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WASTE RESOURCE MANAGEMENT



**LONDON BOROUGH OF HAVERING COUNCIL**

**LOCAL PLAN WIND RESOURCE EVIDENCE BASE**

**SEPTEMBER 2016**

*your earth our world*



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**LONDON BOROUGH OF HAVERING COUNCIL**

**LOCAL PLAN WIND RESOURCE EVIDENCE BASE**

**SEPTEMBER 2016**

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## 1 INTRODUCTION

Wardell Armstrong (WA) have been commissioned to prepare a Wind Energy Assessment for the London Borough of Havering. This commission is in response to the Written Ministerial Statement (HCWS42) on the 18th June 2015 and the subsequent amendments to the Planning Practice Guidance which state:

*“When determining planning applications for wind energy development involving one or more wind turbines, local planning authorities should only grant planning permission if: – the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and – following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing.”*

This Wind Energy Assessment has identified areas within the London Borough of Havering which are potentially suitable for the development of three different scales of wind turbine based on a Geographical Information system analysis of physical, environmental and planning constraints. These areas will form a key part of the evidence base for the Borough’s emerging Local Plan and will help the Council to designate suitable areas for wind energy development in the Plan. The areas identified will not constitute areas of permitted development and will still require full planning approval subject to suitable environmental assessment, public engagement and support.

## 2 METHODOLOGY

This assessment seeks to identify areas within the London Borough of Havering which are suitable for the development of wind power. The Borough is diverse in current land use and therefore suitability of various scales of wind turbine needs to be recognised. Constraints for different scales of wind turbine vary greatly and therefore this assessment has sort to identify suitable areas for development of three scales of wind turbine which have been termed Small, Medium and Large.

The wind speeds for the London Borough of Havering are generally quite low at around 6m/s on average at a reference height of 45m above ground level. This will necessitate a class 2 or

3 turbine which is geared toward lower wind speeds. Generally, this means that turbines will be larger in both rotor diameter and hub height for their respective power output. The three scales of turbine considered are defined below in Table 2.1 in terms of their dimensions and approximate output.

|               | <b>Rotor Diameter (m)</b> | <b>Hub Height (m)</b> | <b>Tip Height (m)</b> | <b>Power Output (MW)</b> | <b>Representative Turbine</b> |
|---------------|---------------------------|-----------------------|-----------------------|--------------------------|-------------------------------|
| <b>Small</b>  | 33                        | 43                    | 59                    | <0.3                     | KWT300 IEC 61400 Class IIIA   |
| <b>Medium</b> | 54                        | 50                    | 77                    | <0.9                     | EWT900 IEC 61400 Class IIIA   |
| <b>Large</b>  | 80                        | 60                    | 100                   | <1.8                     | Leitwind LTW80 Class IIA      |

Larger turbines necessitate larger separation distances from sensitive receptors (constraint offsets) and therefore it was important to limit the maximum size of the turbine in order to ensure at least some turbines at the large scale could still be accommodated within the Borough. Mapping the constraints allowed the maximum size of large turbines to be determined at about 100m to tip. The Medium and Small cut offs for turbines have been selected based on the availability of turbines. Some of the constraints used to define areas for wind turbine suitability are shown in Table 2.2 below. These constraints have been given offsets or minimum distances where development of turbines would not usually be proposed. These offsets are applied to the constraints giving a good graphical illustration of where suitable scales of wind turbines may or may not be implemented.

| <b>Constraint</b>                     | <b>Small Turbines</b>                 | <b>Medium Turbines</b> | <b>Large Turbines</b> |
|---------------------------------------|---------------------------------------|------------------------|-----------------------|
|                                       | <b>Additional Offsets Applied (m)</b> |                        |                       |
| Residential Properties                | 300                                   | 500                    | 700                   |
| Commercial Properties                 | 200                                   | 200                    | 200                   |
| Farm Properties                       | 200                                   | 200                    | 200                   |
| Hedges                                | 50                                    | 50                     | 50                    |
| Woodland                              | 60                                    | 60                     | 60                    |
| Railway                               | 76                                    | 83.6                   | 110                   |
| Roads                                 | 76                                    | 83.6                   | 110                   |
| Electrical Transmission Grid          | 76                                    | 83.6                   | 110                   |
| River, streams and other water bodies | 25                                    | 25                     | 25                    |
| Listed Building Grade 1               | 500                                   | 700                    | 900                   |
| Listed Building Grade 2*              | 400                                   | 600                    | 800                   |
| Listed Building Grade 2               | 300                                   | 500                    | 700                   |

The assessment for each scale of wind turbine was started from a GIS layer comprising the London Borough of Havering boundary. This polygon was then constrained to identify suitable areas in which each scale of wind turbines could be deployed. There are many combinations of turbine hub height and blade diameter which may reduce or increase the offsets distance selected for this study. The areas identified within this evidence base can only be used to help understand where suitable applications for wind turbines might be brought forward. Applications for wind turbines close to the areas identified might also be suitable, especially where they are smaller than the candidate turbines selected for this study.

