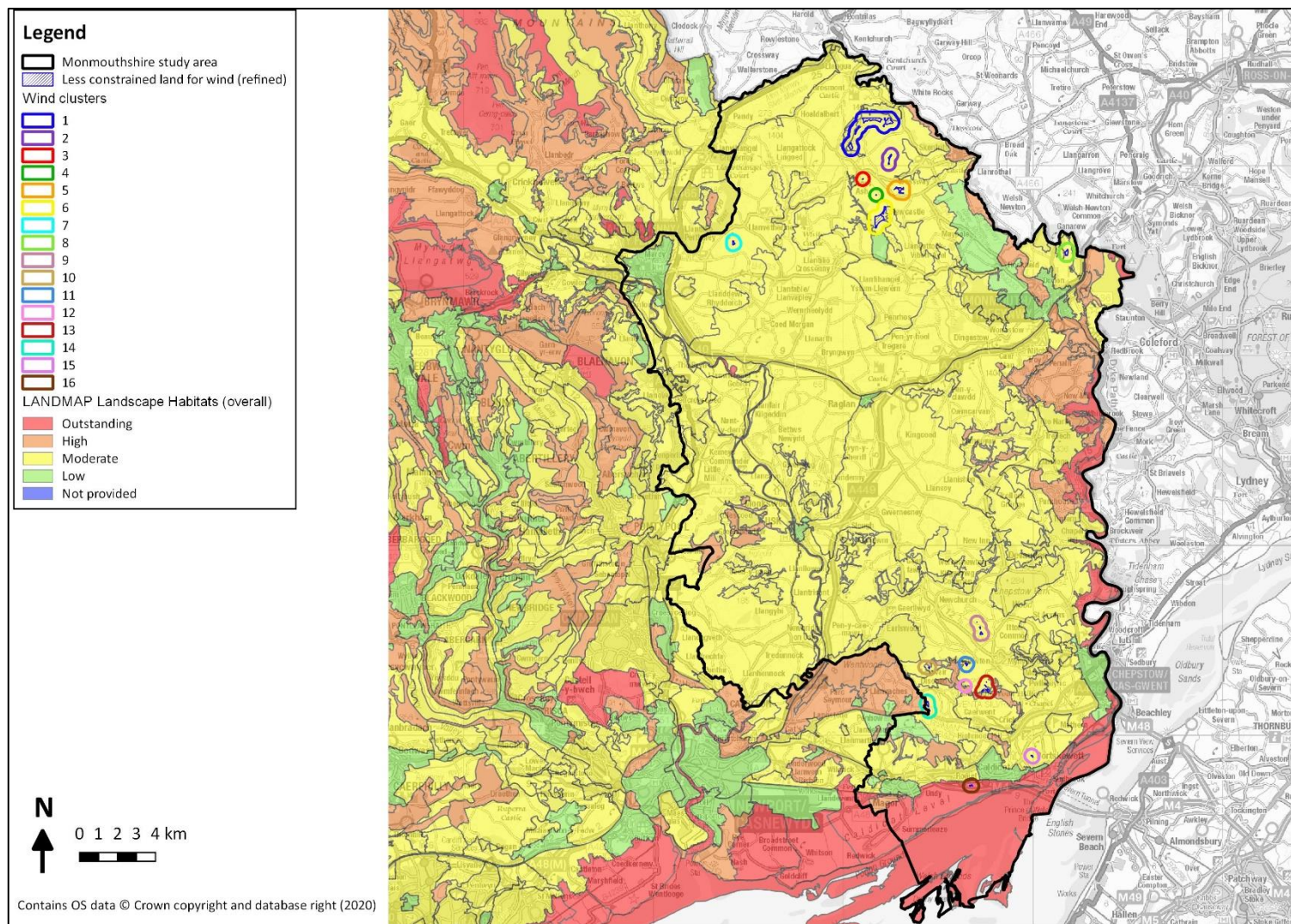


Figure 65: Less constrained land for wind (refined) and LANDMAP landscape habitats overall rating

(Welsh Government, 2020b)

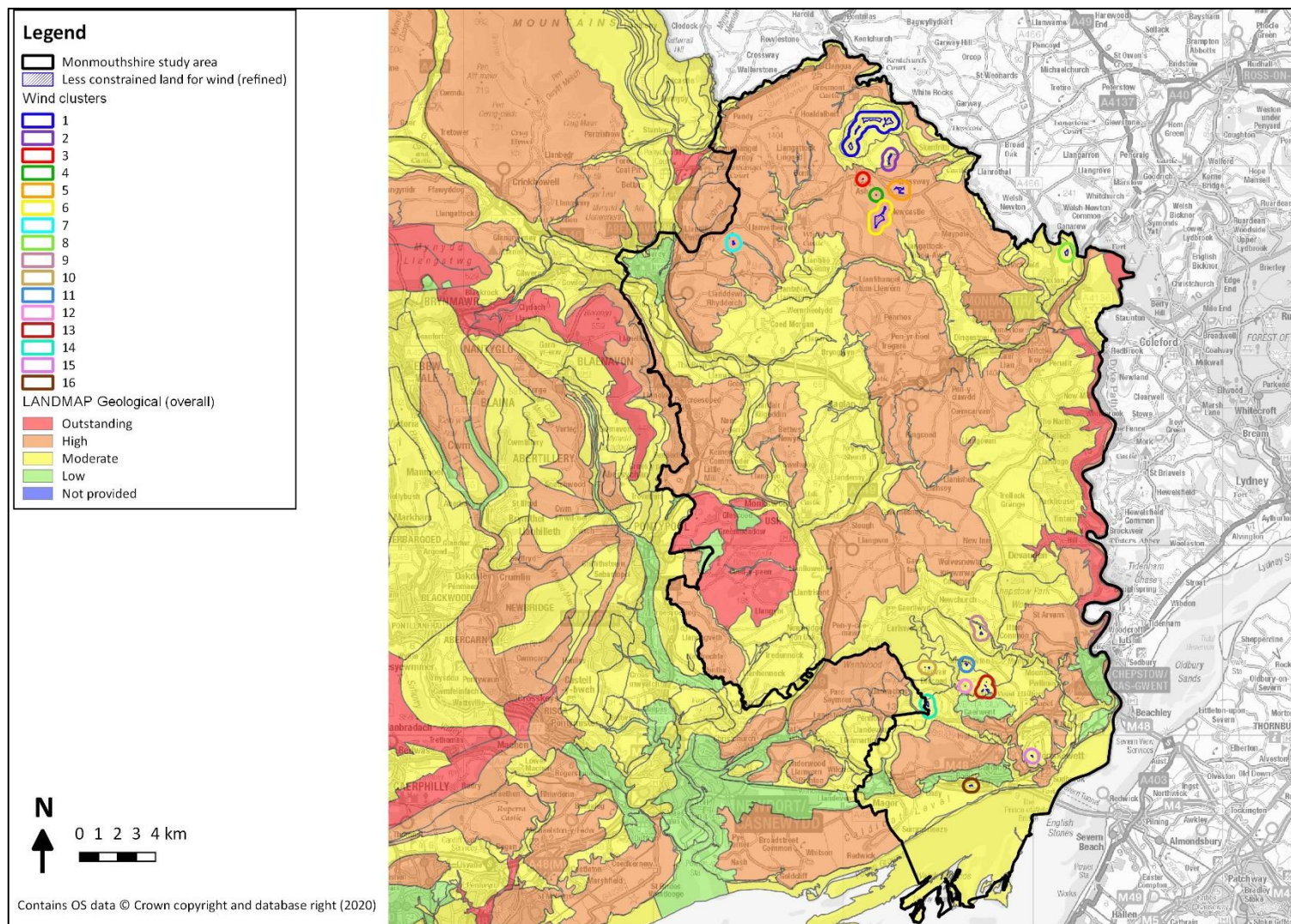


Figure 66: Less constrained land for wind (refined) and LANDMAP geological overall rating

(Welsh Government, 2020b)

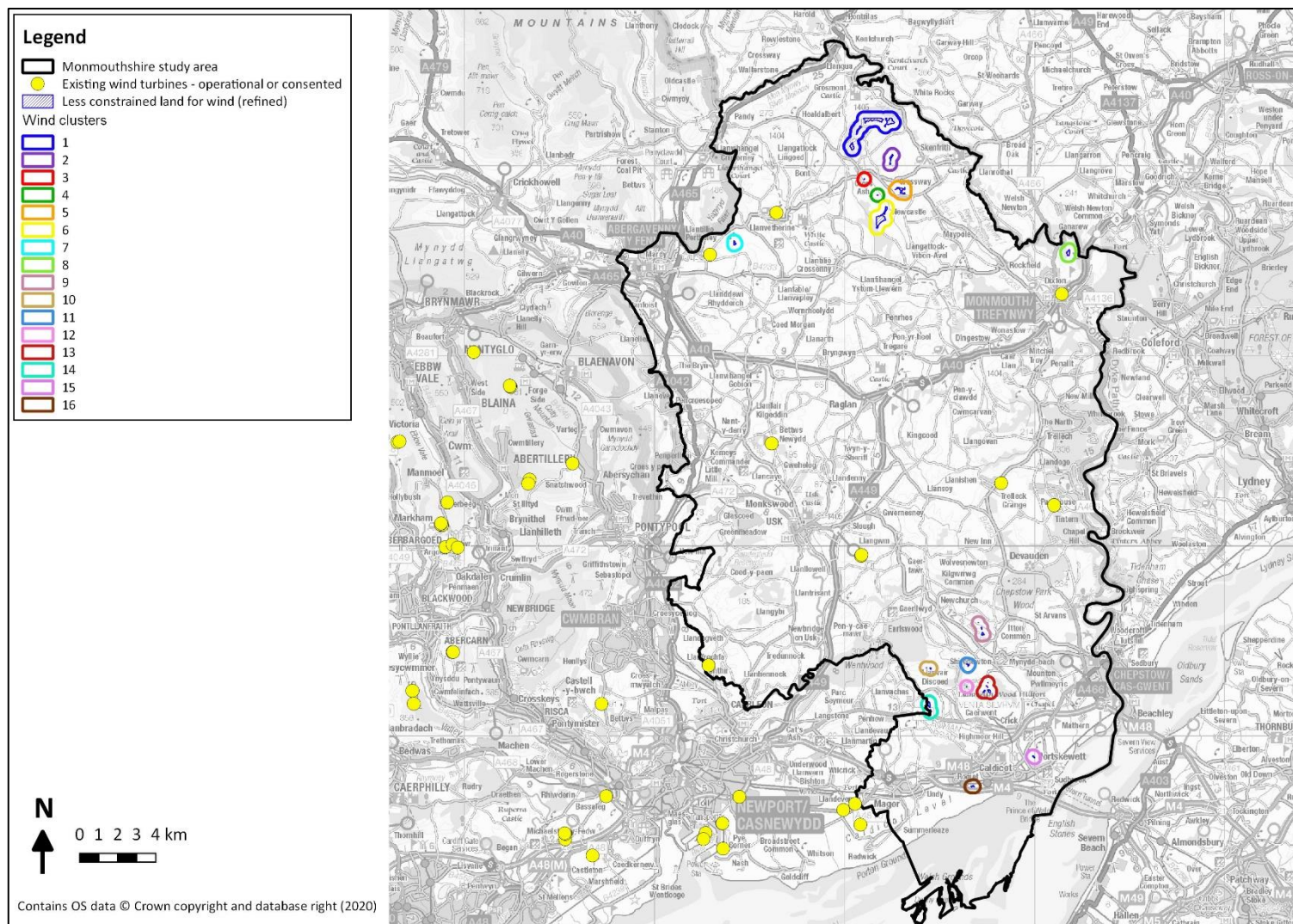


Figure 67: Less constrained land for wind (refined) and existing wind developments

(Welsh Government, 2020b)

