

# Legal advice: HS2 – Environmental Statement – Noise Impact Assessment

## Summary

1. The assessment of the potential noise impacts within the ES needs to be conducted on a basis that is consistent with relevant national policy. There are a number of material aspects of the ES appraisal framework which are not consistent with national noise policy.
2. In particular:
  - a. The Lowest Observed Adverse Effect Level and the Significant Observed Adverse Effect Level have not been correctly identified;
  - b. The LOAEL and SOAEL levels utilised in the HS2 ES are too high, leading to material underestimation of the adverse noise impacts and the significant adverse noise impacts;
  - c. The impact upon those receptors falling within the range between LOAEL and SOAEL has not been assessed on an individual receptors basis as required by national policy;
  - d. The HS2 ES does not identify that the impact upon those receptors lying between LOAEL and SOAEL has been mitigated and minimised as required by national policy;
  - e. The uncertainties in identifying the effect levels, the assessment of impact and the analysis of mitigation to minimise adverse impacts have not been identified – this information is required by the EIA Directive and means that the Environmental Statement is not compliant with EU Law.
3. As a result, HS2 is contrary to national policy and to permit it to proceed would give rise to breach of the EIA Directive. To allow HS2 to proceed would be unlawful.

## National Noise Policy

4. National Noise Policy is set out in the Noise Policy Statement for England (NPSE).
5. The Noise Policy Statement identifies an approach based upon three effect levels:
  - a. The No Observed Effect Level - this is the level of noise exposure below which no effect at all on health or quality of life can be detected;
  - b. The Lowest Observed Adverse Effect Level - this is the level of noise exposure above which adverse effects on health and quality of life can be detected;
  - c. The Significant Observed Adverse Effect Level - This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
6. The draft National Planning practice Guidance explains that:
  - a. The range below LOAEL equates to a level where:

“Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.”
  - b. The range between LOAEL and SOAEL equates to a level where:

“Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.”

c. The range above SOAEL equates to a level where:

“The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.”

7. The LOAEL levels and SOAEL levels must be defined by reference to this policy approach. As set out below that is not the case in respect of the LOAEL and SOAEL thresholds adopted in the HS2 ES.
8. Where noise will be produced that lies between the LOAEL level and the SOAEL level the Noise Policy Statement explains that all reasonable steps should be taken to mitigate and minimise adverse effects whilst taking into account guiding principles of sustainable development.
9. Thus, the national policy approach is to avoid noise above the SOAEL level. However if this cannot be done, then the policy is that noise impacts should be mitigated by taking all reasonable steps and any residual impacts should be weighed in the planning balance.
10. This approach is also reflected in the draft National Planning Policy Guidance which contains a Table explaining the appropriate response at each tier of the noise assessment hierarchy:
  - a. at or below NOEL no action is required;
  - b. at or below LOAEL no action is required;
  - c. between LOAEL and SOAEL – noise impacts should be mitigated by taking all reasonable steps.
11. It follows that national policy requires the following approach to be adopted in determining whether to permit the HS2 and if so, the noise mitigation controls to which it should be subject:
  - a. Where HS2 will give rise to noise below the NOAEL level it will be acceptable in policy terms;
  - b. Where HS2 will give rise to noise levels between the NOAEL level and the SOAEL level all reasonable steps should be taken to mitigate and minimise noise levels;
  - c. Noise levels beyond the SOAEL level should be avoided.
12. This approach is also reflected in the draft “National Policy Statement for National Networks” which is to apply to nationally significant rail projects. It advises at paragraph 5.179  
“The Secretary of State **should not grant development consent unless** satisfied that the proposals will meet the following aims:
  - avoid significant adverse impacts on health and quality of life from noise as a result of the new development;

