

**From:** Cllr Dr AD Shuttleworth <[REDACTED]>  
**Sent:** 23 June 2019 16:44  
**To:** A303 Stonehenge <[A303Stonehenge@planninginspectorate.gov.uk](mailto:A303Stonehenge@planninginspectorate.gov.uk)>  
**Cc:** [REDACTED]  
**Subject:** Deadline 5.0 Submission

Rebuttal of Highways England's response to AQ1.25,

I hope the Examining Authority are minded to accept the submission attached, for the reasons given in the apologia below - reproduced from the submissions paper. Despite the best of intentions, it has not been possible to do so comprehensively before now. As this responses has significant legal implications for the DCO process and in respect of the actions of the Inspectors themselves, I would humbly suggest it might be of some importance

***My apologies for the delay in responding to the Highways England's response to question AQ1.25, but this has been necessitated by 3 key factors. First, for a single individual, working in their spare time on this and other A303-related issues on behalf of Winterbourne Stoke Parish Council, the amount of effort required to check and recheck the Highways England's expansive claims has been considerable. Second, personal circumstances have meant I have been unable to access my library and the internet for significant periods of time. Finally, and perhaps most importantly, details of a model being used by Public Health England (PHE), acting as sub-contractors to the Highways England, on the issue of the radiological hazards posed by phosphatic chalk, only became available to me on Thursday 21st June 2019 in a face-to-face meeting with PHE staff, facilitated by Highways England.***

***I hope the inspectors will have sufficient forbearance to accept this submission, even at this late date, given the particular and unusual circumstances above.***

Best Regards

Cllr Dr Andrew D Shuttleworth  
Winterbourne Stoke Parish Council

[REDACTED]  
[REDACTED]  
<http://winterbournestokepc.org.uk/>

**This email is intended solely for the individual or individuals to whom it is addressed, and may contain confidential and/or privileged material. If you are not the intended recipient you are notified that disclosing, copying, distributing or taking any action in reliance on the contents of this email is prohibited. If you receive this email in error, please contact the sender and delete the email from any computer. All email communication may be subject to recording and/or monitoring in accordance with internal policy and relevant legislation.**

**Any views expressed are those of the sender and, unless explicitly stated, do not necessarily represent the views of Winterbourne Stoke Parish Council.**

**The Council cannot accept any liability for any loss or damage sustained as a result of software viruses. It is your responsibility to carry out such virus checking as is necessary.**

# **A303 - Stonehenge to Berwick Down Scheme**

## **Submission for Deadline 5**

### **Rebuttal Of Highways England's Answer To Written Question AQ.1.25**

by:

Dr A D Shuttleworth

Registration ID 20018263

&

Winterbourne Stoke Parish Council

Registration ID 20019107

### **Written Answer to AQ1.25**

A response to Dr Shuttleworth's request for confirmation of validation of Highways England's data and approach.

### **Apologea**

1.1 My apologies for the delay in responding to the Highways England's response to question AQ1.25, but this has been necessitated by 3 key factors. First, for a single individual, working in their spare time on this and other A303-related issues on behalf of Winterbourne Stoke Parish Council, the amount of effort required to check and recheck the Highways England's claims has been considerable. Second, personal circumstances have meant

I have been unable to access my library and the internet for some periods of time. Finally, and perhaps most importantly, details of a model being used by Public Health England (PHE), acting as sub-contractors to the Highways England, on the issue of the radiological hazards posed by phosphatic chalk, only became available to me on Thursday 21st June 2019 in a face-to-face meeting with PHE staff, facilitated by Highways England.

I hope the inspectors will have sufficient forbearance to accept this submission, even at this late date, given the particular and unusual circumstances above.

## Rebuttal

### 2 General Points

2.1 In their introduction to their written answer, Highways England write:

***“The Aqua Book1 sets out the government’s guidance on producing quality analysis. This is interpreted and applied by different departments and governmental organisations appropriately for their distinct activities. The ONS interpretation is not therefore directly relevant to assessing the quality of evidence presented for environmental appraisal; in parallel to the ONS, different government departments have procedures to ensure the suitability and veracity of evidence’.***

2.1 Whilst we agree that guidance contained in the Treasury’s Aqua Book 1 can be interpreted and applied by different departments and governmental organisations in a way that is appropriate to their distinct activities, Highways England are being disingenuous in the extreme in claiming the ONS [sic] interpretation is not directly relevant. The foreword of the guidelines is quite clear how it applies across government and government agencies:

***“The review provided headline recommendations for departments and their arm’s length bodies, including:***

***☐ †All business critical models in government should have appropriate quality assurance of their inputs, methodology and outputs in the context of the risks they use represents. If unavoidable time constraints prevent this happening then this should be explicitly acknowledged and reported;***

