

# **High Speed 2 – Value for Money Environmental Assessment**

[REDACTED], XXXX XXXX, XXXX XXXX  
Rail Analysis Division

# High Speed 2



# High Speed 2 – Environmental Assessment

- DfT writing a Value for Money (VfM) report to inform Secretary of State's response to the recent High Speed Rail consultation.
- Part of the VfM report will cover the environmental impacts
- The paper covers the methodology being used for these, in particular greenhouse gases and landscape

# High Speed 2 – Environmental Assessment

- Methodology for the appraisal of transport proposals specified in WebTAG, which is based on and consistent with the Green Book.
- WebTAG incorporates developments across Government, and more widely, in assessment of environmental impacts, including guidance published by Defra
- WebTAG guidance includes use of economic valuation and value transfer techniques

# High Speed 2 – Environmental Assessment

- WebTAG specifies the following impacts be considered:
  - Greenhouse gases
  - Landscape
  - Noise
  - Air quality
  - Townscape, heritage, biodiversity and water environment

# High Speed 2 – Greenhouse Gases

- Modal shift from road to rail
  - Valued using DECC value for non-traded carbon
- Changes to aviation
  - Aviation in EU ETS from 2012
  - Price of carbon allowances included in the airfare (and in DfT airfare forecasts)
  - Therefore fully captured and not separately valued

# High Speed 2 – Greenhouse Gases

- HS2 trains consume electricity, which is in traded sector
- According to WebTAG cost of carbon allowances would be captured in the electricity price and does not need to be separately valued
- But:
  - DECC projections for retail electricity price flat after 2030
- Value using IAG methodology but:
  - Industrial variable price not appropriate for very large user like HS2

# High Speed 2 – Greenhouse Gases

- Change in rail electricity consumption multiplied by DECC electricity emissions factors to give CO2 impacts in traded sector
- Valued at traded price of carbon
- Variable electricity price used for HS2 cost estimation, adjusted by current ratio of very large industry to average industry price

# HS2 - Landscape assessment

Methodology based on 2001 DCLG report entitled;

*“Valuing the external benefits of undeveloped land”*

Quantified method not currently in WebTAG guidance, and therefore not within BCR.  
WebTAG uses 7-point-scale Qualitative Assessment.

Survey of 47 papers covering both Reveal Preference and Stated Preference techniques assessing both WTP and WTA.

Literature Assessed Land value:

- £ per hectare
- £ per trip
- £ per annum

No definition for;

- Area of Outstanding Natural Beauty
- Site of Special Scientific Interest
- Monuments (heritage?)

7 Land Classifications

- Urban Core
- Urban Fringe
- Urban Forested
- Rural Forested
- Agricultural Intensive
- Agricultural Extensive
- Natural and Semi Natural

Not formally defined!

# The Land types are valued as follows\* ....

(\*) before accounting for mitigation and distance from rail line

DCLG summary table - land types and non-market benefits

Land type	Coverage of benefits (shaded cells)	£ /ha /yr (2001)	Present value	
			r = 3.5% p=3%	6% p=3%
Urban Core Public space (City park)	Values defined; • Annual values • PV (perpetuity)	£54,000	£10,800,000	£1,800,000
Urban Fringe ('greenbelt')	R L E C H A T A S	£889	£177,800	£29,600
Urban Fringe forested land	Guidance recommends using <b>perpetuity</b> values.	£2,700	£540,000	£90,000
Rural forested land (amenity)		£6,626	£1,325,200	£220,800
Agricultural land (extensive)	Is this consistent with <b>Green Book?</b>	£3,150	£630,000	£105,000
Agricultural land (intensive)	R L E C H A T A c S	£103	£20,600	£3,400
Natural and semi-natural land (Wetlands)	R L E C H A T A c S	£6,616	£1,323,200	£220,500

Notes: R= Recreation; L= Landscape; E= Ecology; C= Cultural Heritage; H= Hydrology; A= Air quality and climate; T= Tranquillity; Ac= Accessibility; S= Soil.