### **Residential Properties & Schools**

Residential properties and Schools are noise sensitive receptors and therefore offsets were created around non-commercial addresses as identified in the Ordnance Survey's AddressBase layer to exclude areas that would otherwise generate noise in excess of background levels at residential receptors. The offset distances have been selected based on WA's experience of modelling noise levels for these scales of turbine and comparison with likely background noise levels in the Borough. The offsets selected are expected to be a good approximation, however the actual offset required for a planning application will need to be confirmed and will depend on the results of specific background noise monitoring and turbine modelling.

### **Commercial Properties and Farms**

Noise from wind turbines also has the potential to impact people while at work however background noise levels are generally much higher in these locations and the noise from turbines is masked. Farms which host residential properties could have financial involvement in wind turbine developments and as such tolerate higher noise levels. To show consideration to occupants of commercial properties and farms, without overly restricting potential development areas, an offset of 200m has been selected for all scales of turbine development. Actual offsets required will depend on specific noise assessments and financial involvement.

### **Hedges, Tree Belts & Woodland**

Natural England has issued guidance for wind turbines regarding their proximity to hedges / tree belts and woodlands. Bat activity (including commuting and foraging) has been seen to decline significantly at distance of 50m or less. Natural England's advice is to ensure that wind turbines blade tips cannot intrude within a 50m offset from hedges / tree belts and woodlands. The corresponding ground level offset is a function of the turbine tower height

and rotor diameter. Based on the selected candidate turbines for each scale of development, the offsets to the turbine centres from these features would need to be 53m (Small turbines) , 59m (Medium turbines) and 69m (Large turbines), assuming a hedge height of 2.5m. For trees these buffers would need to be 58m, 65m and 75m respectively, assuming a tree height of 10m. Specific tree and hedgerow height would also have an effect and the potential impacts would have to be assessed in detail at the planning application stage. For the purposes of this assessment, relatively small standard offsets of 50m for hedges and 60m for trees has been selected.

### **Roads, Railway and Electrical Transmission Grid**

The safety record for wind turbines is excellent however the highways agency, local authority highways departments, Network rail, National Grid and regional Electricity Distribution Network Operators would as a minimum require topple offsets from existing and planned infrastructure of turbine tip height + 10%.

### **River, Streams and Other Water Bodies**

There is currently no guidance on minimum distances between wind turbines and water bodies. However, it is not practical to construct wind turbines immediately adjacent to them. For this reason, an offset of 25m (typically the size of a large turbine foundation) has been selected to prevent excessive run off from the construction area, subsidence and potential contamination of the water body. Much larger offsets may be required if specific ecological concerns are relevant and raised as part of the planning application process.

### **Listed Buildings**

Listed buildings can be vulnerable to impacts from turbines with regard to their setting within their local context. There are three grades of nationally listed buildings which reflect the value of the building and inferred setting. The highest ranking buildings are known as Grade 1 followed by Grade 2\* and lastly Grade 2. Locally Listed Buildings are classified as of less importance and have not been considered in this assessment. There is no specific guidance on minimum separation distances between wind turbines and listed buildings. Impacts would normally be assessed as part of landscape and visual impact, heritage and noise assessments for a specific planning application. This is beyond the scope of this study and a simpler approach of assigning constraint offsets to them has been taken. The higher the listing the greater the offset required. It also follows that due to dominance in the landscape, the larger the turbine the greater the offset required. This is reflected in the offsets selected as shown in the

constraint table (Table 2.2), which are based on Wardell Armstrong’s experience in previous wind resource assessments.