- mitigate and minimise other adverse impacts on health and quality of life from noise from the new development; and
  - where possible, contribute to improvements to health and quality of life through the effective management and control of noise.” (emphasis added)
13. This policy approach also reflects that adopted in other NPS’s. Consequently, if HS2 were permitted on a basis other than through the application of this policy approach it would be treated on a basis that is inconsistent with the approach adopted in relation to other nationally significant rail and infrastructure projects. Such an inconsistent approach cannot be and has not been justified.
  14. It follows that it is national policy that projects that do not avoid impacts above SOAEL are unacceptable and should not be permitted. Further, projects that have impacts between LOAEL and SOAEL are unacceptable and should not be permitted unless it is demonstrated that:
    - a. All the impacts between LOAEL and SOAEL have been identified; and
    - b. Those impacts have been mitigated and minimised.
  15. Even on the basis of the SOAEL’s adopted in the HS2 ES (which are not accepted to be appropriate), HS2 is forecast to give rise to numerous and wide ranging impacts above SOAEL upon a wide range of receptors in a wide range of locations. It follows that consistent with national noise policy HS2 does not avoid significant adverse impacts on health and quality of life from noise. As such it is national policy that HS2 must be refused consent.
  16. Further, in general terms (elaborated further below) the HS2 ES does not identify all of the impacts between LOAEL and SOAEL upon every relevant receptor; rather it employs an approach of examining impacts within this range on a “community impact” basis<sup>1</sup>. This is justified by reference to projects undertaken prior to the adoption of the NPSE. It is an approach which is now out of date and which does not reflect current national noise policy.
  17. National policy as set out in NPSE does not allow for an assessment of impact on a community wide basis; rather it requires every individual receptor that is likely to receive an impact lying within LOAEL and SOAEL to be identified. This has not been done in the HS2 ES. As a result, by following the approach adopted in relation to projects that pre-date NPSE, HS2 has not identified the impacts as required by national policy. Consistent with that policy it must be refused.
  18. Yet further, the HS2 does not demonstrate that the impacts upon those receptors lying within LOAEL and SOAEL have been mitigated and minimised. Policy requires an assessment of the benefits that would be obtained by mitigation for a receptor against the economic and social benefits being derived from the activity causing the noise. Because the approach adopted is one taken on a community wide basis rather than on the basis of individual receptors, the assessment of the cost effectiveness of mitigation is not compliant with national policy. Indeed, the HS2 ES explains in terms that the consideration of mitigation has been undertaken by reference to reducing and controlling exposure to noise for communities<sup>2</sup>. National policy does not provide for the assessment of mitigation on a community wide basis; rather it requires it on an individual receptor basis. As a result, HS2 does not comply with national policy in this respect and consistent with that policy must be refused.

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<sup>1</sup> HS2 ES Vol 5 Annex A p3 para 1.3.4.

<sup>2</sup> HS2 ES Vol 5 Annex A p7 para 1.3.23

## **The Definition of LOAEL and SOAEL**

19. It follows from the above that national policy requires that SOAEL and the LOAEL must be defined. Paragraph 2.22 of the Explanatory Note to NPSE states:
- “It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.”
20. Whilst the HS2 ES purports to identify LOAEL and SOAEL for a number of noise sources and potential receptors, the approach set out is flawed in a number of respects addressed below. The result is that the HS2 ES does not provide an assessment of the potential impacts of the construction and operation of HS2 which is compliant with national noise policy. As matters stand, the HS2 project is therefore contrary to national noise policy and must be refused.
21. It is crucial to note that the HS2 ES explains that the effect thresholds it has adopted are “based upon best practice and previous projects”<sup>3</sup>. They are not then necessarily based upon dose response research which identifies for a particular receptor in relation to a particular source of noise the lowest level of noise that will give rise to an adverse effect on health or quality of life or a significant effect upon health or quality of life.