# The Landscape is calculated with the following equation...

$$V_{s,i} (\text{£}) = \text{lengths}_s (\text{KM}) * \text{value}_i (\text{£/ha}) * (1-\alpha) * 50(\text{ha/KM})$$

Where:

$V_{s,i}$  = total landscape value

$\text{lengths}_s (\text{KM})$  = length of the scheme

$\text{value}_i (\text{£/ha})$  = value of the landtype 'i'

$(1 - \alpha)$  = mitigation adjustment

$50(\text{ha/KM})$  = number of Hectares per KM assessed \*

(\*) Reflects 'distance-weighting'.

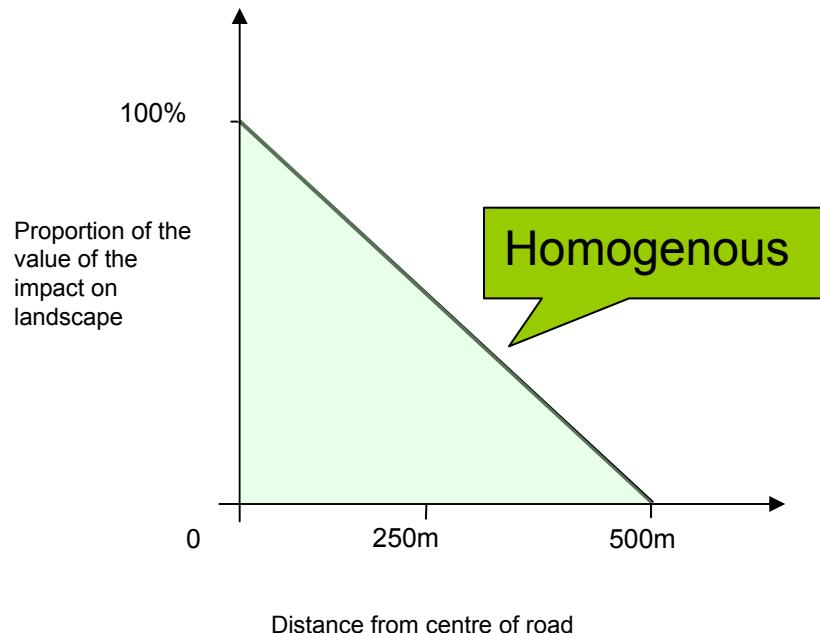
Assumes 1 KM of **linear** track with **homogenous** land and constant mitigation.

# Land is valued less highly the further away from the rail line...

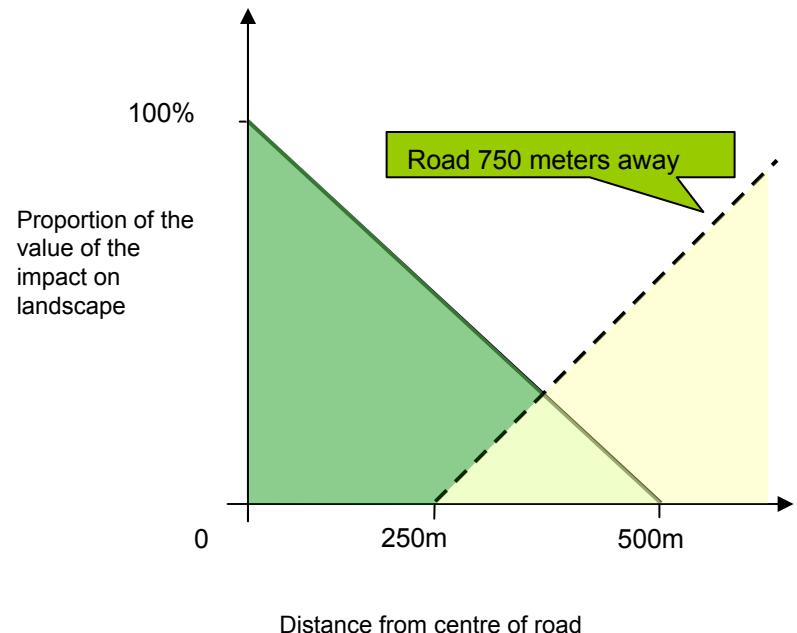
'Distance-weighting' =  $[(500 - D) / 500] = 1 - (D / 500)$

