TOWN AND COUNTRY PLANNING ACT 1990

TOWN AND COUNTRY PLANNING ACT (INQUIRIES PROCEDURE) RULES 2000

APPEAL REF. APP/T31915/A/05/1193511

APPLICATION REF. S/2004/0001

APPEAL INQUIRY:

NEW STONEHENGE VISITOR CENTRE

ON

LAND TO THE EAST AND WEST OF COUNTESS ROAD, AMESBURY

PROOF OF EVIDENCE

by

J R MOON

on

NOISE DISTURBANCE DUE TO LAND TRAIN

on behalf of

THE STONEHENGE ALLIANCE

1. INTRODUCTION

1.1 Personal involvement and expertise

1.1.1 My name is John Moon, I am a CPRE member and I am making this submission on behalf of the Stonehenge Alliance. This submission is entirely concerned with the effects of noise from the Land Train on the WHS environment.

1.1.2 I am a partner in JR & J Moon, a mathematical and statistical consultancy business which I established 25 years ago. We perform studies in a variety of fields of applied mathematics and statistics for various corporate and government clients.

1.1.3 I hold a BA degree in Mathematics and Statistics, an M.Sc in Physics and a Ph.D in Theoretical Physics. I am also a member of the Institute of Physics and of the Institute of Mathematics and its Applications, and I am a Chartered Physicist and a Chartered Mathematician.

1.1.4 During my professional life I have never worked on road noise. However I have had extensive experience in interpreting underwater sound (sonar) data and have been the author of a computer program for predicting sound propagation in the sea. I therefore claim a general familiarity with the concepts of sound propagation.

1.2 Basis of the objection

1.2.1 The Land Train will bring visual and aural disturbance to parts of the WHS that are currently both interesting and peaceful. In particular the tracks in the vicinity of King Barrow Ridge and The Cursus offer access to important features of the WHS as well as offering interesting views of the Stonehenge Monument. These tracks are well-used by local people and by visitors to this part of the WHS; a characteristic of them is their rural nature and from them one can enjoy the sound of skylarks in summer and hear the twittering of small flocks of linnets and corn buntings in winter. It is our contention that users of these tracks, and visitors to nearby monuments, will be disturbed to an unacceptable degree by the operation of the Land Train.

2 AURAL DISTURBANCE DUE TO LAND TRAIN

2.1 Background information

2.1.1 PPG24 (paragraph 20) requires that "Special consideration should also be given to development which would affect the quiet enjoyment of the National Parks, the Broads, Areas of Outstanding Natural Beauty or Heritage Coasts. The effect of noise on the enjoyment of other areas of landscape, wildlife and historic value should also be taken into account." The implication is that an assessment should be made of the noise impacts of the Land Train on parts of the WHS which are close to its route. The Environmental Statement makes no such assessment and instead offers two largely unsubstantiated assertions:

(para. 8.6.10) "Predicted noise levels from the Land Trains at the archaeological sites are within the range 42-43 dB LAeq which would not result in an increase in noise level over and above existing noise levels. **No adverse noise impacts** would occur, such that the overall amenity of these areas would be affected". Note that no details are given of the location of the sites in question, the assumed distance of the Land Train from the sites, nor of the predicted ambient noise levels at the sites.

(para. 8.7.3) "The Land Train is a very quiet vehicle that would result in **no noise impacts."** This is a completely unsubstantiated assertion.

2.1.2 With respect to the impact on users of rights of way, the Environmental Statement (para. 8.2.1) acknowledges that the potential impacts of the new Visitor Centre and its operation include "Impact of changes in noise levels for visitors to the WHS and local Rights of Way users". However, the ensuing sections of the Environmental Statement make no assessment whatsoever of the impact of the Land Train on users of rights of way in the vicinity of the Land Train route.

2.1.3 Paragraph 8.6.10 of the Environmental Statement does offer an assessment of the effect of the Land Train on the noise levels to the rear of residential properties at Strangways and Fargo Road - an assessment which is spurious because predicted Land Train noise is compared with noise measurements made with the existing A303 in place, rather than with predictions made assuming the A303 is within a cutting and tunnel.