## **Ground Borne Noise during Construction and Operation**

22. In relation to ground borne construction and operational noise, the HS2 ES has adopted 35 dB LA<sub>Smax</sub> as LOAEL and 45 dB LA<sub>Smax</sub> as SOAEL<sup>4</sup>. These are levels applicable at any time of day or night. The HS2 ES suggests that Table 28 of the SMR “defines the LOAEL and SOAEL for ground borne noise”. However, Table 28 merely sets out impact classification criterion and does not purport to define LOAEL or SOAEL. It follows that the basis for the selection of 35 dB LA<sub>Smax</sub> as constituting LOAEL for a ground borne noise source is not justified in either the HS2 ES or the Scoping and Methodology Report.
23. The WHO Night Noise Guidelines of Europe identify that 32 dB LA<sub>Smax</sub> is a level at which effects upon motility during sleep are observed. This is a threshold for noise induced motility to occur which is a sign of arousal. The WHO NNG explains that frequent “arousal and accompanying sleep fragmentation can affect mood and functioning next day and lead to a lower rating of the sleep quality. Therefore, motility is relevant for adverse health effects”<sup>5</sup>. Further. The WHO NNG also recognise that noise events at 32 dBA and below will be audible within a property. This would suggest that adverse effects could be experienced within a property at a level of 32 dB LA<sub>max</sub>.
24. That would suggest that the LOAEL is lower than the 35 dB LA<sub>Smax</sub> adopted in the HS2 ES and that the level adopted in the HS2 ES is inappropriate. It would then follow that the entire appraisal of the impact of the HS2 project from ground borne noise sources is flawed because a LOAEL level has been adopted which is 3 dB too high. Thus the impact assessment does not and cannot have identified all of those subject to a level of noise above LOAEL but below SOAEL. It also follows that the impact assessment cannot have considered the need to mitigate and minimise noise

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<sup>3</sup> HS2 ES Vol 5 Annex A p6 para 1.3.18.

<sup>4</sup> HS2 ES Vol 5 Annex A p10 Table 1

<sup>5</sup> WHO NNG page 99.

caused to receptors which ought to have been considered as falling within this range but were not because a LOAEL level was adopted that is 3 dB too high.

25. The consequence is that the appraisal of the impact of construction ground borne noise (e.g. noise from TBMs or from the proposed underground railway) is flawed. It also the case that the appraisal of the impact of operation groundborne noise is flawed.
26. These errors give rise to conflict with national noise policy which requires the identification of LOAEL, the identification of those experiencing noise between LOAEL and SOAEL and the mitigation and minimisation of such impacts. As a result, to grant consent for HS2 would be in direct conflict with national noise policy.
27. It is similarly, the case that the 45 dB LA<sub>Smax</sub> level identified in the HS2 ES as SOAEL in relation to ground borne noise sources has not been justified in the HS2 ES or the SMR.
28. There is no dose response research relied upon in the HS2 ES that establishes that this is the level at which significant adverse observed effects occur. Indeed, the level of 45 dB LASmax is not identified in Table 5.1 of the WHO NNG in relation to any threshold; rather waking up in the night and/or too early in the morning is identified to occur at 42 dB LASmax. In other words, levels at 42 dB LASmax and above will wake people up. By adopting a level for SOAEL that is 3 dB higher than this, the HS2 ES fails to assess impact significance against SOAEL.
29. Again, the HS2 ES has adopted an effect level which is not justified and which appears to be 3dB too low. The consequence of this is that the appraisal of significant effects set out in the HS2 ES is flawed. The ES will not have identified receptors which will experience an impact above the SOAEL.
30. This gives rise to a conflict with national noise policy which requires the identification of SOAEL, the identification of those experiencing noise above SOAEL and the avoidance of impacts above SOAEL. As a result, to grant consent for HS2 would be in direct conflict with national noise policy.
31. In relation to ground borne noise associated with construction impacts, the HS2 ES adopts an approach relating to the duration fo impact that means that even where noise levels are above the level identified in the ES as SOAEL they are not considered to be significant if the noise level is experienced for a period of less than one month<sup>6</sup>. There is no basis in either research or policy for suggesting that those who experience construction related ground borne noise above a SOAEL level for a period of less than a month do not experience significant adverse impacts as defined in national policy. The consequence of this approach is the HS2 ES does not identify receptors as experiencing a likely significant adverse effect when in fact they are forecast to experience impacts that are above SOAEL. The HS2 ES is therefore flawed in this respect.

### **Ground Borne Vibration**

32. The HS2 ES identifies a LOAEL level in respect of ground borne vibration of 0.2 VDV m/s<sup>1.75</sup> and a SOAEL level of 0.8 VDV m/s<sup>1.75</sup> for the daytime. At night the HS2 ES identifies the LOAEL level in respect of ground borne vibration as 0.1 VDV m/s<sup>1.75</sup> and 0.4 VDV m/s<sup>1.75</sup>.