The weight given to a landscape diminishes in a linear fashion the further away the land is from the line of route (within 500 meter buffer.)

**Figure 1**



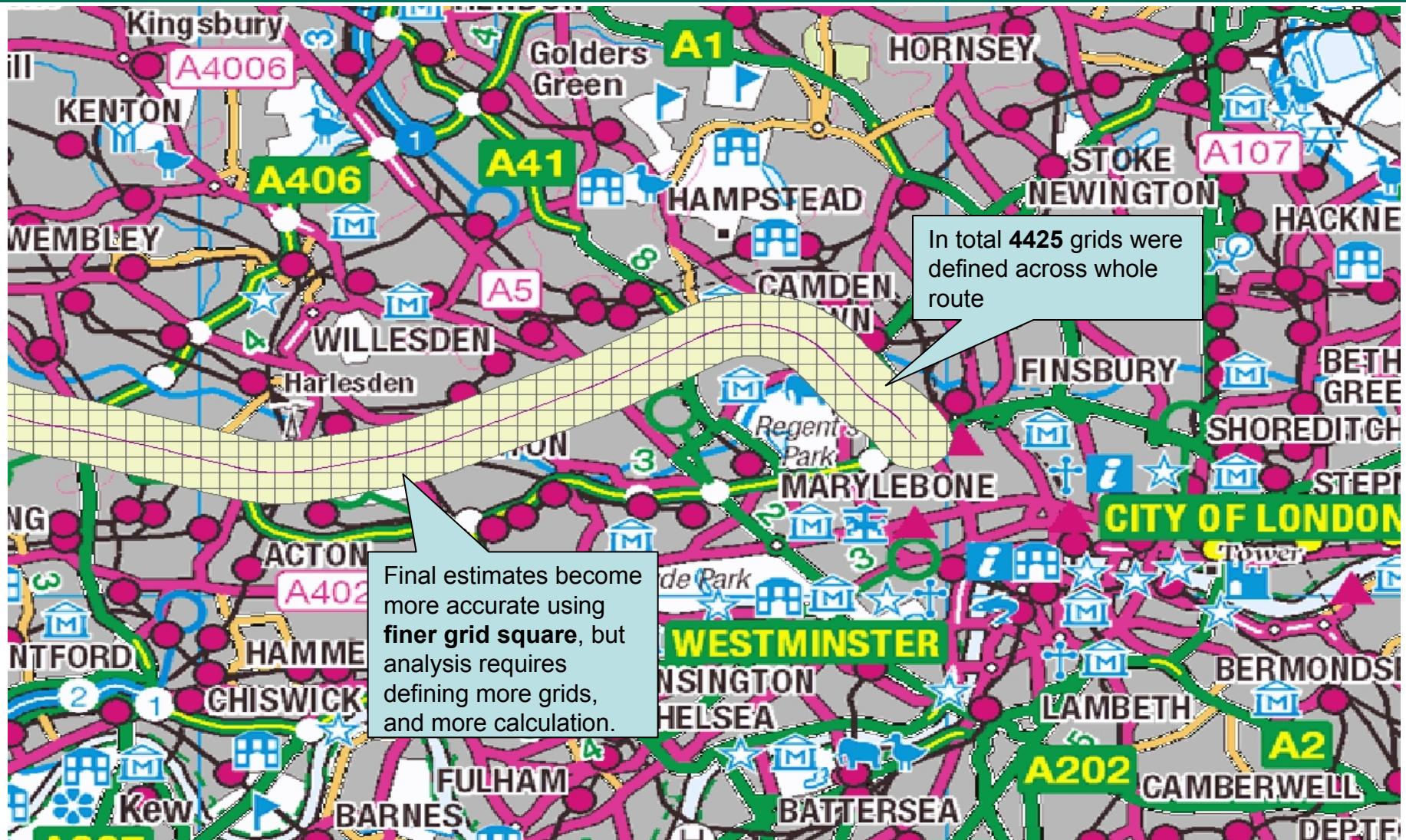
**Figure 2**



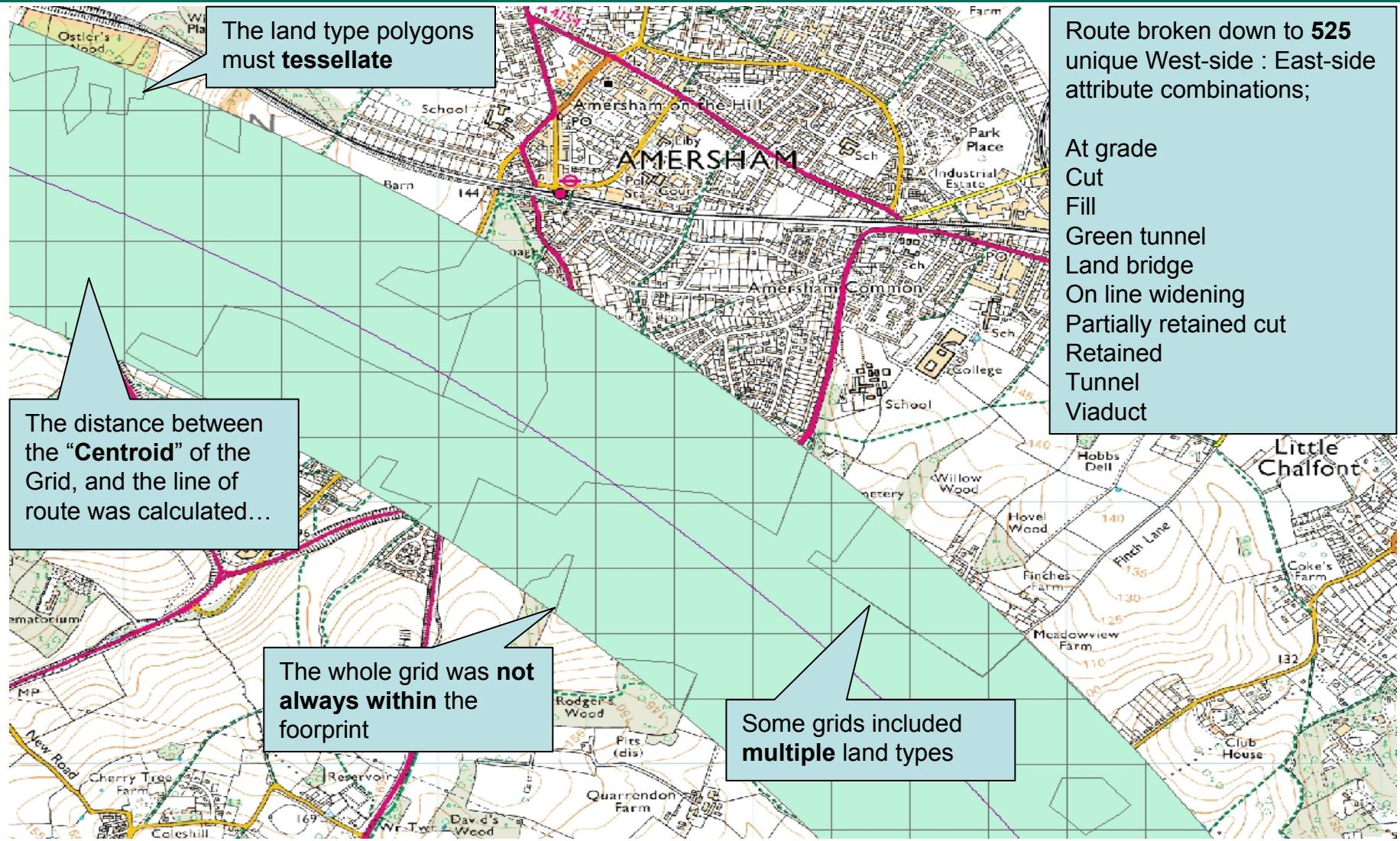
# A 500 meter Buffer Was Added to the Route...