### Environmental Constraints

Wind turbines can have an impact on birds and bats either through direct strike or displacement. To limit the potential for this, environmental designations and certain habitat type such as woodlands / orchards have been removed from the potential wind turbine areas layer, see Table 2.3 below.

| <b>Table 2.3: Environmental Constraints</b> |                                      |
|---|--------------------------------------|
| RSPB Reserves                               | Marine Conservation Areas            |
| RSBP Important Bird Areas                   | Doorstep Greens                      |
| World Heritage Sites                        | Country Parks                        |
| Battlefields                                | Local Nature Reserves                |
| Parks and Gardens                           | National Nature Reserves             |
| Traditional Orchards                        | Special Protected Areas              |
| SSSI  | Special Areas of Conservation        |
| Open Country                                | Ramsar Sites                         |
| Nature Improvement Areas                    | Special Sites of Scientific Interest |
| Millennium Greens                           | Heritage Coast                       |
| Areas of Outstanding Natural Beauty         | National Parks                       |

### Other Constraints Considered but not Included in the Assessment

#### Radar

Wind turbine developments are often prone to objections arising from concerns regarding radar interference. Such objections from the Civil Aviation Authority or Ministry of Defence can be difficult, costly or impossible to resolve. These economic risk considerations should be explored by the developer prior to an application for planning being made. In order to understand where radar interference may occur, Wardell Armstrong has created “viewsheds” or zones of theoretical visibility for primary surveillance radar (PSR) within consultation distance of the London Borough of Havering. These viewsheds shows where the consultation zone is and also how much clearance there is between the ground and radar visibility. The consultation zone depends on whether the radar is used for civil or military operations. Civil radars are perceived to have coverage of 35km in any given direction whilst military radars cover approximately 65km. If a desired site is within or close to the consultation zone for a radar it will be necessary to consult the operator of the radar. Consultation should always be sought with the relevant airport/radar operator when developing a wind project. This GIS

layer has not therefore been applied as an additional constraint to wind resource. Instead it has been supplied to provide information on where difficulties due to radar interference may arise.

The viewsheds show that only the Stansted and Southend indicative radar consultation areas extend into the Borough. The clearance with the Southend radar is in excess of 300m and is therefore unlikely to restrict development of wind turbines. The clearance with the Stansted radar varies between 100m and 35m. Detailed consultation with Stansted will therefore be required by any developer.

### **Green Belt**

The Green Belt covers 53% of the London Borough of Havering however adding the Green Belt to the constraint list would leave no suitable areas for wind development with the exception of the existing site at Dagenham. The National Planning Policy Framework (NPPF) states that;

*“When located in the Green Belt, elements of many renewable energy projects will comprise inappropriate development. In such cases developers will need to demonstrate very special circumstances if projects are to proceed. Such very special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources.”*

Developers wishing to develop wind projects within the Borough will therefore need to demonstrate these special circumstances to allow permission to be granted for wind developments.

## **3 RESULTS**

The areas potentially suitable for Small, Medium and Large turbines development (based on the methodology described above) are highlighted on Figure 2 without the constraints used to identify them. The layers of constraints are somewhat complicated and are shown on Figures 3, 4 and 5 respectively. The key to the constraint layers is shown on Figure 6.

No cut off for lower wind speeds has been derived. The developer of any wind project will first consider the prevailing wind regime combined with the energy yield profile of a turbine best suited to the wind regime. The financial viability of the development may also be dependent on the electricity price. In the future this may or may not include a top up subsidy or an onsite end user power purchase agreement. For reference purposes a wind speed up log law calculation was applied to the UK Wind Speed database to estimate the wind speed at the candidate turbine hub heights for the Small, Medium and Large turbines. These are shown on the respective maps (Figures 3-5).

The areas assessed as suitable for large wind turbines would also be suitable for Medium and Small turbines and areas assessed as suitable for Medium sized turbines would also be suitable for Small turbines. Consideration within the Local Plan should be given as to whether to allow smaller turbines to sterilise areas which would otherwise be suitable for larger wind turbines as this could reduce the potential for wind energy production within the London Borough of Havering.