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<sup>6</sup> HS2 ES Vol 5 p14 para 1.4.36.

33. Again the HS2 ES indicates that the SMR defines these levels<sup>7</sup>. However, once again the SMR does not set out any justification for the adoption of these levels as LOAEL and SOAEL; rather it states that these levels “have been developed using the guidance in BS6472 and are consistent with those applied to other projects such as HS1 and Crossrail”.
34. BS6742 at Table 1 does indeed refer to the VDV levels referred to above. However, it does not do so in the context of defining the lowest level at which an adverse effect would be experienced or the level at which a significant adverse effect would be experienced. Rather, the levels taken from BS6742 are levels identified by reference to the likelihood of adverse comment being made by person who experienced a given dose. In other words, the levels are drawn from research into whether people are likely to complain when they experience a given dose. This is far from being based upon research as to whether people will experience adverse effects from a given dose.
35. Further, the fact that these levels were utilised by projects assessed prior to the adoption of the NPSE does not mean that these levels are appropriate to adopt as LOAEL and SOAEL.
36. It follows that the both the LOAEL and SOAEL levels adopted in the HS2 ES in respect of ground borne vibration do not represent thresholds derived by reference to adverse effects that can be observed; rather they are levels that relate to likelihood of complaint. As a result the LOAEL and SOAEL levels adopted do not correspond with levels required by the NPSE to be adopted. It follows that the HS2 ES appraisal of ground borne vibration is entirely flawed. HS2 must therefore be considered to be contrary to policy and should be refused.

#### **Ground Borne Noise and Non-Residential Receptors**

37. The HS2 ES identifies a series of criteria to be applied in respect of the assessment of adverse impacts upon non-residential receptors<sup>8</sup>. These are all described as representing a threshold of “adverse” effect. In other words, these levels are identified as the point at which adverse effects are experienced or LOAEL. It appears that no SOAEL level is identified in respect of non-residential receptors.
38. As a result, the HS2 ES does not follow the approach required by national policy as set out in NPSE in respect of identifying both LOAEL and SOAEL in respect of non-residential receptors. This means that it is not possible to identify whether any non-residential receptor experiences an effect above SOAEL. This means that the impact of HS2 in terms of ground borne noise upon non-residential receptors cannot be assessed in accordance with national policy. The HS2 ES is thus flawed in this respect also. The result is that HS2 is contrary to national policy and must be refused.
39. Further, no justification is provided for the adoption of the thresholds in the HS2 ES as being considered to be LOAEL for the particular receptors in relation to ground borne noise sources.
40. Indeed, some of the criteria appear to be anomalous. The 40 dB LA<sub>Smax</sub> criterion for hospitals if exceeded would give rise to an adverse effect i.e. it is said to represent LOAEL. This can be contrasted with the LOAEL adopted in the HS2 ES of 35 dB LA<sub>Smax</sub> for residential properties. It thus appears to be suggested that receptors within a hospital are less sensitive to ground borne noise than residential receptors. However the WHO NNG states that “the following groups may be hypothesised to be

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<sup>7</sup> HS2 ES Vol 5 App A p10 paragraph 1.4.18

<sup>8</sup> HS2 ES Vol 5 p 16 Table 4

more vulnerable to noise during sleep: old people, ill people, people with chronic insomnia, shift workers and people resting during the daytime, people with a tendency to depression, light sleepers, pregnant women, people with high anxiety and high stress levels.”<sup>9</sup>

41. This would suggest that a LOAEL for a hospital could be expected to be at a lower than that adopted generally for a residential receptor. In the HS2 ES however the reverse is true and without any explanation provided. It must follow that the level adopted as LOAEL for hospitals in respect of ground borne noise impacts cannot be and is not justified. This gives rise to a breach of national policy in that a group of receptors has not been appraised against LOAEL as required by that policy.