***☐ †All business critical models in government should be managed within a framework that ensures appropriately specialist staff are responsible for developing and using the models as well as quality assurance;***

**☐ †There should be a single Senior Responsible Owner for each model (“a Model SRO”) through its lifecycle, and clarification from the outset on how quality assurance is to be managed. Key submissions using results from the model should summarise the quality assurance that has been undertaken, including the extent of expert scrutiny and challenge. They should also confirm that the Model SRO is content that the quality assurance process is compliant and appropriate, that model risks, limitations and major assumptions are understood by users of the model, and the use of the model output is appropriate”.**

2.2 We re-iterate the point made previously. The government and its departments and agencies are a single legal entity; the “Crown is indivisible”. A “recommendation” by one department (here the Treasury) to all others, carries the same weight as an instruction, or order. It is called a recommendation out of inter-departmental politeness.

2.3 As a consequence, when the paper recommends that there should be a Senior Responsible Owner (SRO) for each model, it is a dictat that there must be a Senior Responsible Owner for each model. The latitude afforded to each department is in what this SRO is called:

**“Each department and agency will require its own business processes and nomenclature to reflect their organisation’s needs. Whilst the Aqua Book refers to commissioners, analysts and analytical assurers, it is the responsibilities identified that are important, not the name of the role. In addition, the Aqua Book makes no statement of the particular level of seniority or grade of each of the occupiers of the roles: this will vary from project to project and between departments and agencies.”**

2.4 Para 1.25 of the Aqua Book notes that:

**“The Aqua Book draws together information that will be of benefit to all departments, agencies and analysts. However specific guidance covering verification and validation of particular types of analysis, as well as example templates and documentation, are also beneficial. ”**

2.5 As a consequence of the above, the Highways England's claims are untenable. The Aqua Book requirements are directly relevant to any and all models being used by Highways England and not just those being used for environmental appraisals.

### **3 Senior Responsible Owner**

3.1 Highways England have referenced 9 models in their written response, plus a tenth referenced by PHE on 21st June 2019. In no case have Highways England identified an SRO, or any individual in the employ

of Highways England having the same responsibilities in departmental documentation.

3.2 The presumption has to be that none of these models have an SRO, or equivalent, and thus the responsibilities of this role are not being met.

## **4 Verification and Validation**

4.1 Whoever prepared the written answer on behalf of Highways England seems to be unfamiliar with difference between Verification and Validation when used in the context of models and assessment of the type undertaken by Highways England. Verification is internationally regarded as the process of determining that a model implementation and its associated data accurately represent the developer's conceptual description and specifications. Validation is the process of determining the degree to which a [simulation] model and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model. In other words, verification answers the question "Have we built the model correctly?" whereas validation answers the question "Have we built the correct model? The original question asked about validation and not verification. Consequently, the references to verification under the heading "validation methods" are completely irrelevant.

4.2 Validation is an ongoing process throughout the lifetime of a model. Each model should have a single validation document that accompanies it through its lifetime (controlled by the SRO or equivalent) and is added to as further validation measures are affected. Since Highways England have not referenced a single validation document for any of the models used by them, the presumption must be that they do not exist.

4.3 In several cases, when describing validation methods, Highways England have resorted to using the phrase: "UK industry standard tool" or "Widely accepted". They may indeed be widely accepted, or used by UK industry, but that has no bearing on the validity of the models themselves; it is merely hyperbole. There may be nothing better that is available, but that does not mean it is fit for purpose. To put it into context, in 1633 Galileo

Galilei was convicted of heresy by the Roman Catholic Inquisition for promoting the idea of heliocentricity. The Church position was that it was widely accepted (actually, in their eyes, determined by God) that the Earth was at the centre of the solar system; it was the RC standard model of the day, used by nearly everyone in an unquestioning way. But, as it turned out, the standard tool proved fundamentally flawed when attempts were made to validate it by Copernicus and then Galileo. In 2019, Highways England appear to be promoting the analytical standards of the 17th Century...

4.4 PHE, on 21st June 2019, at least had the good grace to admit that the model they had used is probably not fully validated to the standards recommended by the Aqua Book and no one person takes responsibility for maintaining the model; though it is updated regularly.

4.5 A model should be developed for a specific purpose, or application, and its validity determined with respect to that purpose. If the purpose of a model is to answer a variety of questions, the validity of the model needs to be determined with respect to each question. If the purpose or application changes, as has happened with CRTN over the years, it needs to be revalidated for its new use. Highways England have presented no evidence that it was validated for its primary purpose (determining compensation levels in an urban environment), let alone for the purposes it has been used for the current scheme. Furthermore, if the underpinning data or assumptions change, then the model needs to be revalidated to reflect these changes. This reinforces the idea that validation is an ongoing process throughout the life of the model and highlights the need for an SRO to control the process.