2.2 Discussion of possible noise impact of the Land Train

2.2.1 The Environmental Statement (para. 8.3.11) quotes information from the manufacturer that the noise level 3m from the Land Train is predicted to be 70 dBA. It is not stated what the activity of the vehicle is when giving rise to this level of noise e.g. idling, driving past at low speed or driving past at its normal cruising speed. Paragraph 8.3.11 appears to imply that English Heritage (EH) have assumed that the noise at 3m distance will be 70 dBA in all circumstances.

2.2.2 Data given for coaches and buses in the existing visitors' car park (table 8.4) indicate that there may not be too much difference between noise levels alongside a bus/coach when idling and when it is driving past at low speed. It might be anticipated that a higher noise level will be emitted at the Land Train's normal cruising speed because of increased engine and tyre noise at higher speed. Higher noise levels would also be expected when the vehicle is going up a gradient.

2.2.3 Some predictions were made by the Highways Agency (HA), as evidence for the 2004 Stonehenge Improvement inquiry, of the ambient noise levels when the A303 improvements are in place at 114 locations in and around the WHS (A303 Improvement Inquiry 2004, Proofs of Evidence HA/6/3 and HA/6/4). Only a handful of the locations are relevant to the route of the Land Train and these are shown in Figure 1 together with the predicted (ground floor) noise levels in 2008. The noise data are also repeated in the table below.

Table 1 Traffic noise levels predicted by Highways Agency

HA receptor no.	Location	2008 noise level $L_{A10\ (18\text{-}hr)}$
28	Byway Amesbury 12 – at the Cursus	36.0
29	Stonehenge Cottages (West) – S façade	50.2
30	Stonehenge Cottages (East) – S façade	53.0
31	12 Strangways – S façade	41.5
62	2 Fargo Road – S façade	40.1
63	84 Fargo Road – S façade	39.4
64	3 Fargo Close – S façade	40.4

2.2.4 As the map (Figure 1) shows, the line of barrows on King Barrow Ridge roughly stretches between Stonehenge Cottages (West) and Strangways. There were no HA locations on the central

part of the ridge, but it can be assumed that the noise levels will decrease monotonically as one moves north from Stonehenge Cottages (West) to Strangways. The proposed Seven Barrows Cottages drop-off point is on the line between the above mentioned locations and is 0.74 km from Stonehenge Cottages (West). An estimate of the interpolated noise level at the drop-off point can be obtained assuming the A303 is a semi-infinite line source giving rise to cylindrical spreading of the noise. This interpolation gives 43.4 dBA for $L_{A10\ (18\text{-}hr)}$ at the drop-off point. The Durrington Farm drop-off is fairly close to HA receptor 28, where the predicted ambient traffic noise is 36 dBA.

2.2.5 These figures show that away from the immediate vicinity of the new A303, the area around King Barrow Ridge and the Cursus will really be part of a quiet rural environment. Noise from the Land Train at a level of 70dBA will clearly be considerably in excess of the ambient noise experienced in the vicinity of the Land Train route.

2.2.6 It is therefore established that there must be a zone around the Land Train such that within this zone the noise from the Land Train will be intrusive. The only point of debate is the size of this zone which may depend on the instantaneous activity of the Land Train. Noise from the Land Train will become noticeable (i.e. intrusive) when it becomes comparable with the ambient noise. Thus the intrusive zone can be defined as the zone within which noise from the Land Train equals or exceeds the ambient noise.

2.2.7 Unfortunately the Environmental Statement does not provide any information on the rate at which noise from the Land Train attenuates with distance. In the absence of such information a rough estimate can be made using the following assumptions:

the length of the Land Train is 35m, based on the drawings of the drop-off shelters

the noise sources are uniformly distributed throughout this length

the surrounding ground is level grass

the average height of propagation of the noise is 1.7m (head height).

The attenuation as a function of distance from the side of the Land Train, and the resulting noise level (assuming 70dBA at 3m) can be evaluated using standard CRTN procedures. The results are shown in the table below (details are given in Appendix A).