#### **Airborne Noise - Construction**

42. In respect of airborne construction noise the HS2 ES identifies SOAEL for the daytime, evening and night time periods as 75 dB LAeq, 12 hr, 65 dB LAeq 1 hr and 55 dB LAeq 1hr during the night respectively. These are levels to be measured externally.
43. No justification is provided in the HS2 ES for the identification these levels as SOAEL. They appear to be drawn from BS5228 Annex E ABC method category C. However, the values set out in BS5228 Annex E are not values derived from any dose response study; rather the 75 level can be traced back to having origins in the Wilson Report as being a level at which a meeting could be held in a building with windows shut.
44. In relation to the adoption of an evening 1 hour LAeq level of 65 dB as SOAEL, no dose response evidence is referred to in the HS2 ES to justify the use of this threshold.
45. Further, in relation to the adoption of a 1 hour LAeq level of 55 at night as SOAEL no dose response evidence is referred to in the HS2 ES to justify the use of this threshold. Indeed, it is instructive to have regard to the WHO NNG section 5.6 which explains that in relation to the range of 40 to 55 dB L<sub>night</sub> (i.e. and LAeq measured over 8 hours of the night):

“adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.”
46. This suggests that significant observed adverse effects will be experienced at levels of 40 dB at night and above. On this basis it would appear that the 55 dB adopted does not represent SOAEL but a much higher level. Indeed, the WHO NNG states at section 5.6 that at levels above 55 dB L<sub>night</sub> :

“The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence of the risk of cardiovascular disease increases.”
47. Thus the 55 dB level adopted in the HS2 ES is not SOAEL but rather a level much higher than SOAEL.
48. It follows that the HS2 ES appraises construction impacts from airborne noise at night by reference to a threshold level that is above SOAEL. As a result, it fails to capture all of the likely significant impacts arising. The fact that that level has been used in assessments conducted in relation to other projects conducted prior to the adoption of the NPSE does not justify the selection of 55 dB as SOAEL now.

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<sup>9</sup> WHO NNG p100

49. In addition to these matters, the HS2 ES does not identify LOAEL for any receptor in relation to airborne construction noise. This means that a critical threshold has not been defined and there has been no assessment of the adverse impacts of the project against such a threshold. The consequence is that there has been a fundamental failure to engage with the requirements of national policy as set out in the NPSE and indeed as emerging in the draft NPS.
50. It is not possible to identify from the ES the receptors that lie in the range between LOAEL and SOAEL in respect of airborne construction noise impacts. The impact upon these properties cannot therefore be taken into account by the decision maker. It is also not possible to have identified those properties in respect of which there is a policy requirement to mitigate and minimise the impacts. Nor can any judgement be reached as to whether this policy objective has been attained.
51. Once again, only where the airborne construction noise SOAEL is exceeded for a period exceeding one month does the HS2 ES record the impact upon a receptor as significant. There is no basis in either research or policy for suggesting that those who experience construction related airborne noise above a SOAEL level for a period of less than a month do not experience significant adverse impacts as defined in national policy. The consequence of this approach is the HS2 ES does not identify receptors as experiencing a likely significant adverse effect when in fact they are forecast to experience impacts that are above SOAEL. The HS2 ES is therefore flawed in this respect.
52. The HS2 ES is thus fundamentally flawed in respect of its approach to airborne construction noise. HS2 is contrary to policy and cannot be permitted.