# 250meter<sup>2</sup> Grids were Incorporated within the Route...



# The 7 Land types Were Defined Within the Footprint using Polygons...



# Mitigation values were not advised in the DCLG guidance paper...

Mitigation impact	Mitigation
<b>Footprint</b>	
Urban area partially degraded	0.5
Urban area degraded	1
A road [or motorway]	0.2
Built up area partially degraded	0.4
Current rail line in place	0.6
<b>At the line</b>	
At grade	0
Cut	0.5
Fill	0
Green tunnel	1
Land bridge	0
On line widening	0
Partially retained cut	0.3
Retained	0.3
Tunnel [long – more than 500m]	1
Tunnel [short – less than 500m]	0.5
viaduct	0

Mitigation provided by both:

1. Degradation to the landscape already within the '**footprint**'.
2. Engineering attributes of the proposed route '**at the line**'

Need to define whether scheme is **on-line** or **off-line**

Mitigation ultimately requires a **judgement**.

However, mitigation is crude (ie should 'cutting' and 'retaining' mitigation be proportional to depth)

# ... with some initial sensitivities outlined below...

'r' (discount) =	3.5%
'p' (income uplift) =	3.0%
Effective discount 'r-p' =	0.5%
Value timeframe =	<b>perpetuity</b>

Scenario	ratio
central (r=3.5% p=3.0%, perpetuity)	
central (intensive/extensive = intensive)	1.000
central (intensive/extensive = extensive)	1.059
<b>central (intensive/extensive = intensive)</b>	
central (r-p=0.5%)	1.000
central (r-p=2.0%)	0.250
central (r-p=3.5%)	0.143
<b>central (intensive/extensive = intensive)</b>	
r = green book declining p = 3% 60 years	0.273
r = green book declining p = 2% 60 years	0.208
r = green book declining p = 1% 60 years	0.163
r = green book declining p = 0% 60 years	0.132

Intensive / Extensive (5.4% land coverage) **does not** appear sensitive.

The 'effective discount rate' **does** appear to be highly sensitive.

"Landscape impacts are assumed to exist in perpetuity. Even if a road [rail] lasts for 60 Years (the current appraisal period) its impact is assumed to continue- unless costs of returning the landscape to its original form are included. Changing the time horizon would reduce the Recommended guideline values."

Assessment over 60 years and not into perpetuity **does** appear to be highly sensitive.

# High Speed 2 – Environmental Assessment – Next steps

- Secretary of State response to consultation by the end of the year
- Needs to decide whether to go ahead with further scheme development and hybrid bill
- Not final decision, but will entail significant cost
- Should SoS decide to go ahead with further development of the proposals then a full Environmental Impact Assessment (EIA) would be carried out

# High Speed 2 – IAG is asked to consider...

- Carbon
  - Does the flat lining of the DECC retail electricity price after 2030 mean implicitly that the increase in carbon price after this point is offset by a change in another component of the retail price?
- Landscape:
  - Is it appropriate to discount landscape values into perpetuity?
  - Are the assumptions surrounding mitigation appropriate?
  - Should AONB / SSSI be valued separately?
  - Any feedback on the environmental assessment?