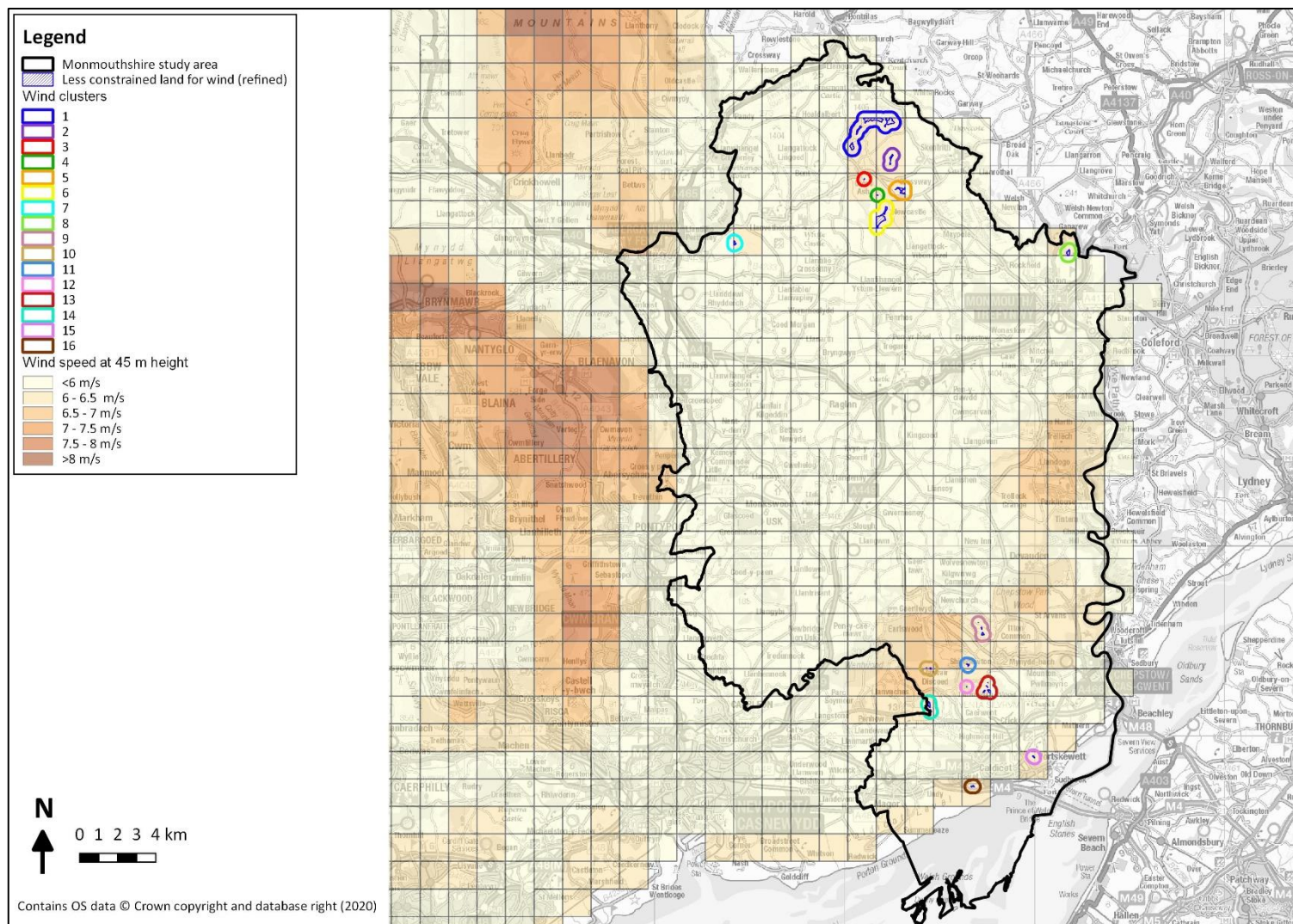


Figure 68: Less constrained land for wind (refined) and wind speed

(Met Office, no date)

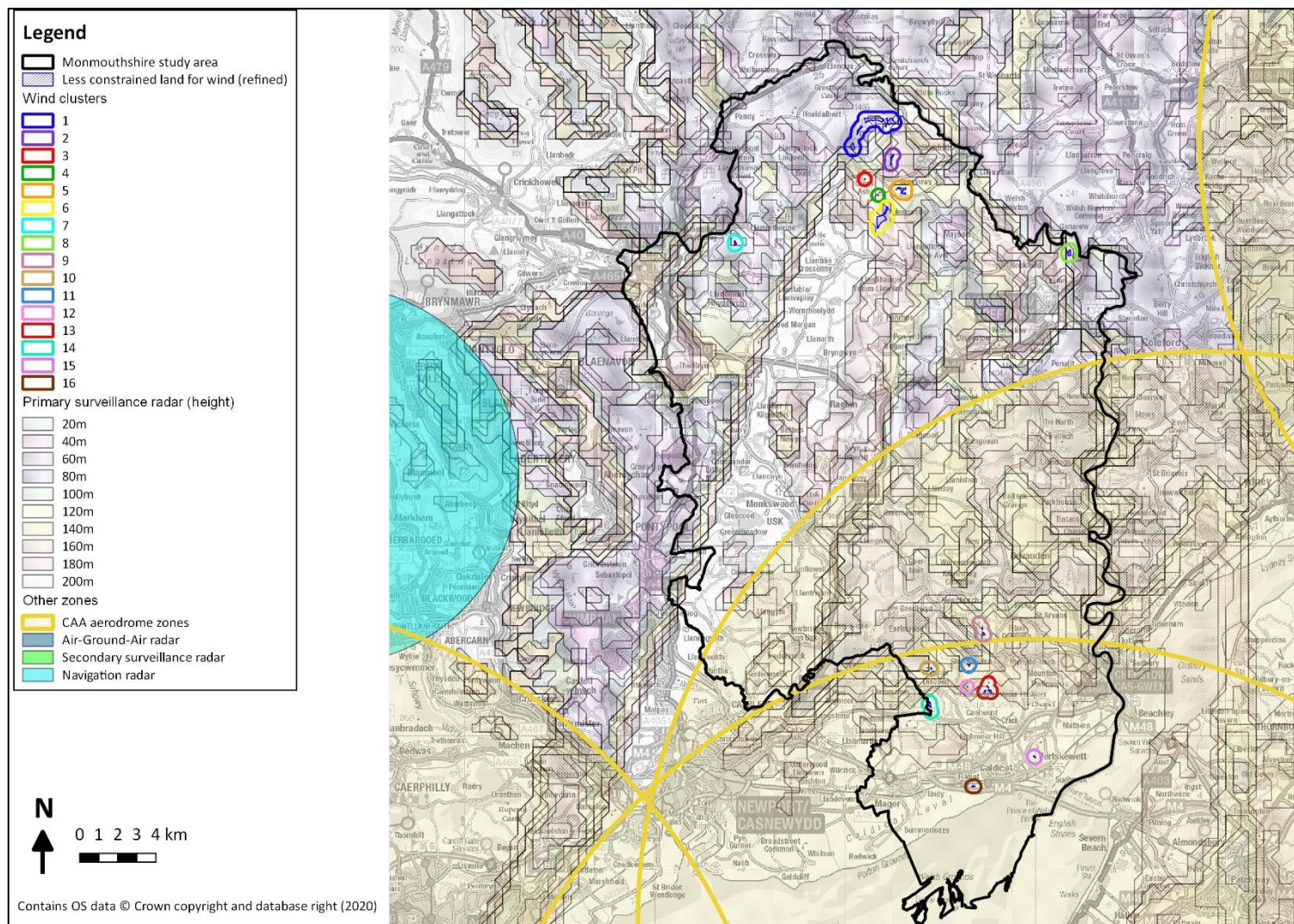


Figure 69: Less constrained land for wind (refined) and aviation zones

(CAA, 2014, NATS, no date)

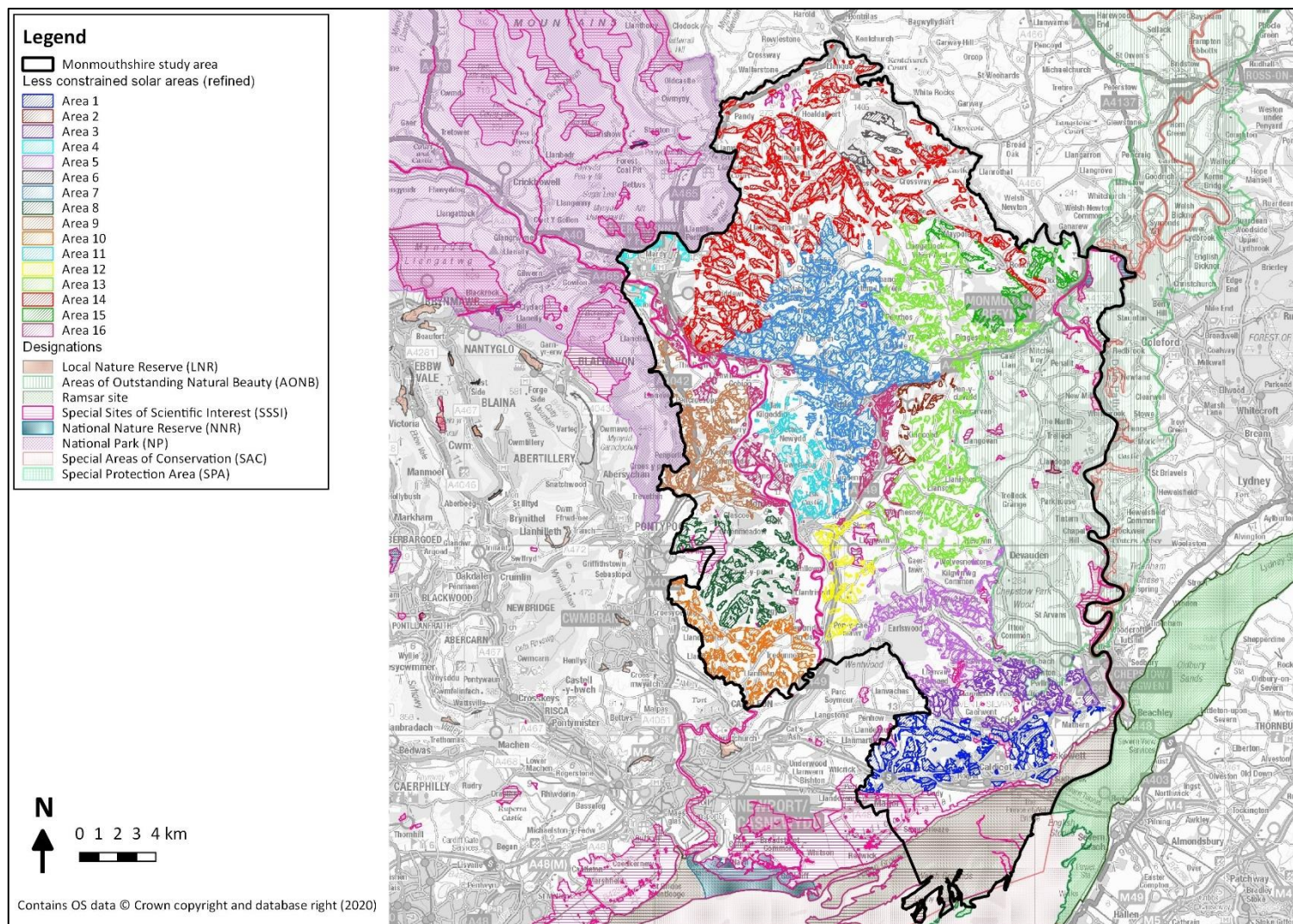


Figure 70: Less constrained land for solar (refined) and landscape designations

(Welsh Government, 2020b)