#### **Airborne Noise - Operations**

53. In respect of operation airborne noise, the HS2 ES adopts as SOAEL levels of 65 dB LAeq 16 hour during the day and 55 dB LAeq 8 hour at night.
54. The day time SOAEL is said to be consistent with the daytime trigger level in the UK Noise Insulation (railways and Other Guided Systems) Regulations. The daytime SOAEL is measured as an external level.
55. The WHO Guidelines for Community noise identify that 50 dB LAeq 16 hour is a threshold of moderate annoyance for the daytime and evening for outdoor living areas and that 55 dB LAeq 16 hour is a threshold of serious annoyance for the daytime and evening for outdoor living areas. The threshold of 65 dB adopted as SOAEL is thus 10 dB above the level that the WHO Guidelines has identified as the threshold of serious annoyance. The level adopted in the HS2 ES is thus a level that is twice as loud as a level where serious annoyance would be caused.
56. Indeed the WHO Guidelines for Community Noise indicate that an internal level of 35 dB LAeq 16 hour for the daytime represents the threshold beyond which there is an adverse impact upon speech intelligibility within a dwelling and moderate annoyance caused. The WHO NNG identifies that in general a partially open window will provide 15 dB of noise attenuation to an external noise level. Thus, an SOAEL level of 65 would equate to 50 dB internally with a partially open window. Even with a window closed it is unlikely to offer significantly greater than 20 dB of noise attenuation i.e. the 65 dB level equates to 45 dB internally. Those levels are 10 dB greater than the threshold identified by the WHO guidelines as appropriate i.e. a level of noise which is up to twice as loud as the WHO threshold is considered not to have a significant adverse effect on the approach adopted in the HS2 ES.

57. It is plain 65 dB is a level that is set without regard to the relevant dose response research and does not represent SOAEL; rather a lower level of 50 dB LAeq 16 hour for SOAEL from operational noise in the daytime should have been adopted.
58. This means that the HS2 ES does not assess the impact of operational noise from the operation of HS2 upon residential receptors during the daytime on a basis that is appropriate or consistent with national noise policy. The HS2 ES by adopting an level for SOAEL necessarily significantly under-estimates the likely significant impacts arising from operational airborne noise during the daytime.
59. In relation to the nighttime, the HS2 SOAEL level for operation noise is 55 dB LAeq 8 hour externally. This is identified as equating to the Interim Target defined by the WHO NNG.
60. The WHO NNG describes this interim target in the following terms:  
 “An interim target (IT) of 55 dB  $L_{night, outside}$  is recommended in the situations where the achievement of NNG is not feasible in the short run for various reasons. It should be emphasized that IT is not a health-based limit value by itself. Vulnerable groups cannot be protected at this level. Therefore, IT should be considered only as a feasibility-based intermediate target which can be temporarily considered by policy-makers for exceptional local situations.”<sup>10</sup>
61. Indeed, a threshold of 55 dB  $L_{night}$  is described in the WHO NNG as a level where:  
 “The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.”<sup>11</sup>
62. The Interim Target is thus not a level that represents SOAEL. Rather the WHO NNG advises that between 40 and 55 dB  $L_{night}$ ,  
 “Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.”<sup>12</sup>
63. Further the WHO NNG states that:  
 “For the primary prevention of subclinical adverse health effects related to night noise in the population, it is recommended that the population should not be exposed to night noise levels greater than 40 dB of  $L_{night, outside}$  during the part of the night when most people are in bed.”<sup>13</sup>
64. Again, the HS2 ES has adopted a value for SOAEL which is far above the level that actually represents the threshold of significant observed adverse effects as described in national policy.
65. This means that the HS2 ES does not assess the impact of operational noise from HS2 upon residential receptors during the night on a basis that is appropriate or consistent with national noise policy. The HS2 ES level for SOAEL at night necessarily significantly under-estimates the likely significant impacts arising from operational airborne noise during the night.

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<sup>10</sup> WHO NNG p109

<sup>11</sup> WHO NNG p108 table 5.4

<sup>12</sup> WHO NNG p 108 Table 5.4

<sup>13</sup> WHO NNG p109

66. LOAEL in respect of daytime operational noise is identified in the HS2 ES as 50 db LAeq 16 hour. As set out above this is a level which the WHO Guidelines identify as representing the threshold of moderate annoyance, and impacts upon speech intelligibility within a dwelling. It is not a threshold below which there are no observed adverse effects, thus it cannot be LOAEL.
67. The HS2 ES is thus fundamentally flawed in respect of its approach to airborne operational noise. HS2 is contrary to policy and cannot be permitted.

