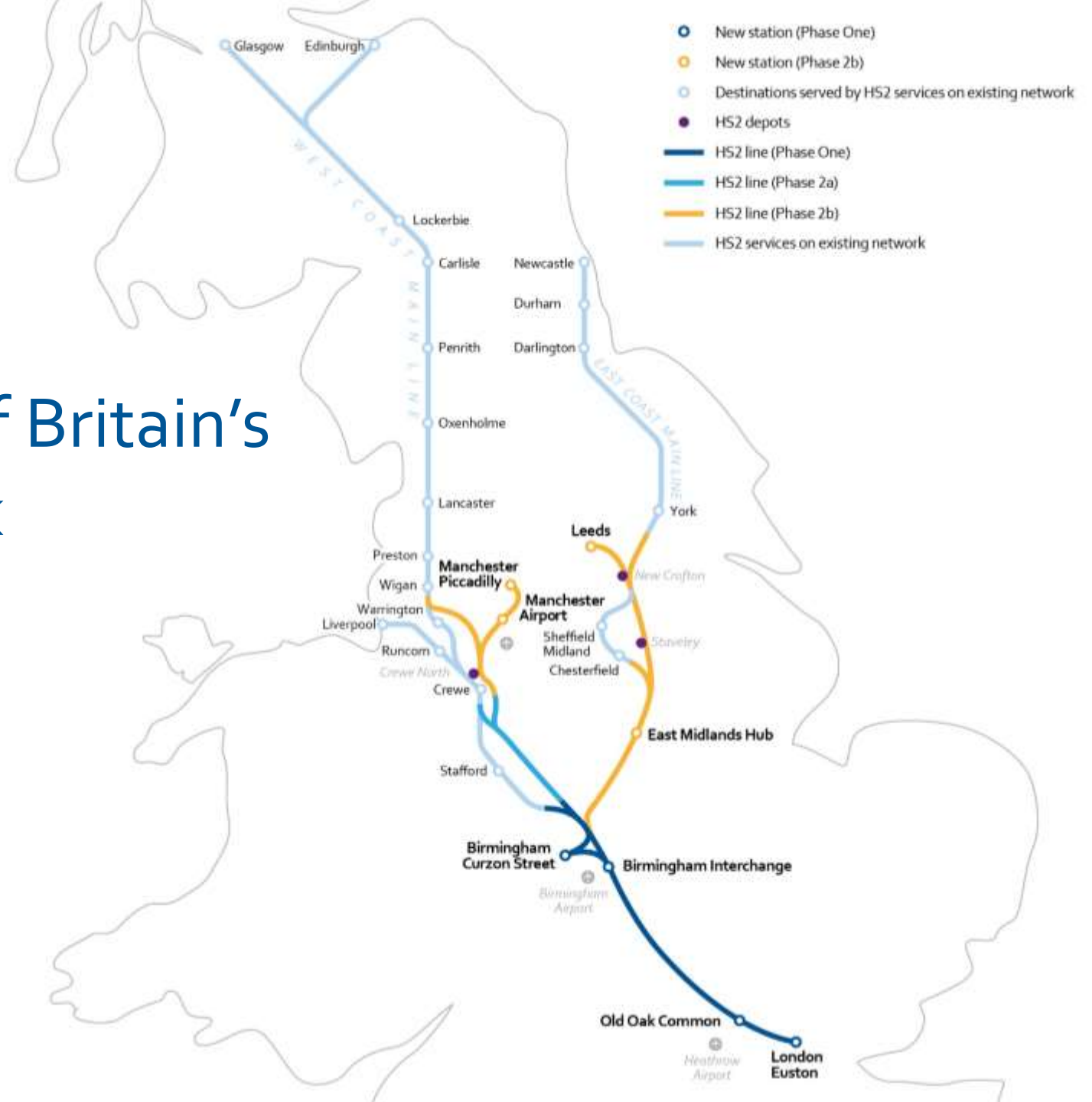# Noise, sleep and high speed rail

Pam Lowery, Acoustics Advisor, HS2 Ltd

Association of Noise Consultants - Annual Conference
Wednesday 21st June 2017

www.gov.uk/hs2

HS2:
the new backbone of Britain's rail network

HS2 route statistics

Phase One: Up to 20 trains / hr
Phase Two: Up to 48 trains / hr

Operating times:
05:00 – 23:59 (Mon – Sat)
08:00 – 23:59 (Sunday)

Station dwell times:

Terminus: 7-35 mins
Through: <2 mins

Tunnel length full network:
73.5 km
Cutting length full network:
190km

Noise Policy Statement for England (2010) – Noise Policy Aims

- Avoid significant adverse impacts on health and quality of life - SOAEL

- Mitigate and minimise adverse impacts on health and quality of life - LOAEL

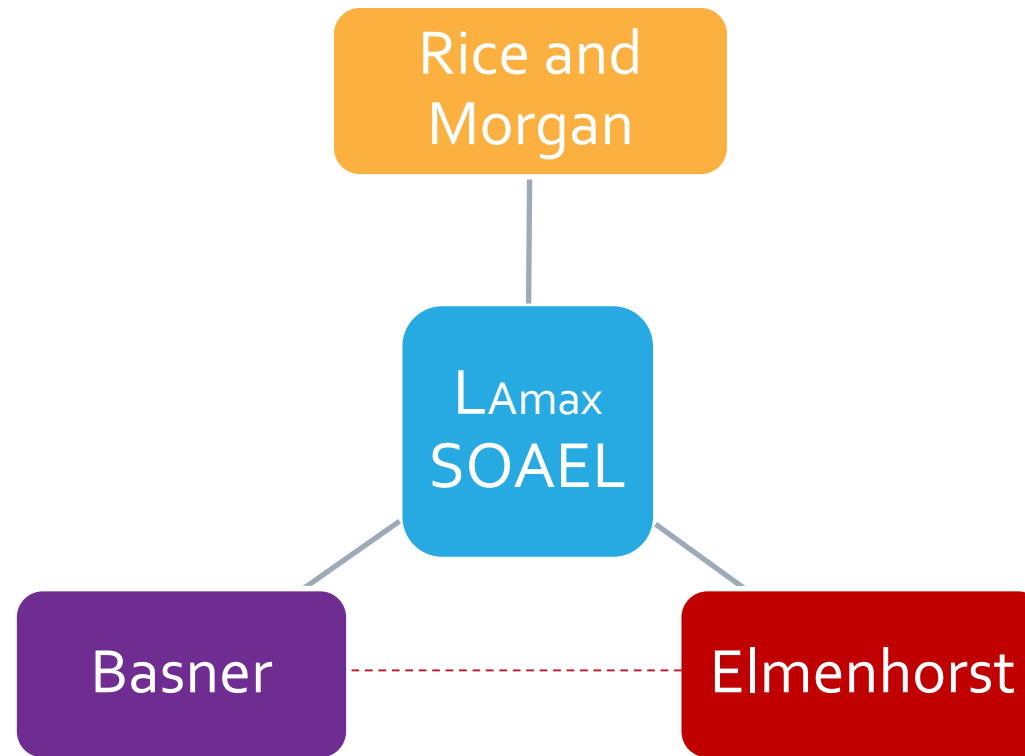- Where possible, contribute to the improvement of health and quality of life.

LOAEL - Noise can be heard and causes small changes in behaviour and/or attitude…. **Potential for some reported sleep disturbance.**

SOAEL - Noise causes a material change in behaviour and/or attitude… **Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep.**

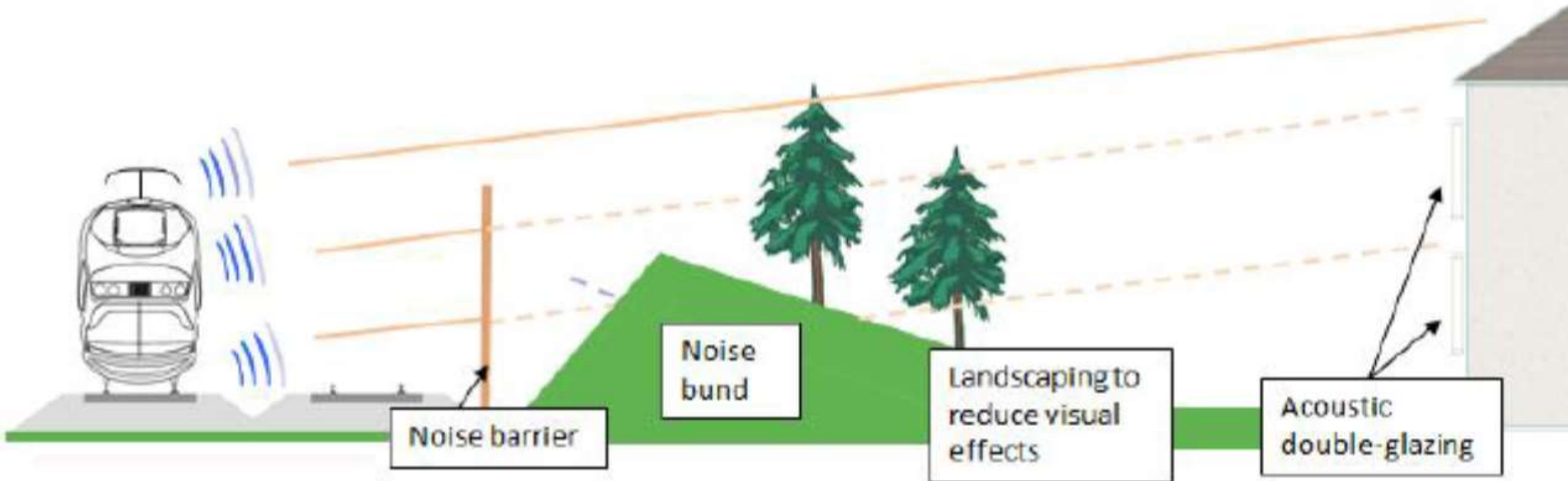National Planning Practice Guidance - Noise