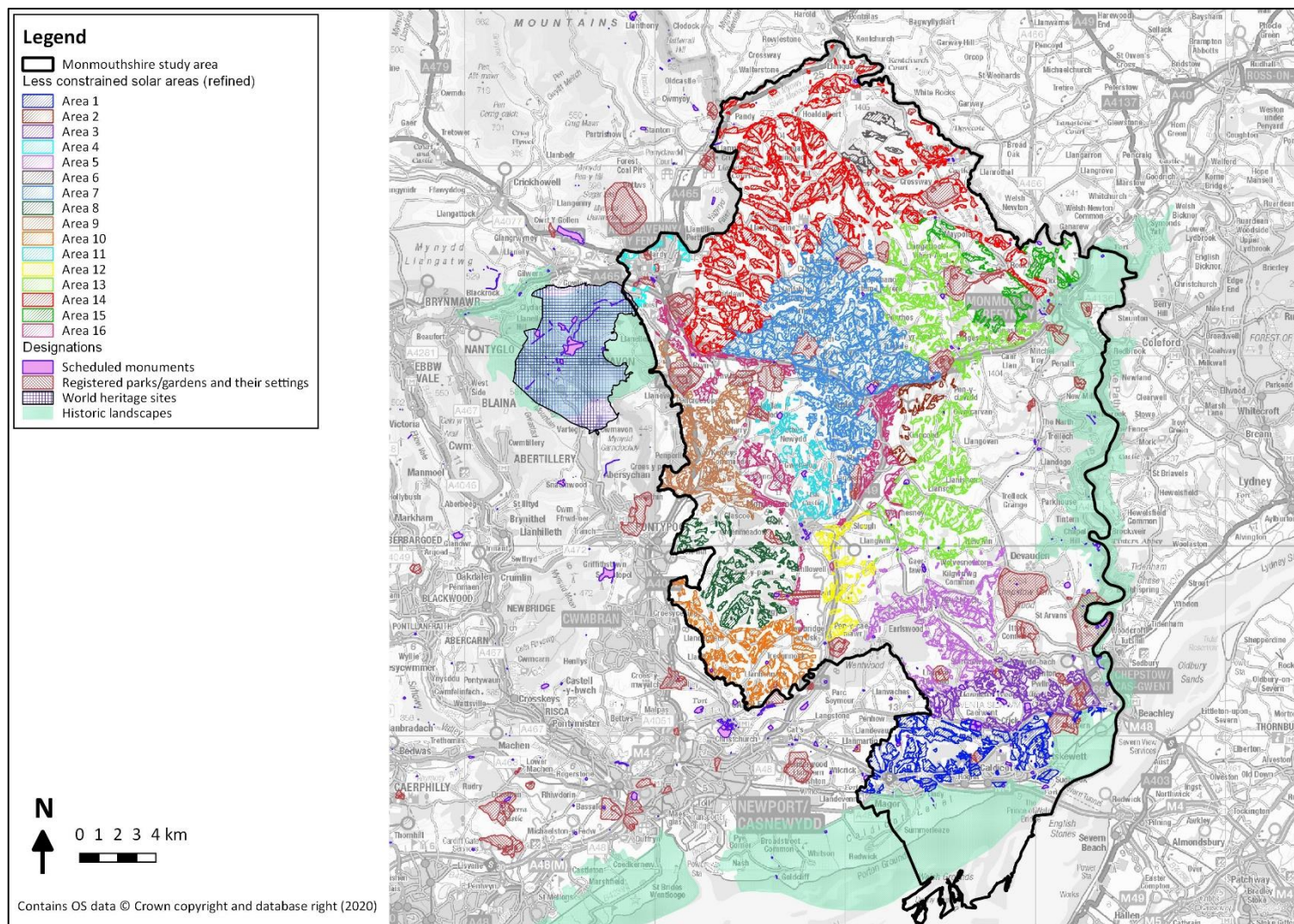


Figure 71: Less constrained land for solar (refined) and historic designations

(Welsh Government, 2020b, Cadw, 2020)

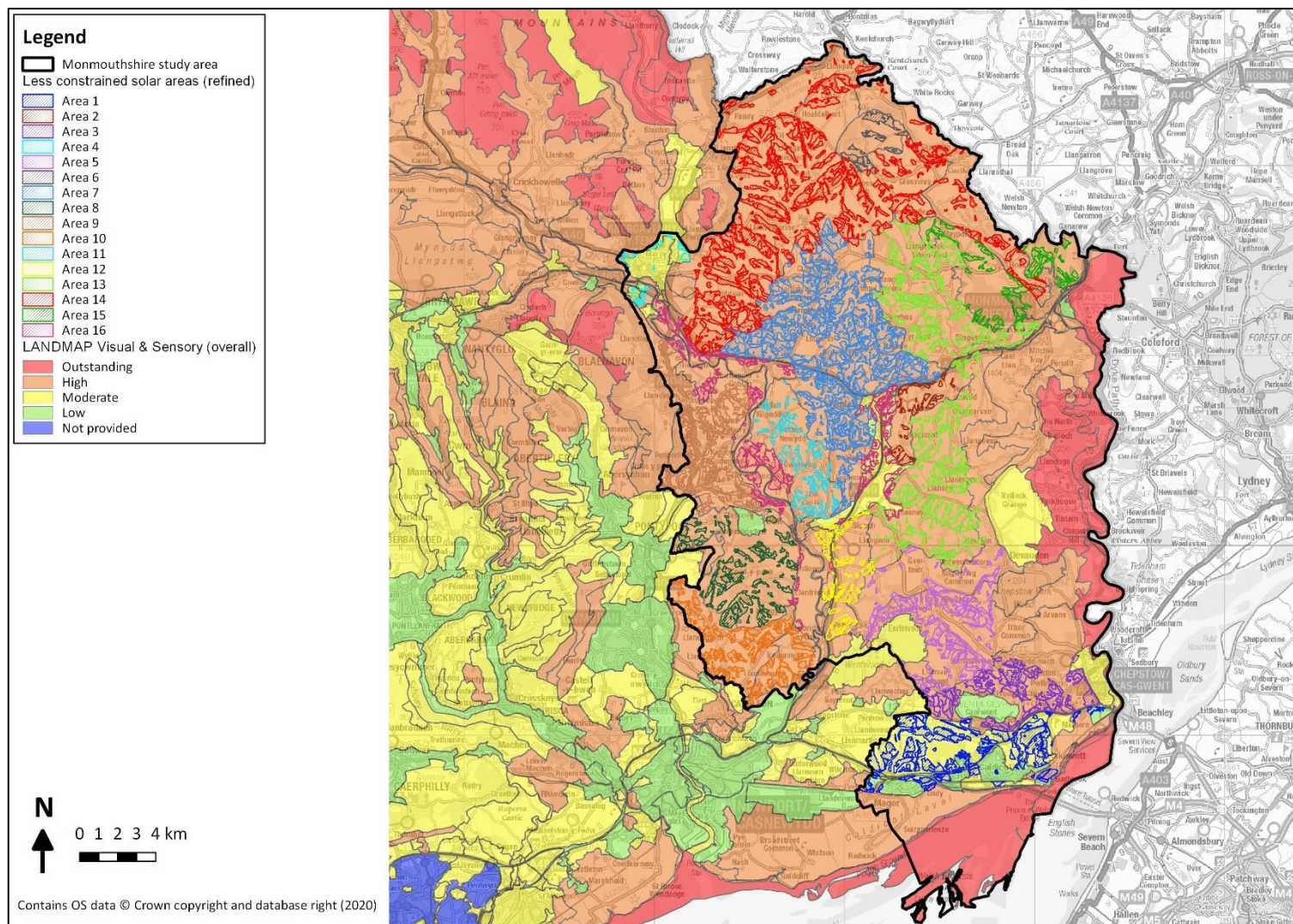


Figure 72: Less constrained land for solar (refined) and LANDMAP visual and sensory overall rating

(Welsh Government, 2020b)

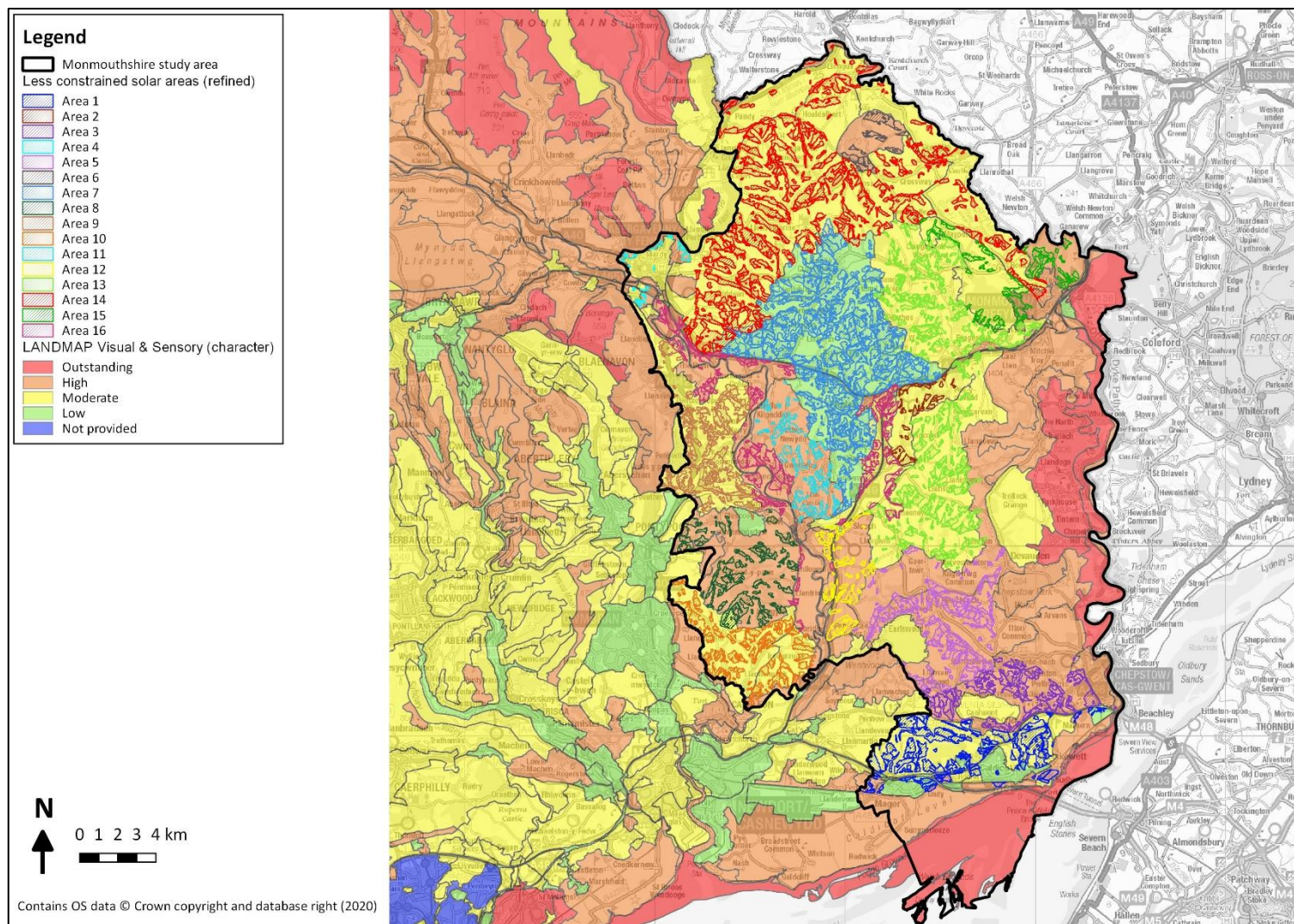


Figure 73: Less constrained land for solar (refined) and LANDMAP visual and sensory character rating

(Welsh Government, 2020b)