#### **Airborne Noise and Non-residential receptors**

68. The HS2 ES adopts a series of different assessment criteria in relation to airborne noise and non-residential receptors. The approach is similar to the approach adopted in relation to the thresholds for ground borne noise and non-residential receptors namely, that a LOAEL level is identified.
69. It appears that no SOAEL level is identified in respect of non-residential receptors. As a result, the HS2 ES does not follow the approach required by national policy as set out in NPSE in respect of identifying both LOAEL and SOAEL in respect of non-residential receptors. This means that it is not possible to identify whether any non-residential receptor experiences an effect above SOAEL. This means that the impact of HS2 in terms of airborne noise upon non-residential receptors cannot be assessed in accordance with national policy. The HS2 ES is thus flawed in this respect also. The result is that HS2 is contrary to national policy and must be refused.
70. Further, no justification is provided for the adoption of the thresholds in the HS2 ES as being considered to be LOAEL for the particular receptors in relation to airborne noise.

#### **Traffic Noise**

71. No LOAEL or SOAEL values are identified for use in assessing the impact of noise from traffic. Indeed, the impact methodology followed is one that simply examines the magnitude of change in terms of road traffic noise.
72. As approach to impact assessment that simply assesses the magnitude of change without reference to absolute levels and without reference to LOAEL and SOAEL is one that does not comply with national noise policy. This is because it does not enable a decision maker to identify whether properties would be affected by traffic noise above a SOAEL level, nor does it allow for the identification of properties adversely affected between the LOAEL and SOAEL levels or consideration of whether the impacts upon such properties have been mitigated and minimised in accordance with policy requirements.
73. A SOAEL level must be defined for road traffic noise. Properties that are already experiencing levels above SOAEL should not experience any increase in road traffic noise as a result of HS2: such impacts are to be avoided consistent with national policy.
74. A LOAEL level must also be defined for road traffic noise. Properties experience adverse impacts lying between LOAEL and SOAEL have to have those impacts mitigated and minimised consistent with national policy.
75. The failure to adopt this approach in relation to road traffic noise means that the HS2 ES appraisal of road traffic noise impacts is totally inadequate. The ES presents no impact assessment on a basis that could be considered to be remotely consistent with national policy.

76. The HS2 ES is thus fundamentally flawed in respect of its approach to road traffic noise. HS2 is contrary to policy and cannot be permitted.

#### **Ground Borne Noise Assessment Methodology**

77. The assessment of ground borne noise has assumed that a temporary construction railway will be utilised. However, the use of such a railway gives rise to a number of impacts above SOAE and above LOAEL and SOAEL. It is therefore incumbents upon the HS2 project in accordance with national policy to consider how to avoid the impacts above SOAEL and how to minimise the impacts between LOAEL and SOAEL.
78. No such consideration is presented in the ES consistent with the requirements of national policy. For example, there is no examination of whether alternatives to using a railbased railway (e.g. trucks on rubber tyres) might be used.
79. Although the HS2 ES refers to matters relating to uncertainty in the forecasting of ground borne noise and vibration, it present no data relating to a train travelling at the speeds that HS2 is proposed to operate at. Nor does it present any data that indicates to the reader how accurate the forecasts are likely to be. This is crucially important in respect of those receptors where forecasts are just below LOAEL and SOAEL levels as it may be that due to inaccuracy in the forecasting such receptors may experience adverse or significant adverse impacts.

#### **Airborne Noise Assessment Methodology**

80. In relation to construction noise, it is to be noted that the impact assessment has been conducted using predicted calendar monthly average noise levels. The HS2 ES acknowledges that daily levels can be around 5dB higher than the monthly levels<sup>14</sup>.
81. It follows that given that SOAEL and LOAEL should be defined by impacts over a single day, night or evening (as appropriate), to assess impacts by reference average monthly levels will not identify either the number of receptors that will actual experience impacts above SOAEL levels or adverse effects between LOAEL and SOAEL. In other words, the methodology adopted seriously underpredicts the scale and nature of the impacts arising from construction. The methodology is thus inconsistent with the requirements of noise policy because it allows receptors to experience impacts above SOAEL whereas policy states that such impacts should be avoided. The methodology is thus wholly flawed.
82. Further, the impacts are only presented for the worst affected floor in buildings with multiple floors. This means that a particular occupier on a floor other than the worse affected floor cannot identify from the HS2 ES what the project predicts the impact upon his/her particular property is likely to be. Further, it means that in circumstances where in a building some floors may be affected above SOAEL but other between LOAEL and SOAEL, the reader o the ES is unable to identify the dividing line. This means that there will be properties between LOAEL and SOAEL that experience adverse effects that are not identified in the ES. Accordingly, it is not possible to determine whether the impacts upon such properties have been mitigated and minimise din accordance with national policy.
83. The precise specification of HS2 trains is unknown. Sensitivity testing has demonstrated that changes to the specification could lead to changes in predicted sound level of up to 3 dB<sup>15</sup>. It is wholly unclear from the HS2 ES whether the project has appraised the operational airborne noise impact on the basis of an assumption