To estimate the number of turbines and resulting installed capacity that could be developed in these areas, it has been assumed that areas suitable for larger scale turbines will be populated by large turbines and that these areas are mutually exclusive with Medium and small scale turbines. The estimates for each area were based on the land area occupied by a single turbine and the land take required for each scale of turbine ellipses set at 5 rotor diameters downwind and 3 rotor diameters across the wind aligned along a south west axis to match the prevailing wind direction for London<sup>1</sup>. These buffers are to ensure optimum wind resource extraction based on wind flow between adjacent turbines and are the minimum spacing expected to be acceptable by the turbine manufacturers. The results are summarised in Table 3.1 below.

| <b>Turbine Scale</b> | <b>Total Area (ha)</b> | <b>Indicative Turbines/ha (5Dx3D spacing)</b> | <b>No of mutually exclusive turbines</b> | <b>Indicative capacity (MW)</b> |
|----------------------|------------------------|---|--|---------------------------------|
| Small                | 268.3                  | 0.81  | 217                                      | 65                              |
| Medium               | 102                    | 0.36  | 37                                       | 18                              |
| Large                | 24.5                   | 0.16  | 4  | 8                               |

<sup>1</sup> [https://www.meteoblue.com/en/weather/forecast/modelclimate/london\\_united-kingdom\\_2643743](https://www.meteoblue.com/en/weather/forecast/modelclimate/london_united-kingdom_2643743).

The number of turbines estimated from the areas available is conservative in that if the areas are fragmented, which they generally are (see Figure 2), it would be possible to apply higher density turbine packing. Nevertheless, the areas identified are likely not be suitable for wind development for a number of reasons, which may include:

- Existing land use
- Landowner willingness
- Justification of special circumstances in the Green belt
- Turbine uneconomic without a suitable end user for the electricity generated
- Grid connection limitations
- Landscape and heritage concerns
- Ecology and archaeology outside of areas currently designated
- Radar and aviation issues
- Public amenity

It would therefore be sensible to assume less than 10% of the sites could be developed.