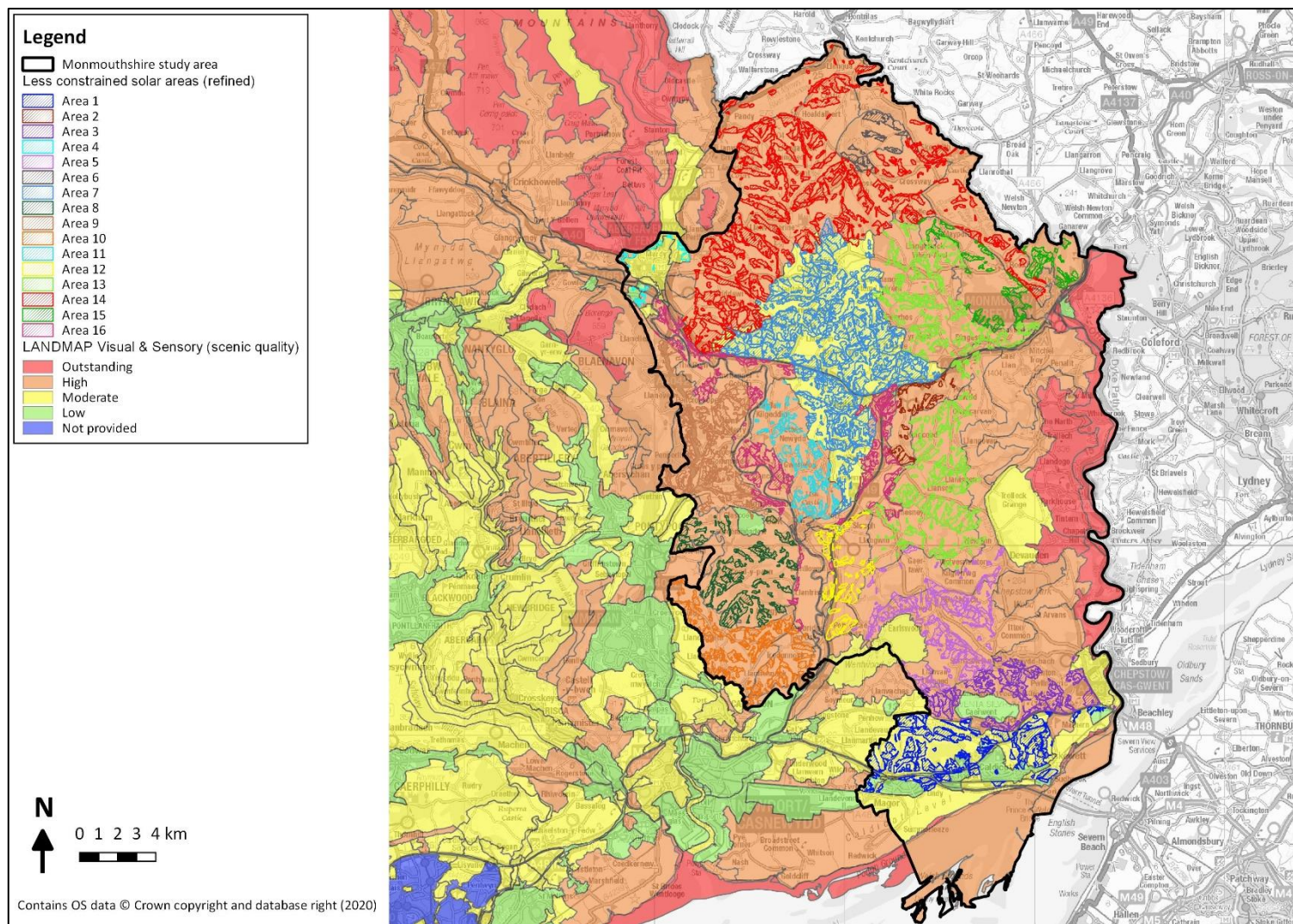


Figure 74: Less constrained land for solar (refined) and LANDMAP visual and sensory scenic quality rating

(Welsh Government, 2020b)

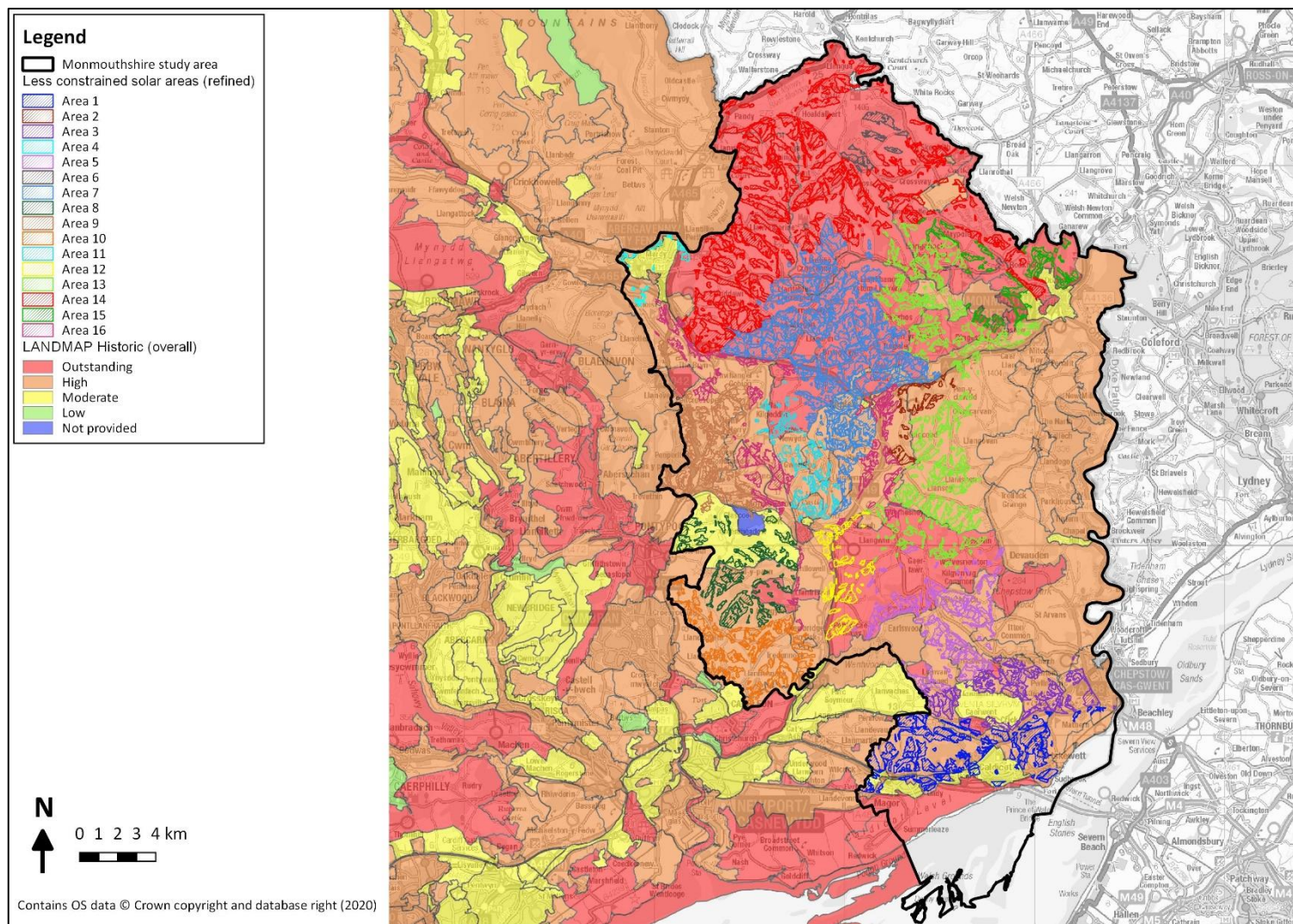


Figure 75: Less constrained land for solar (refined) and LANDMAP historic overall rating

(Welsh Government, 2020b)

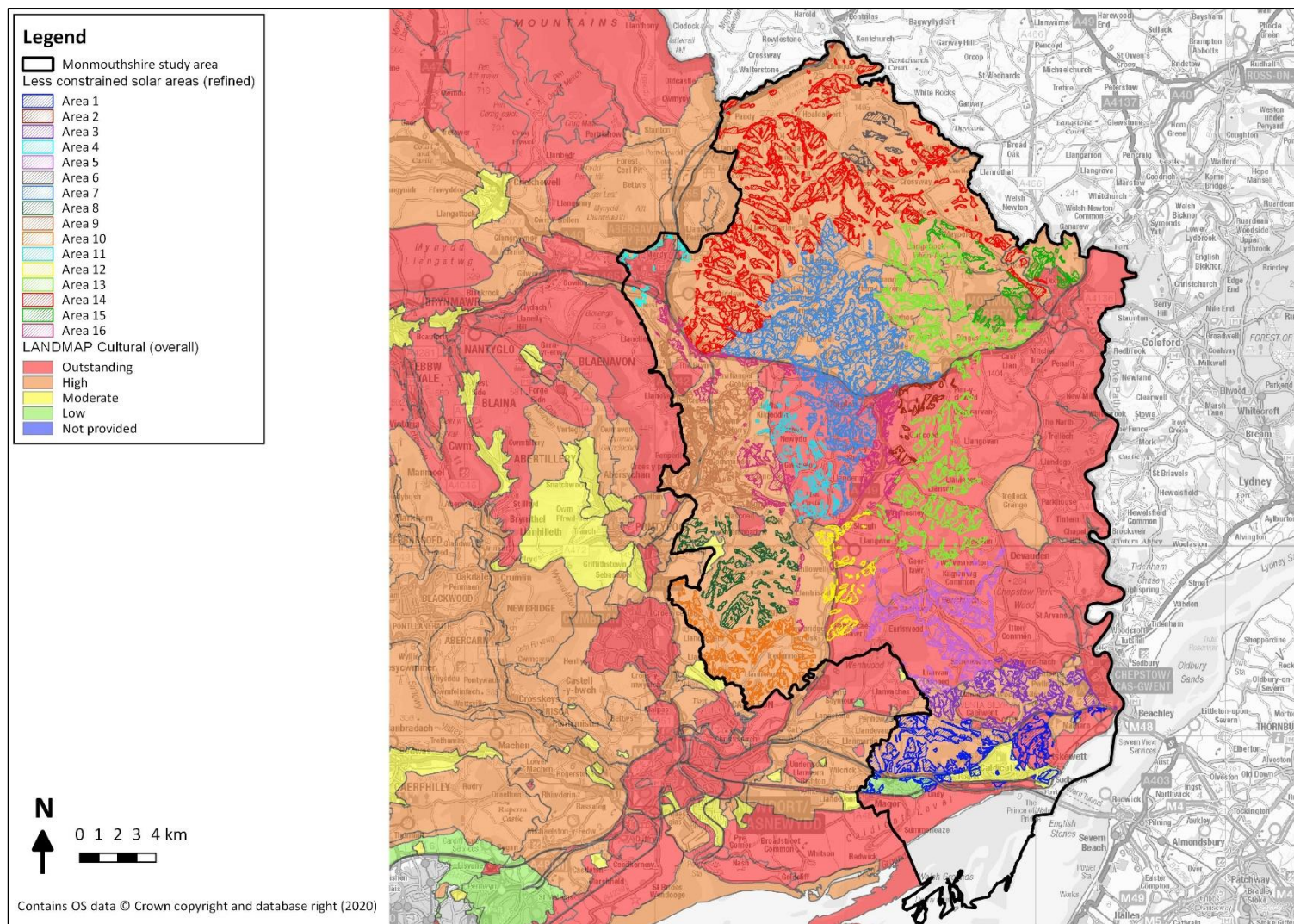


Figure 76: Less constrained land for solar (refined) and LANDMAP cultural overall rating

(Welsh Government, 2020b)