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<sup>14</sup> HS2 ES Vol 5 Annex C p5 para 2.1.11

<sup>15</sup> HS2 ES Vol 5 Annex D p24 para 1.3.5

that trains may be up to 3dB noisier. If that has not been done then there has been a failure to appraise the project on a robust basis. The need to make allowance for such uncertainty is crucial in relation to properties lying within 3dB of either the LOAEL or SOAEL levels as these might be subject to adverse or significant adverse effects which the ES would not report if this matter is not taken into account.

### **The Approach to Mitigation**

84. National noise policy is clear that noise impacts above SOAEL are to be avoided and that development consent for nationally significant infrastructure projects should be refused if this aim is not achieved.
85. Where adverse impacts are experienced by receptors i.e. impacts between LOAEL and SOAEL, national policy requires these impacts to be mitigated and minimised on a basis that is consistent with the costs and benefits that the project would deliver.
86. In relation to construction related ground borne noise, no appraisal is presented that demonstrates that the forecasts adverse impacts have been minimised. For example, there is no appraisal that justifies the use of a construction railway as opposed to the use of trucks with rubber tyres on the basis of a cost/benefit analysis.
87. Similarly in relation to operation ground borne noise, there is no appraisal of whether such noise could be further minimised through the use of floating slab track on the basis of a cost/benefit analysis.
88. In relation to airborne noise impacts (both construction and operational) noise insulation for properties is only proposed where impacts above SOAEL are predicted to arise.
89. There is no material presented in the ES that examines whether it would be possible to extend noise insulation to those affected by airborne noise between the LOAEL and SOAEL levels. The only appraisal conducted has looked at the provision of noise barriers.
90. This means that properties predicted to experience noise just below SOAEL levels will not be provided with noise insulation whereas properties above will. The latter properties will then experience a reduction in noise to levels below that experienced by the properties just below the SOAEL. In other words the approach creates a “black hole” where properties will experience high levels of noise and materially adverse conditions without mitigation.
91. It follows that the HS2 ES does not present the information necessary to determine whether adverse effects have been minimised in a manner that is consistent with national policy.

### **Noise from Stationary Systems**

92. As with road traffic noise, the approach adopted to the assessment of noise impacts from stationary systems is based upon examination of the magnitude of change in noise levels. For the same reasons set out above in relation to the road traffic noise this approach does not comply with the requirements of noise policy because it is not based upon the identification of LOAEL and SOAEL levels.

### **Utility Diversions**

93. The precise nature of the utility diversion required has not yet been defined<sup>16</sup>. Where the HS2 project requires utilities to be diverted any noise impacts of those works fall to be assessed as part of the project itself because they form part of the project. It

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<sup>16</sup> HS2 ES Vol 5 Annex C p 8 para 2.2.6

follows that the failure to assess the impacts of utility diversions is a failure to assess the likely significant impacts of the project. The HS2 ES is thus defective in that it fails to assess the likely significant impacts of the project in this respect.

## **CONCLUSION**

94. For the reason set out above, the appraisal of the noise impacts arising from HS2 set out in the HS2 ES is not compliant with national policy. Further, the defects within the ES are so numerous and of such consequence that it cannot be reasonably concluded that the ES is an ES within the requirements of the EIA Directive.
95. As a result it would be contrary to national policy and it would be unlawful to allow HS2 to proceed.