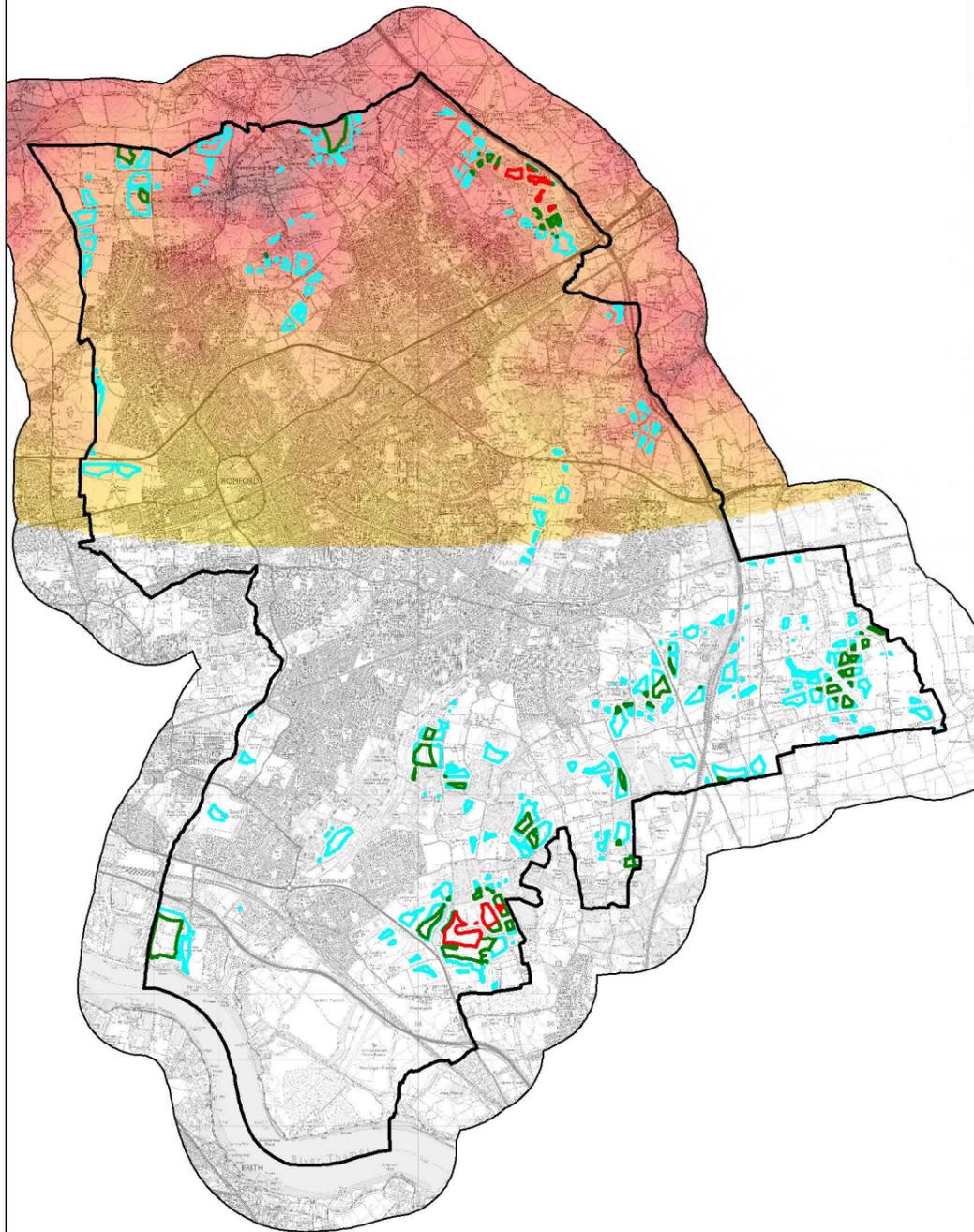
#### **4 CONCLUSION**

The study has identified a large number of potentially unconstrained locations for the development of Small, Medium and Large wind turbines in the Borough. The majority of these can accommodate Small scale turbines. There is some scope for Medium scale turbines and very few opportunities to implement large scale turbines.