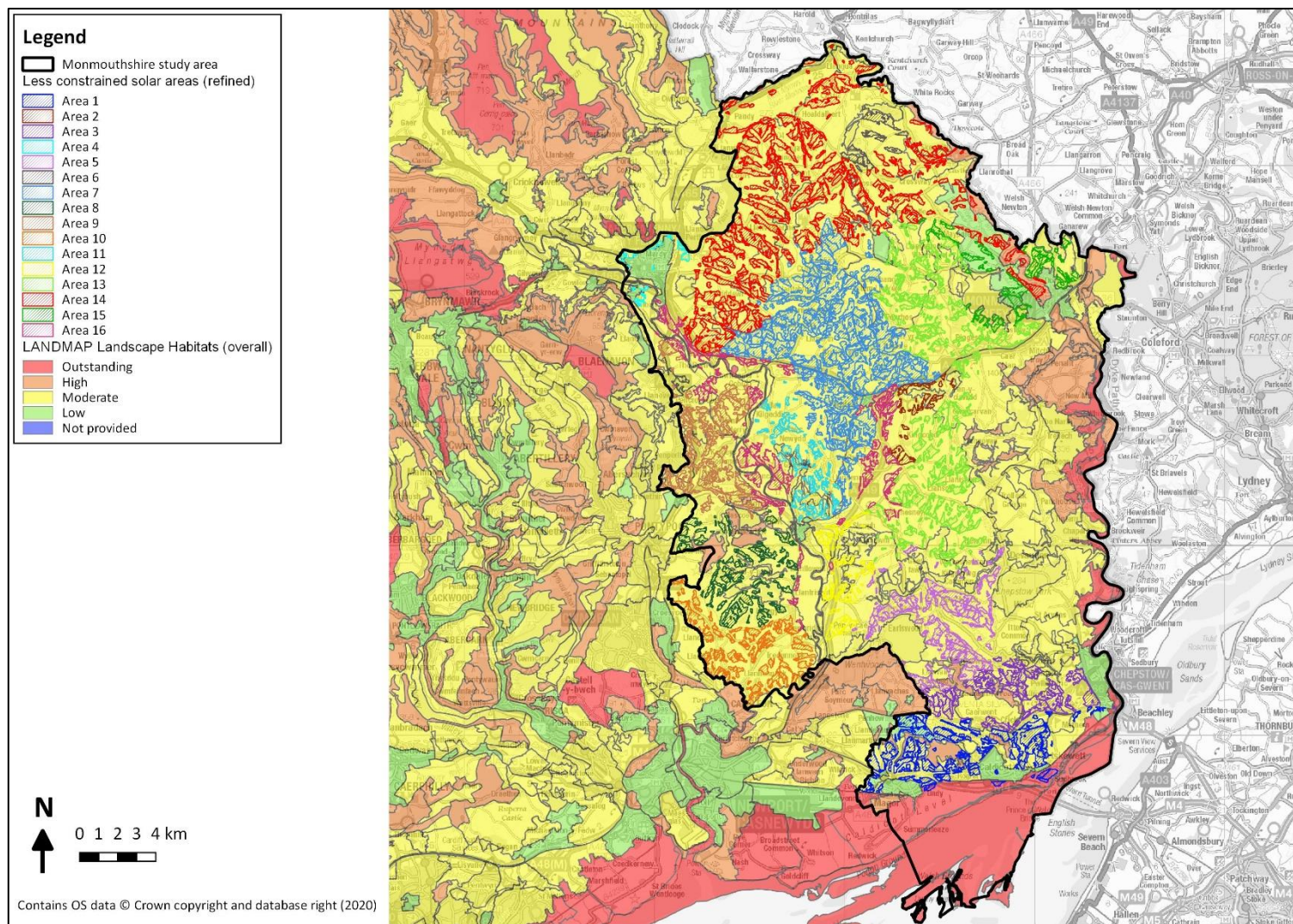


Figure 77: Less constrained land for solar (refined) and LANDMAP landscape habitats overall rating

(Welsh Government, 2020b)

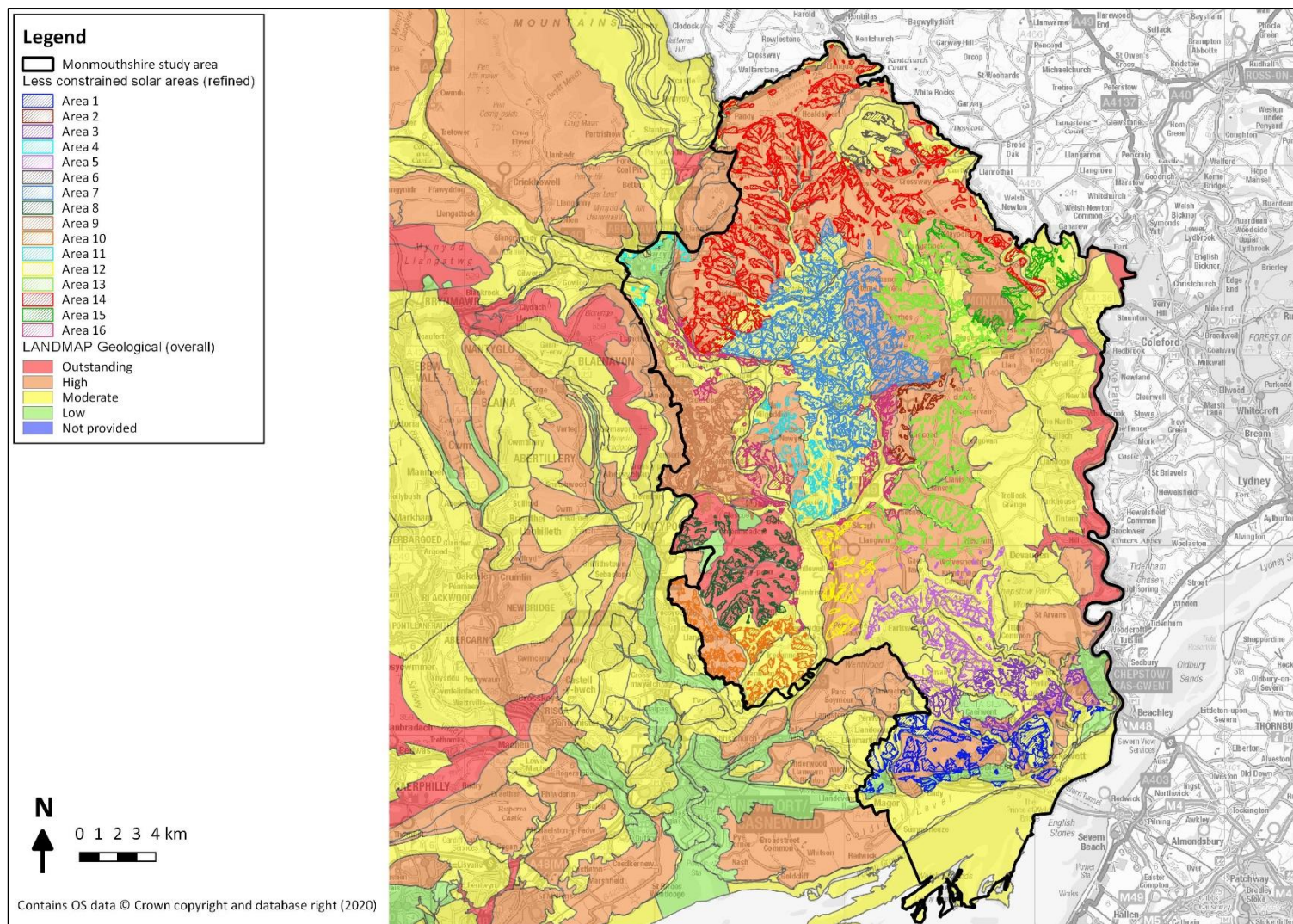


Figure 78: Less constrained land for solar (refined) and LANDMAP geological overall rating

(Welsh Government, 2020b)

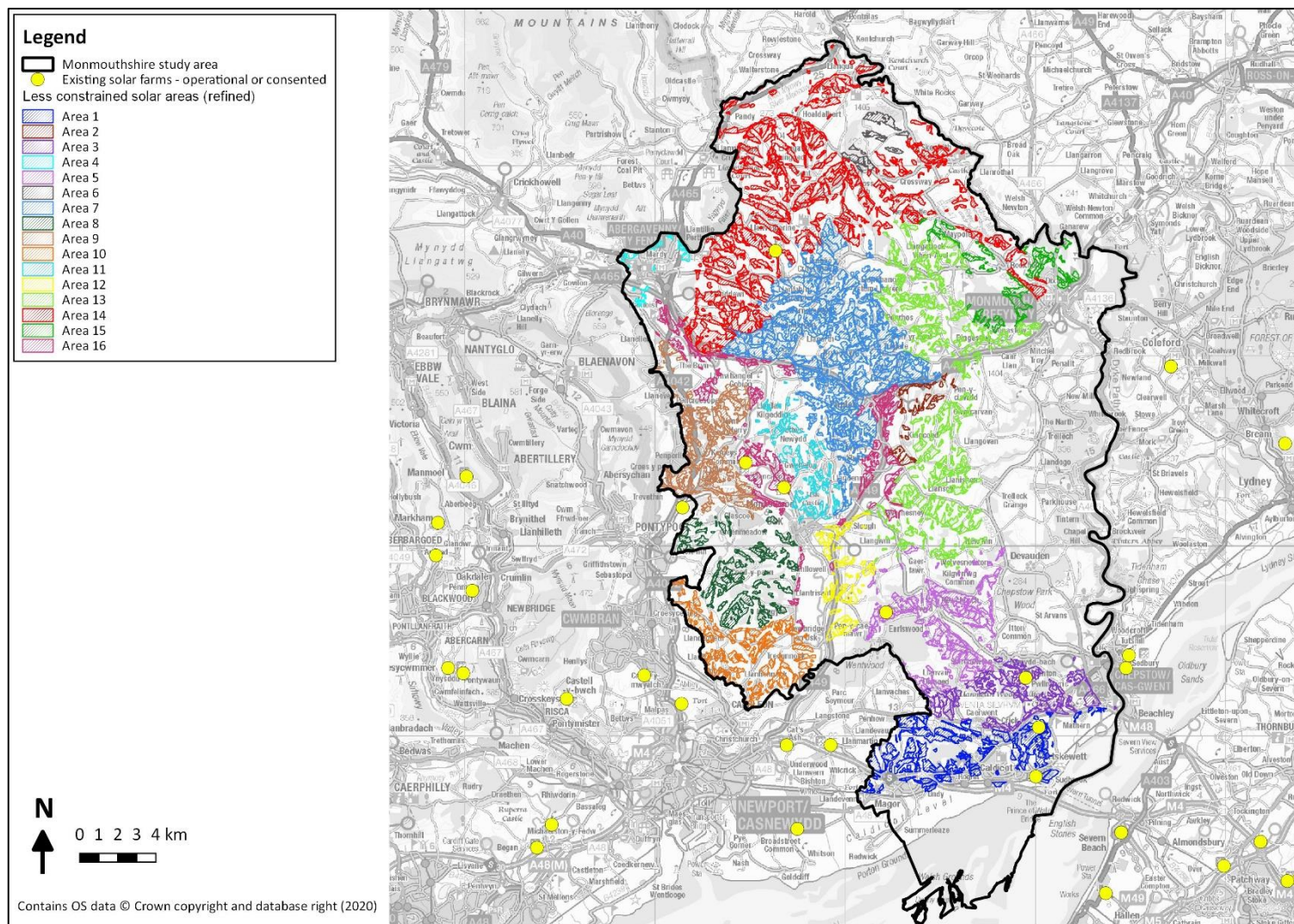


Figure 79: Less constrained land for solar (refined) and existing solar farm developments

(BEIS, 2020a)