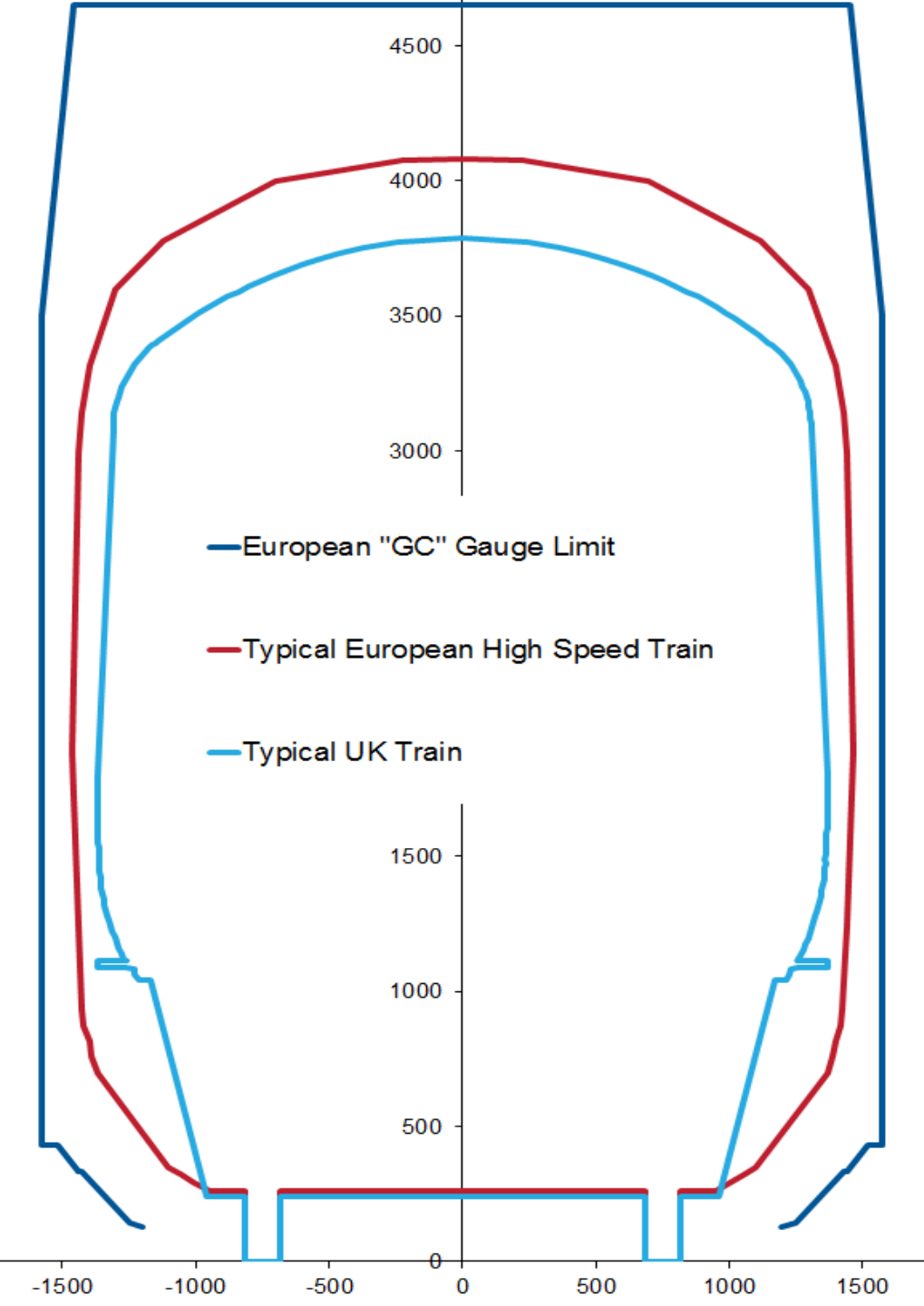# Adverse effect levels during night - Airborne noise during operation

- Night-time L_{Aeq}
  - LOAEL 40 dB(A)   Night Noise Guidelines for Europe 2009
  - SOAEL 55 dB(A)   Night Noise Guidelines for Europe 2009

- Night L_{Amax}
  - LOAEL 60 dB(A)   WHO Guidelines for Community Noise 2000
  - SOAEL 80/85 dB(A)   Research findings on adverse effects of non restorative sleep

Research - LA$_{max}$ and sleep disturbance

Approach to mitigation

Noise barrier

Noise bund

Landscaping to reduce visual effects

Acoustic double-glazing

European "GC" Gauge Limit

Typical European High Speed Train

Typical UK Train

Noise mitigation on rolling stock

- WebTAG pre-Nov 2015 – hedonic pricing basis
  - Based on L_{Aeq} levels – daytime only
- WebTAG post-Nov 2015 – monetisation of health outcomes
  - Disability Adjusted Life Years (DALYS)
  - Based on L_{Aeq} levels – day and night

Role of WebTAG monetisation of impacts

- WHO Guidelines for Community Noise update
  - LOAEL changes?

- WebTAG valuation
  - Accounting for L_{Amax} in valuation of noise impacts

- Controlling effects on more sensitive population groups

Current and future challenges