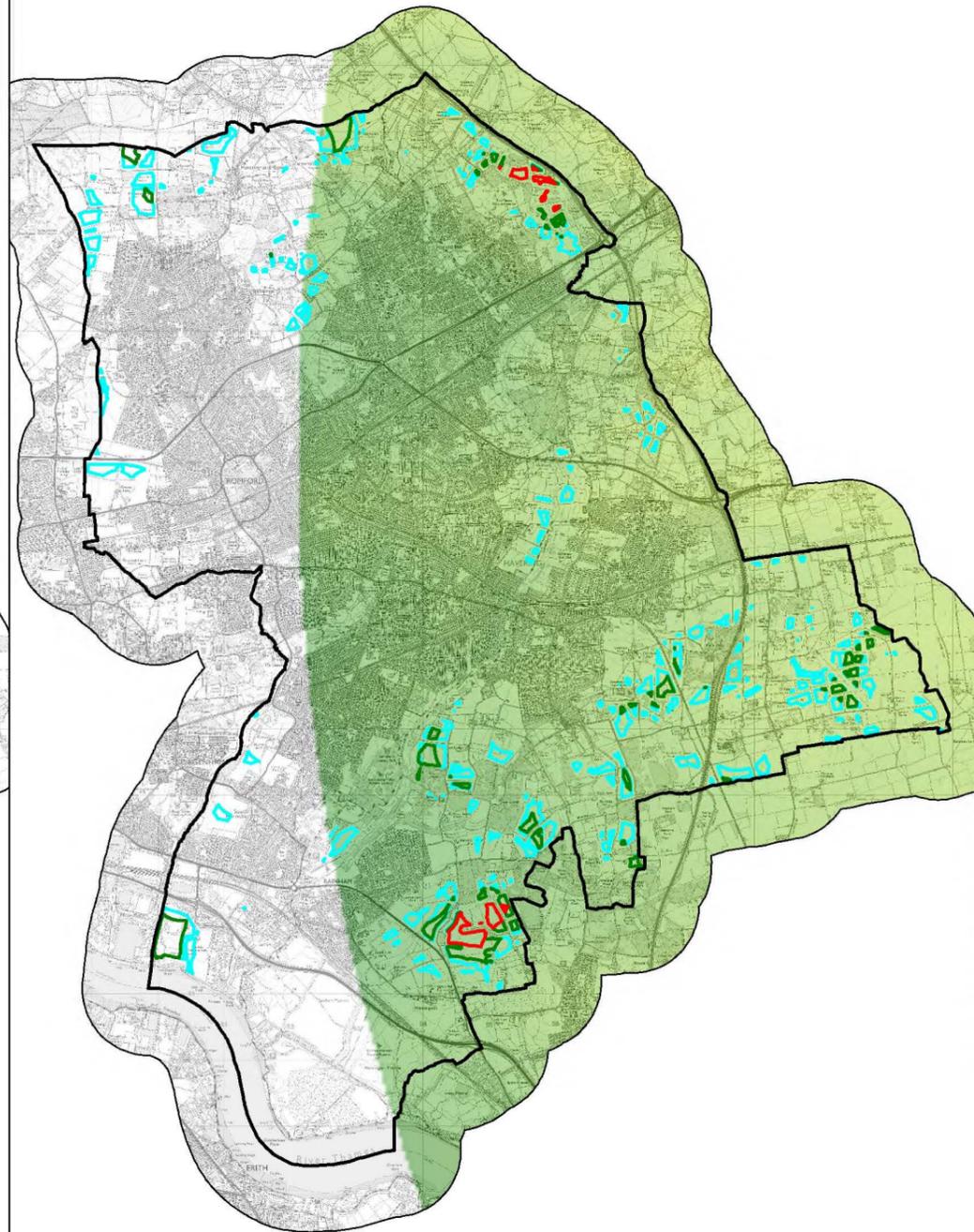
#### **5 RECOMMENDATION**

We would recommend that the Local Plan highlights the locations identified within this study and invites developers to bring forward well planned projects which have carefully considered the scale and appropriate constraints, and can be justified in terms of Green belt policies.

## FIGURES



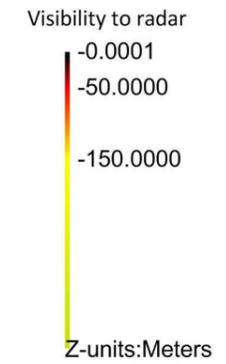
**Stanstead Radar Viewshed**



**Southend Radar Viewshed**

- Havering Borough boundary
- large wind areas
- medium wind areas
- small wind areas

The viewsheds show that the Stansted and Southend indicative radar consultation areas only partly extend into the Borough of Havering. The clearance with the Southend radar is in excess of 300m and is therefore unlikely to restrict development of wind turbines. The clearance with the Stansted radar varies between 100m and 35m. Detailed consultation with Stansted will be required.



0 4 kilometres 1 : 100 000 @ A3

|                                  |   |                     |
|----------------------------------|---|---------------------|
| BNG Ref: 555032 : 186650         | OS 100km Grid: TQ                           | Landranger Ref: 177 |
| Long : Lat DD 0.2366° : 51.5569° | Long : Lat DMS 0° 14' 11.8" : 51° 33' 24.9" |                     |



|  |   |
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| Checked By: SA | Date: 25/08/16 |

Potential for Large, Medium & Small Wind Turbines  
Local Plan Evidence Base for Wind Farm Development  
Havering London Borough

RADAR\_WIND\_PE10658 Figure 1



- Havering Borough boundary
- large wind areas
- medium wind areas
- small wind areas



0 4 kilometres 1 : 60 000 @ A3  
OS 100km Grid: TQ

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|              | Date: 25/08/16 |

**Potential for Large, Medium & Small Wind Turbines  
Local Plan Evidence Base for Wind Farm Development  
Havering London Borough**

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Please see Figure 6 for key to wind resource constraint colours and Table 2.2 for relevant constraint offsets



0 4 kilometres 1 : 60 000 @ A3

BNG Ref: 555032 : 186650 OS 100km Grid: TQ Landranger Ref: 177

Long: Lat DD 0.2366° : 51.5569° Long: Lat DMS 0° 14' 11.8" : 51° 33' 24.9"



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Constraints to small scale wind turbine development  
Local Plan Evidence Base for Wind Farm Development  
Havering London Borough

SMALL\_WIND\_PE10658 Figure 3



Please see Figure 6 for key to wind resource constraint colours and Table 2.2 for relevant constraint offsets



Scale bar: 0 to 4 kilometres. Scale: 1:60,000 @ A3.

BNG Ref: 555032 : 186650 OS 100km Grid: TQ Landranger Ref: 177  
Long: Lat DD 0.2366° : 51.5569° Long: Lat DMS 0° 14' 11.8" : 51° 33' 24.9"



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Constraints to medium scale wind turbine development  
Local Plan Evidence Base for Wind Farm Development  
Havering London Borough

MED\_WIND\_PE10658 Figure 4



Please see figure 6 for colour key to constraint layers and table 2.2 for relevant constraint layer offsets



0 4 kilometres 1 : 60 000 @ A3

BNG Ref: 555032 : 186650 OS 100km Grid: TQ Landranger Ref: 177  
Long: Lat DD 0.2366° : 51.5569° Long: Lat DMS 0° 14' 11.8" : 51° 33' 24.9"



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Constraints to large wind turbine development  
Local Plan Evidence Base for Wind Farm Development  
Havering London Borough

LARGE\_WIND\_PE10658 Figure 5

Figure 6 - Key to wind resource constraints mapping  
Local Plan Evidence Base for Wind Farm Development  
Havering London Borough



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