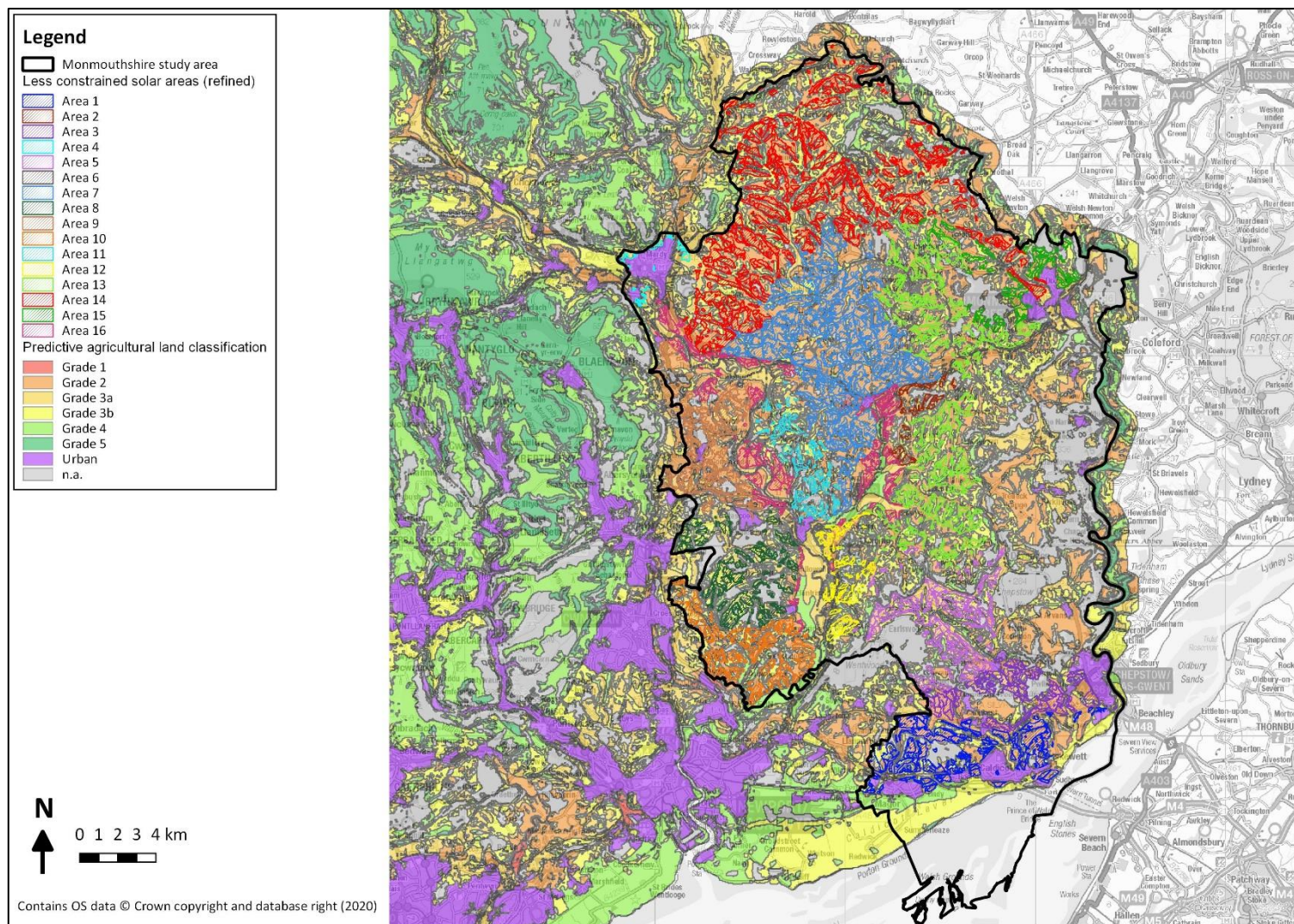


Figure 80: Less constrained land for solar (refined) and predicted agricultural land classification

(Welsh Government, 2020b)

Appendix 5: Non-domestic Energy Benchmarks

Non-domestic energy benchmarks considered for use in the assessment of demand from potential anchor heat loads are summarised in Figure 51, Figure 52, Figure 53, Figure 54, Figure 55 and Figure 56. These Figures show the range in benchmarks available and the factors that can affect energy use, e.g. air conditioning, exact building use, etc.

For the purpose of this assessment mean energy intensity values provided for heating and non-heating energy uses provided by BEIS (2016) for different non-domestic use types have been used. The values are based on a survey of 3,690 buildings across Wales and England. In order to identify the heating demand from the energy intensity values an 80% efficiency factor is assumed.

The CIBSE (2012) benchmarks are discounted due to the length of time since they were produced, with respect to energy use, and do not reflect the advances that have been made with respect to energy efficiency. Additionally, the detail provided in CIBSE (2012) requires a more detailed understanding of the nature of the buildings rather than just their broad category. CIBSE is in the process of collating a new database of benchmarks via an online tool – the beta version of this tool is currently being trialled (CIBSE, 2019).

The Aecom (2016) benchmarks are ambitious with respect to energy demand for space heating and hot water, generally providing lower benchmarks for these elements, whereas the non-heating elements are generally higher than those provided by BEIS (2016).

Benchmarks provided by BEIS (2016) have been used in this assessment as they provide a more generic energy use for each of the categories provided which is considered appropriate given the final nature of the developments is currently uncertain.