## **5 Detailed Response**

5.1 The following table provides a detailed critique of the models used by Highways England or their contractors and whether the information provided confirms that the models have been validated:

Topic	Model Used	Critique of Validation Claim
Operational Traffic Noise and Vibration	CRTN	<p>No SRO or equivalent identified.  No validation document referenced.  No evidence validation conducted by originator or Highways England  Evidence of change of use of model, but no evidence of subsequent revalidation  No evidence that Highways England is a competent authority for acoustic models  Evidence that some competent authorities have found CRTN assumptions to be outdated (Australia, India and Singapore).</p>
Construction Noise and Vibration	British Standards Institution (2014), BS 5228:2009 + A1:2014	<p>No SRO or equivalent identified.  No validation document referenced.  No evidence validation conducted by a competent authority  No evidence of any form of validation</p>
Traffic Modelling	A303 Stonehenge SWRTM (DCO)	<p>DfT and Highways England are competent authorities for this model.  WebTAG (Particularly TAG Units M1 and M2 and Advice for the Project Technical Manager) does give some very limited low level guidance on model validation  WebTAG cross-references to guidance in DMRB Volume 12 Section 2 Part 1 and in turn, this cross-references to the Traffic Appraisal Manual (TAM), designed for traffic appraisal in urban areas - entirely irrelevant for the current scheme  The TAM does make the following general point: <b><i>“If the use of an existing traffic model is considered, its suitability for appraisal of the current scheme must first be checked in detail.... ...If further data collection is found to be necessary, model re-validation must be carried out and documented to comply with the overseeing Departments’s mandatory processes”</i></b>.  There is a role for a TAG SRO, but Highways England have failed to demonstrate the role is active and identify the SRO.  In any event, model validation is not listed as a responsibility of the SRO.  No evidence provided of a validation document, or any form of validation, or re-validation, being undertaken - despite this being mandatory</p>
Traffic Modelling	VISSIM Operational Model	<p>As above.  Wiltshire Council are model end-users and cannot sensibly be regarded as a competent authority for model validation.  Competent authorities would be those with a high level of scientific, technical and modelling expertise in Traffic Modelling - typically, a university department, or industrial body</p>

Road Drainage and the Water Environment	Highways England Water Risk Assessment Tool (HEWRAT) Version 2.0.3.	HE claims that model is validated. Details of model can be found at: <a href="http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/hd4509.pdf">http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/hd4509.pdf</a> . Was developed in conjunction with the Environment Agency. Documentation relates only to operational validation and not high level validation of underpinning model No SRO or equivalent identified. No validation document available and no evidence for high level validation being undertaken.
Groundwater	Wessex Basin groundwater model with local refinements	No SRO or equivalent identified. No validation document referenced. A claim of independent, peer-reviewed validation, but substantive evidence not provided.
Fluvial flood risk	Flood Modeller Pro (ISIS) – TUFLOW (coupled model)	The documentation referenced (R&D Technical Report W5-105/TR0 Benchmarking of hydraulic river modelling software packages) does not address model validation. The presumption must be that the model is unvalidated. No SRO or equivalent identified. No validation document referenced.
Pluvial flood risk	ESTRY-TUFLOW	No SRO or equivalent identified. No high-level validation document referenced. Low-level operational validation undertaken and relates only to validation of input data and not validation of the underlying model. Some evidence that, following the Australian floods in 2007 and 2011, the Water Research Laboratory, University of New South Wales, Sydney undertook limited validation of the model in urban environments. As of 2013, DEFRA had not been able to access the validation package and there is no evidence that they have yet developed their own.
Operational and Construction Traffic Air Quality	Cambridge Environmental Research Consultants (CERC) Atmospheric Dispersion Modelling System for Roads (ADMS-Roads).	This is a fully validated model and the validation documentation is readily available.  Private company, so no SRO required by them, but CERC underwrite their model validation  <b>It is the benchmark against which all the models above, used by Highways England, should be judged.</b>
Radiological Burden of Phosphatic Chalk  Provided orally on 21/06/2019 by PHE	Model developed by NRPB - now maintained by PHE	No SRO or equivalent identified. No high-level validation document referenced.  Evidence provided that the model is in continuous development and updated to meet changing situations. Unclear if model was originally validated and if revalidated subsequently.  <b>It is possible interlocutors were not familiar with model SRO and validation documentation</b>

5.2 From the table above it can be seen that Highways England have failed to demonstrate that 8 of 10 models offered (9 in their written



response and one orally on 21/06/2019) have been appropriately validated. One model may have been validated, but this is unproven. Only 1 model, the Cambridge Environmental Research Consultants (CERC) Atmospheric Dispersion Modelling System for Roads (ADMS-Roads), has been fully validated to the level required by the Aqua Book and, seemingly, by the mandatory requirements of the Department for Transport. A screenshot is reproduced below showing just some of the validation material available:

CERC
Cambridge Environmental Research Consultants  
Environmental Software and Services

---

Home
Software
Prices
Support
Consultancy
Forecasting
Research
About us
Search
Contact us
Login

You are here: Home > Environmental software > Model validation

### Model validation

- Overview
- Air pollution modelling
  - ADMS 5
  - ADMS-Roads (Extra)
  - ADMS-Urban
  - ADMS-Urban RML
  - ADMS-Airport
  - ADMS-Screen
  - Feature comparison
- Emissions management
  - EMIT
- Wind energy and airflow
  - FLOWSTAR-Energy
- Accidental releases
  - GASTAR
  - LSMS
  - ADMS-Puff
  - ADMS-STAR
- Managing model runs
  - Run Manager
- Air quality forecasting
  - ADMS-Forecast
- Model evaluation
  - Model Evaluation Toolkit
- Meteorological data processing
  - WRFToMet

## Model validation

CERC models are continually validated against available measured data obtained from real world situations, field campaigns and wind tunnel experiments.

Validation of the ADMS dispersion models has been performed using many experimental datasets that test different aspects of the models, for instance: ground/high level sources, passive and buoyant releases, buildings, complex terrain, chemistry, deposition and plume visibility. These studies are both short-term as well as annual, and involve tracer gases or specific pollutants of interest.

The [ADMS 5](#) validation documents, which describe comparisons with field campaigns and wind tunnel experiments, also validate many of the features of the urban air dispersion models [ADMS-Urban](#), [ADMS-Roads](#) and [ADMS-Airport](#), as the underlying ADMS scientific model code is shared. The urban air dispersion models are most commonly validated in real-world situations where there is significant uncertainty in the model inputs, although papers describing direct validation of dispersion from 'road' and 'aircraft' emission sources are also given below. For an overview of validation of the urban models, see this [summary](#) (.pdf).


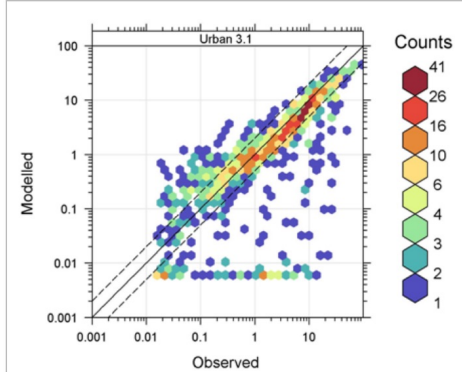
The documents below have been categorised according to model, with the ADMS 5 industrial source validation documents listed separately from the ADMS-Urban, ADMS-Roads and ADMS-Airport validation documents. In addition to the 'General model validation' sections, which list papers that describe the comparison of model output with measured data, the urban family of models have the following sections:

- [Local Air Quality Management](#), which lists example CERC project reports covering topics including source apportionment and emission reduction scenario modelling;
- [Policy](#), which covers the use of ADMS-Urban in regulatory applications; and
- [Airports](#), which gives papers specifically related to the ADMS-Airport model.

All the ADMS dispersion models and [FLOWSTAR-Energy](#) share the same underlying scientific model code for the calculation of flow and turbulence over complex terrain; this is validated in the documents listed below under 'Flow field'.

For full list of CERC publications go to [www.cerc.co.uk/environmental-software/publications.html](http://www.cerc.co.uk/environmental-software/publications.html).

*Most online documents are in Portable Document Format (.pdf)—please download [Adobe Acrobat Reader](#) to view these files if necessary.*

Frequency scatter plot created using the [Model Evaluation Toolkit](#) showing ADMS-Urban 3.1 model results for the US EPA Idaho Falls dataset

## **6 Conclusion**

6.1 Highways England appear to have scored a significant “own-goal” and demonstrated, fairly conclusively, that 8 of the 10 models relied on for the A303 Scheme have not been validated in any meaningful way, that validation documentation is unavailable and that no Senior Responsible Owner (or equivalent) has been identified for any of them.

6.2 Irrespective of Highways England’s claims to the contrary, the recommendations in the Aqua Book apply to them and have not been followed either in practise or spirit.

6.3 Notwithstanding the implications of 6.2, Highways England have failed to adhere to the mandatory requirements of DfT in their own internal documentation (WebTAG and its primary source documentation).

6.4 As 8 of the 10 models must be regarded as unvalidated, their outputs and implications must be treated as questionable.

6.5 We invite the EA to reject any and all studies based on the use of these models and draw the shortcomings of Highways England to the attention of the Chief Scientific Advisor for the Department of Transport and the Government Chief Scientific Advisor.