Table 2 Estimated Land Train noise as a function of distance from it.

distance from Land Train (m)	Attenuation A dBA	Land Train noise (70 – A) dBA_{max}
50	22.9	47.1
75	27.2	42.8
100	30.3	39.7
125	32.7	37.3
150	34.7	35.3

It is assumed that these levels apply whatever the activity of the Land Train.

2.2.8 By comparison with the ambient noise figures shown in Figure 1, it can be seen that the predicted intrusive zone will vary from 75m either side of the Land Train at the King Barrow Ridge drop-off to around 150m either side of the Land Train when it is at the Durrington Farm drop-off. Around the northern end of King Barrow Ridge the intrusive zone will be 100m either side of the Land Train. Thus it is apparent that users of the tracks in this area, and visitors to the northern barrows and The Cursus, will find passing Land Trains aurally intrusive.

2.2.9 If anything the above analysis is generous towards the Land Train. The ambient traffic noise levels with which the Land Train noise is compared are $L_{A10\ (18\text{-}hr)}$ values i.e. A-weighted values which are exceeded only 10% of the time in an 18-hr period. It would be more appropriate to use $L_{A50\ (18\text{-}hr)}$ values (noise levels which are exceeded 50% of the time) when making the comparison with the noise from the Land Train. Unfortunately HA did not compute any $L_{A50\ (18\text{-}hr)}$ values for the 2004 Inquiry, however such values would normally be expected to be 3-4 dB below the equivalent $L_{A10\ (18\text{-}hr)}$ values – a difference that would somewhat extend the width of the intrusive zone.

2.2.10 It might be argued that the chances of anyone on or near a right of way being within 75 – 150m of a passing Land Train is slight. However,

A maximum of 6 Land Trains per hour leaving the Visitor Centre corresponds to 12 journeys per hour, either outward or return, along the new road, i.e. one will pass every 5 minutes at peak times.

The new road runs alongside one bridleway (along and near the old railway) and crosses two other rights of way in the vicinity of King Barrow Ridge.

3 CONCLUDING REMARKS

3.1 EH's assertion at the end of the Environmental Statement (Noise and Vibration) that the Land Train will have no noise impacts has been shown to be false. There will always be a zone around the Land Train within which noise from it will be intrusive. In part EH's erroneous conclusion may arise from the fact that they have compared Land Train noise with noise from the existing A303, rather than with the much reduced noise from an A303 that is locally hidden in a tunnel and a cutting.

3.2 EH have provided precious little information on the Land Train, but our best estimates based on the little data that have been provided are that the width of the intrusive zone associated with a moving Land Train will be such that it will embrace many of the tracks and points of interest at the northern end of King Barrow Ridge. Our analysis indicates that the presence and operation of the Land Train will impair the enjoyment of this area of attractive countryside, pleasant birdsong and interesting archaeological monuments.

APPENDIX A Calculation of Land Train Noise Attenuation

The assumptions of paragraph 2.2.7 apply, and let

d = distance from side of Land Train (m)

L = length of Land Train (m)

H = mean height of propagation (m).

CRTN procedures can be used to compute the attenuation with distance (assumed greater than the reference 3m) which will have three components due to:

Cylindrical spreading $A_1 = 10\log_{10}(d/3)$ (CRTN chart 7)

Reduction in subtended angle $A_2 = 10\log_{10}\left[\frac{2}{\pi}\tan^{-1}\left(\frac{L}{2d}\right)\right]$ (CRTN chart 10)

Absorption loss $A_3 = -5.2\log_{10}\left[\frac{6H-1.5}{d}\right]$ (CRTN chart 8).

These three terms are evaluated and summed in the table below.

Table A1 Land Train noise propagation loss components as a function of distance d.

d (m)	L (m)	H (m)	spreading loss (A_1)	angular loss (A_2)	absorption loss (A_3)	total loss (dBA)
50	35	1.7	12.22	6.69	3.95	22.86
75	35	1.7	13.98	8.36	4.86	27.20
100	35	1.7	15.23	9.57	5.51	30.32
125	35	1.7	16.20	10.53	6.02	32.74
150	35	1.7	16.99	11.31	6.43	34.73

The total losses in the last column are replicated in Table 2 of the main text.