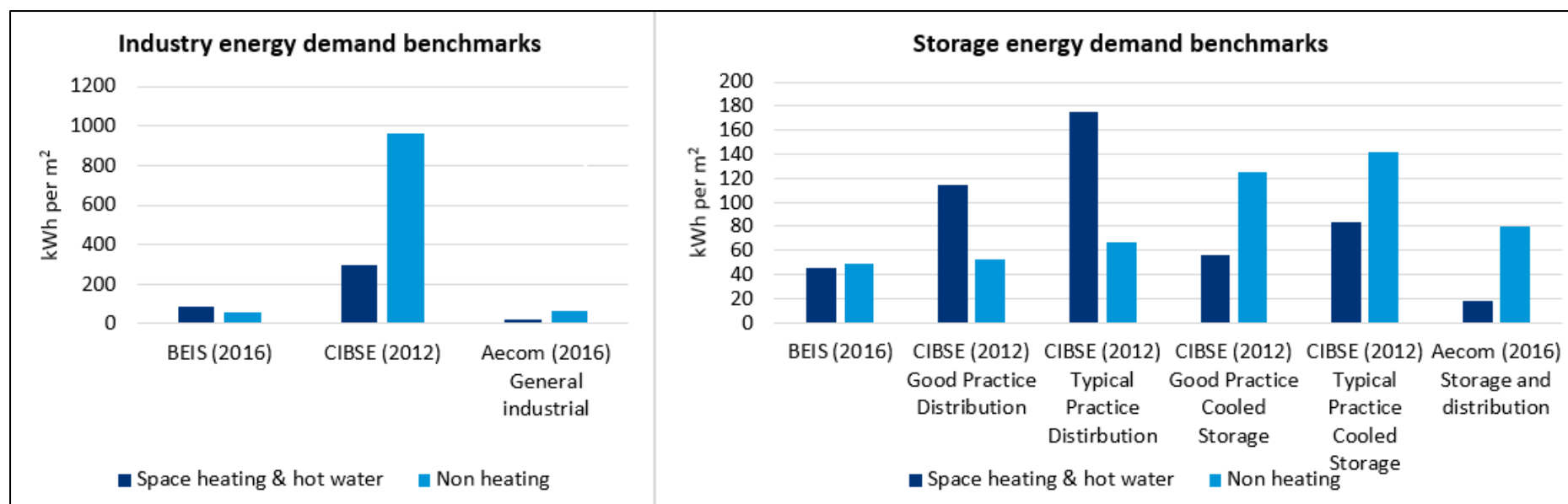


Figure 81: Industry and storage energy demand benchmarks

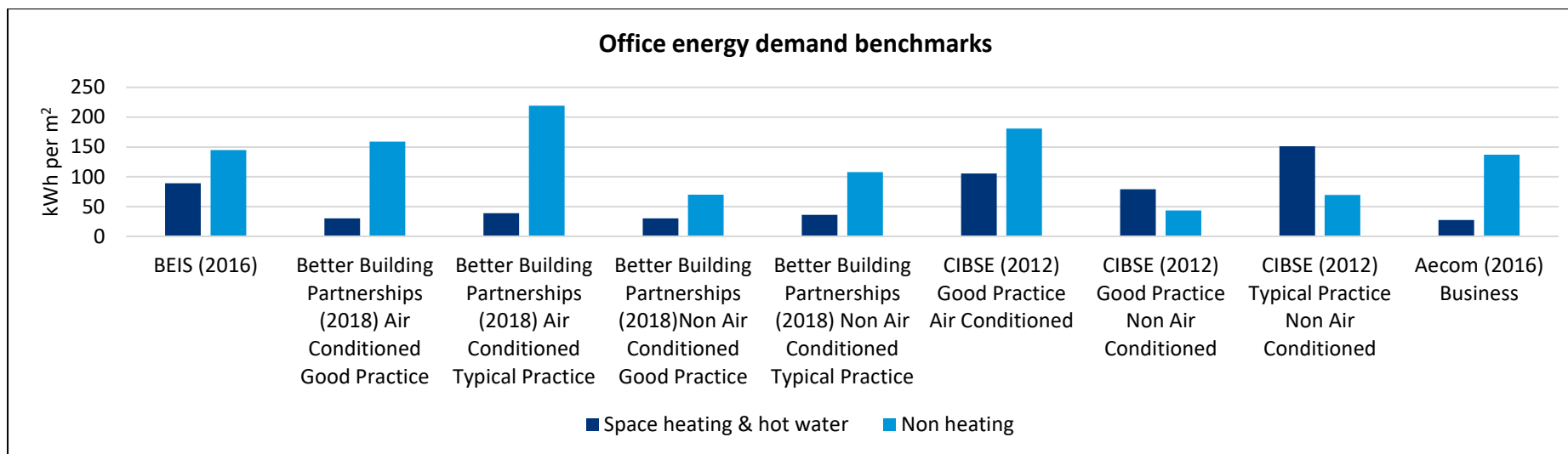


Figure 82: Office energy demand benchmarks

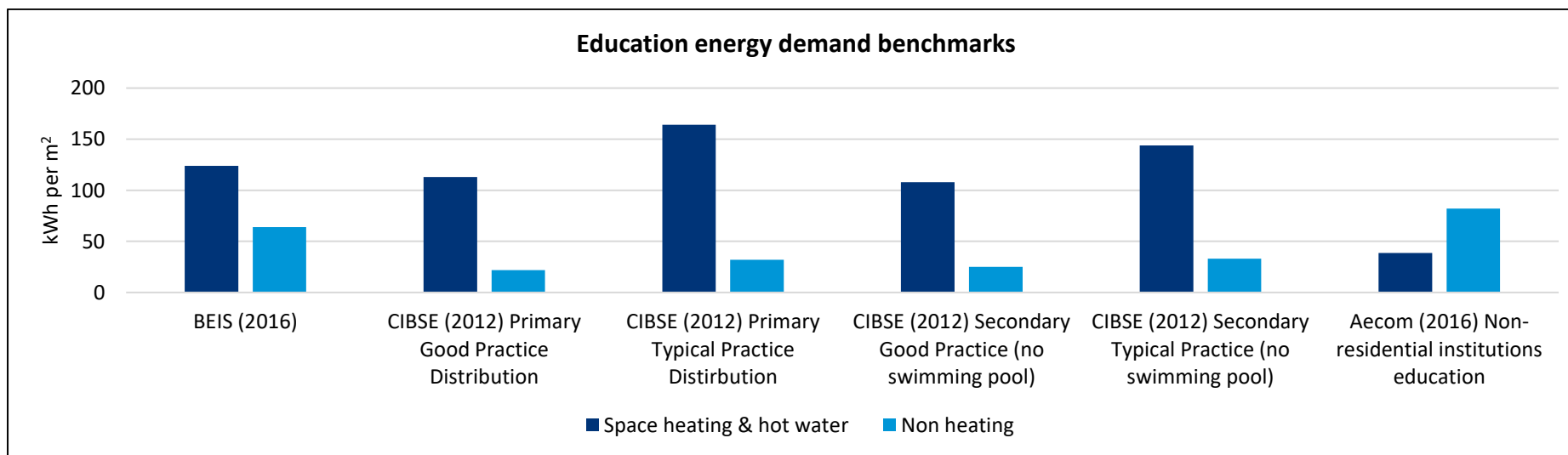


Figure 83: Education energy demand benchmarks

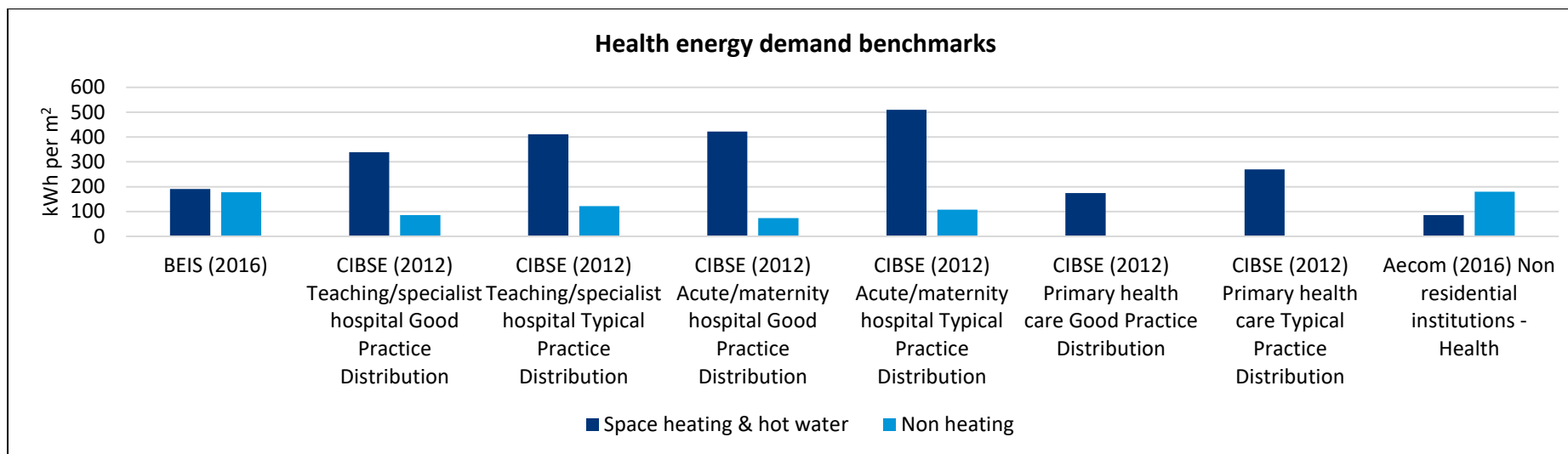


Figure 84: Health energy demand benchmarks

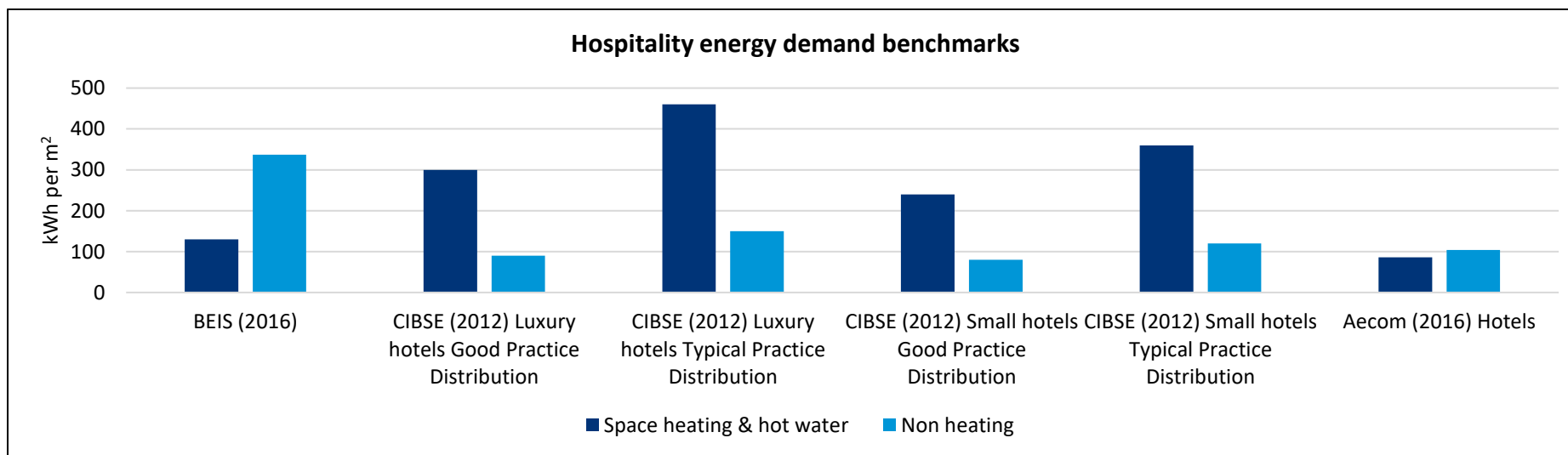


Figure 85: Hospitality energy demand benchmarks

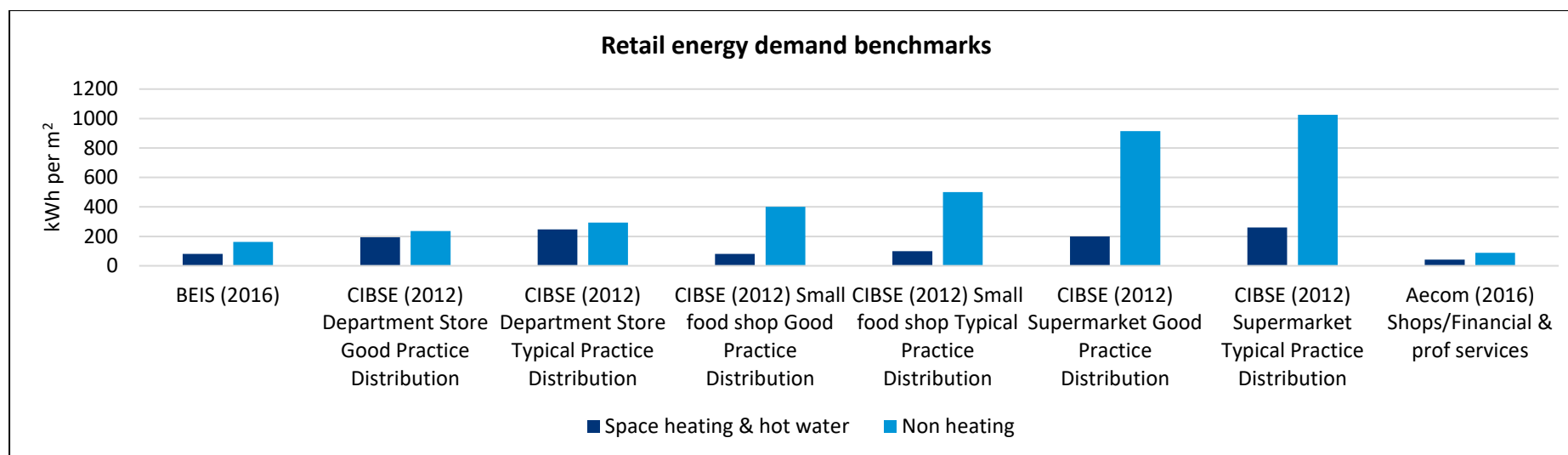


Figure 86: Retail energy demand benchmarks

Notes on benchmarking comparison

CIBSE (2012) Office air-conditioned benchmarks are found by taking the average between the standard air conditioning and prestige air conditioning figures.

CIBSE (2012) Office non-air-conditioned benchmarks are found by taking the average between the open plan and cellular office figures.

CIBSE (2012) Industrial energy use figures are derived by taking the average of all of the industrial sub-sectors provided.

CIBSE (2012) Warehouse figures were used to represent the storage values. Fossil fuel energy use was assumed representative of energy used for space heating and domestic hot water.

Appendix 6: Further Appraisal of Wind and Ground Mounted Solar

Table 56: Wind cluster assessment summary and priority

Cluster	1	2	3	4	5	6	7	8	Score
Priority	7	5	5	4	6	6	8	8	1 – Most constrained
Capacity (MW)	2	2	2	2	2	2	2	2	2
Wind resource	6.06 - 6.12	6.06	6.39	6.5	6.5	6.26	6.02	6.46	3
Designations within 1km	Registered park/garden and/or essential setting	None	None	None	Registered park/garden and/or essential setting	Registered park/garden and/or essential setting	Brecon Beacons National Park	Wye Valley AONB, Lower Wye Valley historic landscape, 2 SSSIs, 2 SACs	4
Landmap Visual Sensory	Overall/scenic quality/ character: High	Overall/scenic quality: High Character: Moderate	Overall/scenic quality: High Character: Moderate	Overall/scenic quality: High Character: Moderate	Overall/scenic quality: High Character: Moderate	Overall/scenic quality: High Character: Moderate	Overall/scenic quality: High Character: Moderate	Overall/scenic quality/ character: High	5
Landmap Historic	Outstanding	Outstanding	Outstanding	Outstanding	Outstanding	Outstanding	Outstanding	Outstanding	6 – Least constrained
Landmap Cultural	High	High	High	High	High	High	High	High	
Landmap Landscape Habitats	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	
Landmap Geological	Moderate	High/ moderate	High	High	High	High	High	Moderate	
Aviation constraints	Partly within 20-100m PSR. Fully within 100-200m PSR	Partly within 160m PSR. Fully within 180-200m PSR.	Fully within 140-200m PSR	Fully within 180-200m PSR	Fully within 100-200m PSR	Partly within 140m PSR. Fully within 160-200m PSR	Fully within 100-200m PSR	Partly within 40m PSR. Fully within 60-200m PSR	
Other developments	None nearby	None nearby	None nearby	None nearby	None nearby	None nearby	2 micro turbines within 3 km	1 micro turbine within 3 km	
BSP/ Primary substations	BSP: Abergavenny Primary: Monmouth/ Abergavenny	BSP: Abergavenny Primary: Monmouth	BSP: Abergavenny Primary: Monmouth	BSP: Abergavenny Primary: Monmouth	BSP: Abergavenny Primary: Monmouth	BSP: Abergavenny Primary: Monmouth	BSP: Abergavenny Primary: Abergavenny	BSP: Abergavenny Primary: Monmouth	

Cluster	9	10	11	12	13	14	15	16	Score
Priority	7	5	4	1	3	2	2	8	1 – Most constrained
Capacity (MW)	2	2	2	2	2	2	2	2	2
Wind resource	6.41	6.84	6.42	6.04	6.04	6.09	6.1	6.15	3
Designations within 1km	Wye Valley AONB, 1 SSSI	Registered park/garden and/or essential setting, 1 scheduled monument (SM)	1 SSSI, 1 SM	2 SSSIs, 2 scheduled monuments	1 SSSI, 1 registered park and garden, 3 scheduled monuments	3 scheduled monuments	Gwent levels historic landscape, 1 SSSI, 3 scheduled monuments	Gwent Levels historic landscape, 1 SPA, 1 RAMSAR site, 1 SAC, 2 SSSIs	4
Landmap Visual Sensory	Overall/scenic quality/ character: High	Overall/scenic quality/ character: High	Overall/scenic quality/ character: High	Overall/scenic quality/ character: High	Overall/scenic quality/ character: High	Overall/scenic quality/ character: High	Overall/scenic quality/ character: Moderate	Overall/scenic quality: Moderate Character: High	5
Landmap Historic	High	Outstanding/ high	High	Moderate	High/ moderate	High	High	Outstanding	6 – Least constrained
Landmap Cultural	Outstanding	Outstanding	Outstanding	High	High	High	Outstanding	Outstanding	
Landmap Landscape Habitats	Moderate	Moderate	Moderate	Moderate	High/ moderate	Moderate	Moderate	Outstanding	
Landmap Geological	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	
Aviation constraints	Fully within 140-200m PSR. Bristol Filton airport and Bristol airport zones	Partly within 40-60m PSR, Fully within 80-200m PSR zones. Bristol Filton airport and Bristol airport zones	Fully within 100-200m PSR. Bristol Filton airport and Bristol airport zones	Fully within 160-180m PSR zones. Bristol Filton airport and Bristol airport zones	Partly within 180m PSR zone Fully within 200m PSR zone. Bristol Filton airport and Bristol airport zones	Bristol Filton airport and Bristol airport zones	Bristol Filton airport and Bristol airport zones	Bristol Filton airport and Bristol airport zones	
Other developments	None nearby	None nearby	None nearby	None nearby	None nearby	None nearby	None nearby	None nearby	
BSP/ Primary substations	BSP: Sudbrook Primary: Chepstow	BSP: Magor Primary: Magor	BSP: Sudbrook Primary: Caldicot	BSP: Sudbrook Primary: Caldicot	BSP: Sudbrook Primary: Caldicot	BSP: Sudbrook Primary: Caldicot	BSP: Sudbrook Primary: Sudbrook	BSP: Sudbrook Primary: Caldicot	

Table 57: Ground mounted solar area summary and priority

	1	2	3	4	5	6	7	8	Score
Priority	3	6	6	8	5	4	2	4	1 – Most constrained
Capacity (MW)	607	81	399	49	519	102	1,739	351	2
Designations within 1km	AONB, Penhow Woodlands NNR, Gwent Levels historic landscape, Ramsar, 2 SACs, SPA, 11 SSSIs, 6 Registered parks/gardens and/or their settings, 34 SMs	1 registered park/garden and/or their essential setting, 4 SMs	AONB, Gwent Levels and Lower Wye Valley historic landscapes, 9 SSSIs, Ramsar, 3 SACs, 1 SPA, 6 registered parks/gardens and/or their essential settings, 24 SMs	Brecon Beacons National Park, Blaenavon World heritage site and historic landscape, 6 SSSIs, 2 SACs, 5 registered parks/gardens and/or their essential settings, 7 SMs	AONB, 8 SSSIs, 1 SAC, 4 registered parks and gardens, 16 scheduled monuments	1 registered park/garden and/or their essential setting	2 SSSIs, 1 SAC, 8 registered parks/gardens and/or their essential settings, 20 SMs	5 SSSIs, 1 SAC, 2 registered park/garden and/or their essential settings, 6 SMs	3
									4
									5
									6 – Least constrained
Landmap Visual Sensory	Overall/character: High/moderate/low scenic quality: Moderate/low	Overall/scenic quality: High Character: Moderate	Overall/scenic quality: High/low Character: High/moderate	Overall/scenic quality: High/moderate/low Character: High/moderate	Overall/scenic quality: High Character: High/moderate	Overall/scenic quality/ Character: High	Overall: High Scenic quality: Moderate Character: Low	Overall/scenic quality: High Character: High/moderate	
Landmap Historic	High/moderate	High	High/moderate	Outstanding/high/moderate	Outstanding/high	Outstanding	Outstanding/high	Outstanding/high/moderate	
Landmap Cultural	Outstanding/high/moderate/low	Outstanding	Outstanding/high	Outstanding/high	Outstanding/high	High	Outstanding/high	High	
Landmap Landscape Habitats	Moderate/low	Moderate	High/moderate	Moderate/low	Moderate	Moderate	Moderate	Moderate	
Landmap Geological	High/moderate/low	High	High/moderate	High/moderate/low	High/moderate	Moderate	High/Moderate	Outstanding/moderate	
Predictive agricultural land classification	1, 2, 3a, 3b, 4, Urban	2, 3b	2, 3a, 3b, Urban, NA	3a, 3b, Urban	2, 3a, 3b, 4	2, 3b, 4	1, 2, 3a, 3b	2, 3a, 3b, 4, 5 Urban	
Other developments > 1 MW (consented or operational)	Oak Grove Farm 5.7 MW, Southbrook Solar Farm 5MW within 1km, Rhewl Farm 6MW within 2km	None nearby	Rhewl Farm 6MW and Oak Grove Farm 5.7 MW within 1km	None nearby	Buckwell Farm Solar Park 8.1 MW within 1km, Rhewl Farm 6MW within 2km	None nearby	Manor Farm 10.5 MW within 1km	Llancayo Solar Farm 3.9MW within 2km	
BSP/ Primary substations	BSP: Magor/Sudbrook Primary: Magor/Sudbrook/Caldicot/Newhouse	BSP: Abergavenny, Primary: Monmouth	BSP: Magor/Sudbrook Primary: Magor/Sudbrook/Caldicot/Newhouse/Chepstow	BSP: Abergavenny, Primary: Abergavenny	BSP: Sudbrook/Panteg/Magor, Primary: Caldicot/Usk/Magor/Chepstow	BSP: Abergavenny, Primary: Monmouth	BSP: Abergavenny/Panteg, Primary: Abergavenny/Monmouth/Usk	BSP: Panteg, Primary: Panteg/Usk	

	9	10	11	12	13	14	15	16	Score
Priority	5	1	9	8	2	7	8	4	1 – Most constrained
Capacity (MW)	476	351	171	167	785	1,740	227	532	2
Designations within 1km	Brecon Beacons National Park, Blaenavon historic landscape and World Heritage Site, 5 SSSIs, 1 SAC, 6 registered parks/gardens and/or their essential settings, 6 SMs	3 SSSIs, 1 SAC, 4 registered parks/gardens and/or their essential settings, 9 SMs	2 SSSIs, 1 SAC, 3 registered parks/gardens and/or their essential settings, 11 SMs	2 SSSIs, 1 SAC, 3 registered parks/gardens and/or their essential settings, 4 SMs	AONB, 7 SSSIs, 1 SAC, 6 registered parks/gardens and/or their essential settings, 19 SMs	Brecon Beacons National Park, AONB, The Lower Wye Valley historic landscape area, 5 SSSIs, 2 SACs, 10 registered parks/gardens and/or their essential settings, 21 SMs	Fiddler's Elbow NNR, AONB, Lower Wye Valley historic landscape, 3 SSSIs, 3 SACs, 6 registered parks/gardens and/or their essential settings, 9 SMs	Brecon Beacons National Park, Blaenavon World Heritage Sites and historic landscape, 4 SSSIs, 1 SAC, 12 registered parks/gardens and/or their essential settings, 27 SMs	3
Landmap Visual Sensory	Overall: High Scenic quality: High/low Character: Moderate	Overall/scenic quality: High Character: Moderate	Overall/scenic quality/character: High	Overall/scenic quality/ Character: High	Overall/scenic quality: High Character: Moderate	Overall/scenic quality: High Character: Moderate/high	Overall/scenic quality: High Character: High/moderate	Overall/character: High/moderate Scenic quality: High	4
Landmap Historic	High/moderate	High	Outstanding/high	Outstanding/high	Outstanding/high	Outstanding/high	Outstanding/high/moderate	Outstanding/high	5
Landmap Cultural	Outstanding/high	High	Outstanding/high	Outstanding/high	Outstanding/High	High	Outstanding/high	Outstanding/High	6 – Least constrained
Landmap Landscape Habitats	Moderate	Moderate	Moderate	Moderate	Moderate	High/moderate/low	Moderate/low	Moderate	
Landmap Geological	Outstanding/high/moderate/low	High/moderate	High/moderate	High	High/Moderate	High/moderate	High/moderate	High/moderate	
Predictive agricultural land classification	2, 3a, 3b, Urban	2, 3a, 3b, 4	2, 3a, 3b, 4	2, 3b, 4	2, 3a, 3b	2, 3a, 3b, 4	2, 3a, 3b, 4, Urban	2, 3a, 3b, 4	
Other developments > 1 MW (consented or operational)	Land at Lower House Farm 8.1MW within 1km, Llanccayo Solar Farm 3.9MW within 2km	None nearby	Llanccayo Solar Farm 3.9MW within 1km, Land at Lower House Farm 8.1MW within 2km	None nearby	None nearby	Manor Farm 10.5MW within 1km	None nearby	Llanccayo Solar Farm 3.9MW, Land at Lower House Farm 8.1MW within 1km	
BSP/Primary substations	BSP: Abergavenny/Pontypool North/Panteg, Primary: Abergavenny/Pontypool North/Usk	BSP: Llantarnam/Panteg, Primary: Llantarnam/Panteg/Usk	BSP: Panteg, Primary: Usk	BSP: Panteg, Primary: Usk	BSP: Panteg/Abergavenny Primary: Usk/St. Arvans/Monmouth	BSP: Abergavenny, Primary: Abergavenny/Monmouth	BSP: Abergavenny, Primary: Abergavenny/Monmouth	BSP: Abergavenny/Panteg, Primary: Abergavenny/Usk	

Appendix 7: Explanation of Terms

Anaerobic Digestion:	Anaerobic digestion refers to the process whereby organic material is broken down in an oxygen-free environment to produce biogas (predominantly a mixture of methane and carbon dioxide), which can be burnt to produce heat/power or upgraded to biomethane (an alternative to natural gas).
Carbon budgets:	To assist with meeting the UK's 2050 carbon reduction targets, the UK government has set five-yearly carbon budgets (up to 2032), which set the amount of greenhouse gases that the UK can legally produce. Welsh Government has set Wales' specific carbon budgets.
District heat networks:	District heat networks generate heat in a central energy centre and distribute the heat to a number of buildings through a network of insulated pipes. Heat is transferred from the network of pipes to the buildings via a heat exchanger.
Electrification of heat and transport:	It is anticipated that heating and transport will increasingly become electrified in the future, i.e. there will be increasing numbers of electric vehicles and heating will be increasingly provided by electricity rather than direct fossil fuels.
Energy from Waste:	The assessment estimated the potential for energy generation from waste via direct combustion.
Future energy demand estimations:	Future energy demand cannot be confidently predicted on either a local or national level. All projections/estimations will be dependent on assumptions relating to the market, regulations, policies etc. Two estimates of future energy demand are provided within the assessment to illustrate the range of estimates available which vary due to uncertainties regarding the underlying contributory factors.
GIS constraints mapping:	GIS stands for "Geographic Information Systems", it is mapping software, which allows analysis of spatial and geographical data. GIS was used with spatial data on "constraints", e.g. nature reserves, low wind speed, built-up areas, etc. to identify the areas considered as "less-constrained" for wind and solar. It was also used with spatial data on resource, e.g. woodland and agricultural land to identify areas of biomass fuel potential.

Grid constraints:	The electricity network was designed and built based on a traditional energy system, in which energy is generated in a centralised manner from large thermally driven electricity generators and then distributed across the country with the voltage gradually reducing as the network reaches smaller electricity users. Large-scale increases in de-centralised generation is using up the available capacity in the existing infrastructure. When the available capacity is fully utilised constraints are encountered and additional investment is required to either upgrade or reinforce existing infrastructure.
Heat Pumps:	Heat pumps deliver more thermal energy than the electrical energy consumed (the ratio between thermal output and electrical input is the “Coefficient of Performance”), by extracting and compressing heat from an external source. Heat pumps can be extracted from the air (air source heat pumps) or ground/water (ground source heat pumps). Hybrid heat pumps utilise a heat pump and gas boiler in one heating system.
Repower:	The upgrading or continuation of operation of existing renewable energy generation assets beyond the time period of their initial planning consent.
Typical household consumption values:	Typical household consumption values for gas and electricity are used to convert the energy values provided in the assessment into an equivalent number of households’ demand. It is worth noting that typical household consumption values are likely to change in the future with increasing electrification of heat and transport, as well as increasing energy efficiency.

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Published in the UK: 2020

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