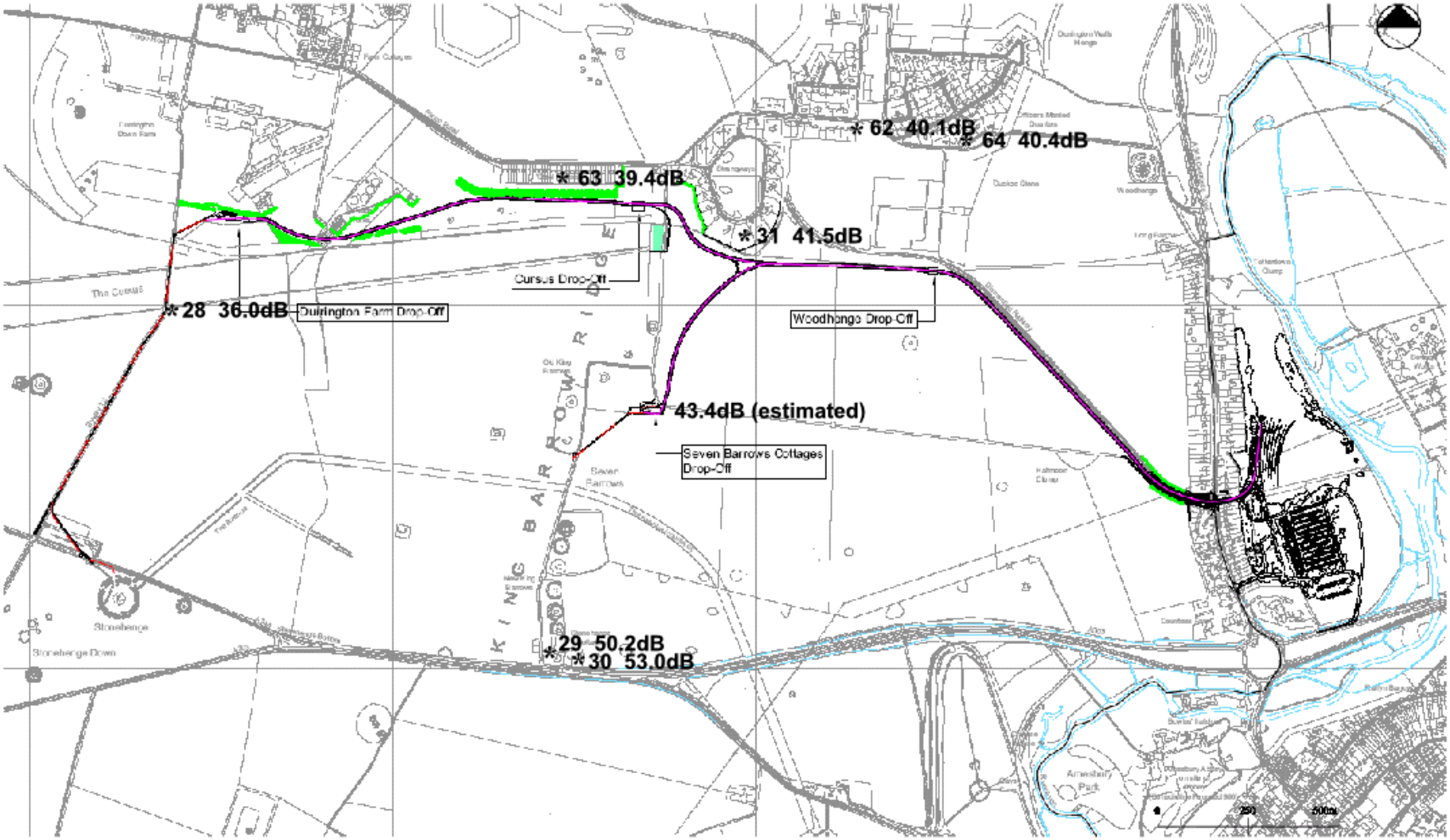

Figure 1 HA receptor points and 2008 traffic noise predictions (dBA10,18hr)