25th February 2016

Mr. Evans
Swale Borough Council
Swale House
East Street
Sittingbourne
Kent, ME10 3HT

Dear Mr. Evans,

Planning Application SW/15/510595/Out – Proposed Development of land off London Road, Newington.

I am writing in my capacity as Chairman of the Swale Branch Committee of the CPRE. No doubt you are aware that we are part of CPRE Protect Kent, the Kent Branch of the Campaign to Protect Rural England. We campaign to protect and promote a beautiful and thriving countryside that is valued by everyone. It is our view that the planning system should protect and enhance the countryside in the public interest for the important contribution it makes to people's physical and mental wellbeing, as well the vital role in it plays in feeding the nation.

It is our position that local planning authorities should seek to ensure that the impact of development on the countryside, both directly and indirectly, is kept to a minimum and that development is sustainable in accordance with national planning policy.

We have looked very closely at this application and the supporting documentation, and we are familiar with the site. For the reasons explained below we consider that the application should be **refused permission**.

General Points

Section 38(6) of the Planning and Compulsory Purchase Act 2004 requires planning applications to be determined in accordance with the Development Plan unless other material planning considerations indicate that a different decision should be made. This plan-led approach to development is endorsed and enshrined in the National Planning Policy Framework. It forms the first of the *core-planning principles* - see *para*. 17 of the NPPF.

It is clear that this application is not consistent with the plan-led approach that the NPPF advocates. Although Swale are still in the process of developing their local plan, with the submitted Plan

currently at Examination, at no time in any of the previous drafts or discussions has this site figured as a potential development site.

The applicants, in their *Statement of Community Involvement* state that,

> "*This site has been identified as an area that would be sustainable to the existing village of Newington.*"
>
> p.9

Given the background to the developing local plan it is clear that the only people who have "identified" this site are the applicants themselves. It does not seem to be a view shared by Swale's planners. The draft local plan describes Newington in the following way.

> "*Despite its role and level of services, development opportunities are very limited due to the valued and important heritage, landscapes and habitats to the north of the village, poor pedestrian connections between north and south of the village, a restricted internal road network, poor air quality and surrounding high quality agricultural land.*"
>
> *para*. 4.3.20

The plan-led approach that the NPPF endorses implies that the saved policies in the adopted Swale Borough Local Plan (SBLP) 2008 will comprise the primary consideration, though the NPPF and the emerging new local plan (ELP) will be important material considerations. The CPRE's view is that the relevant saved policies in the SBLP remain up-to-date as they are consistent with the policy objectives of the NPPF.

The NPPF states that

> "*Relevant policies for the supply of housing should not be considered up-to-date if the local planning authority cannot demonstrate a five-year supply of deliverable housing sites.*"
>
> *para.* 49

However, to be considered deliverable the NPPF states that sites should **offer a suitable location for development** (footnote to *para*. 47). It is our contention, as explained below, that this site is not suitable and any reading of the documents in the development of the ELP would indicate that Swale Borough Council has never considered this a suitable site for housing development.

Our view is reinforced by the recently updated SHLAA published by Swale Borough Council in October 2015. The site did not meet the criteria for 'suitability' as set out by the SHLAA methodology.

We note that the main justification for making the application is that Swale does not have a 5 year housing land supply. In their evidence, the applicant refers to a July 2015 update on the housing land supply position published by Swale Borough Council. This suggests a 5 year housing land supply of 4.9 years. They also consider the 5 year housing land supply against other scenarios with a higher annual requirement, both of which have been considered by the Inspector to the Local Plan.

The Inspector has responded to the constrained housing target in the draft Local Plan in her Interim Findings. This is not, however, a final report of the examination, any main modification will be subject to consultation. Therefore the plan is still at examination and a new housing target has not been finalised.

In any case, the recently updated SHLAA (which will inform the forthcoming consultation) shows that the site will not be required to achieve the increased housing target required by the Inspector in her Interim Findings.

However, even if it is accepted that Swale does not have a five-year land supply, the application of *paras*. 14 and 47 of the NPPF does not mean that any development should be *automatically* seen as acceptable and that relevant planning considerations should be overridden. This is quite clear in the final bullet point of *para.* 14 of the NPPF which states that planning permission should be granted unless:

> "*… any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole; or … specific policies in this Framework indicate development should be restricted.*"

We consider that in this case the adverse impacts do outweigh the benefits. Sustainable development is key and in this case, we believe, along with Swale Borough Council that the adverse impacts of development outweigh the benefit of increasing housing supply.

The Committee's view is that this application is a deliberate attempt to pre-empt and undermine the ELP, and thus the plan-led approach, by seeking to secure the development of a site that is not allocated for development in the SBLP and has been implicitly rejected by the Council for inclusion in the ELP. We are very concerned that the development seeks to pre-determine matters that are being considered through the Local Plan process, and to pursue matters that should be dealt with through the plan making process. Because of this we consider there are grounds for refusing the application on grounds of prematurity.

We accept that prematurity is a reason for refusal that should not be used lightly. However, the National Planning Practice Guidance (NPPG) helps to explain the circumstances in which it can be used. This guidance can be found at paragraph 014 of the section headed '*Determining a Planning Application'* (Reference ID: 21b-014-20140306). This advises that,

> *"…in the context of the Framework* [Annex 1 of the NPPF] *and in particular the presumption in favour of sustainable development – arguments that an application is premature are unlikely to justify a refusal of planning permission other than where it is clear that the adverse impacts of granting permission would significantly and demonstrably outweigh the benefits, taking the policies in the Framework and any other material considerations into account. Such circumstances are likely, but not exclusively, to be limited to situations where both:*
>
> *a) the development proposed is so substantial, or its cumulative effect would be so significant, that to grant permission would undermine the plan-making process by predetermining decisions about the scale, location or phasing of new development that are central to an emerging Local Plan or Neighbourhood Planning; and*
>
> *b) the emerging plan is at an advanced stage but is not yet formally part of the development plan for the area."*

In our opinion the Council can satisfy both of these conditions. With regard to a) the application comprises a substantial greenfield site that would predetermine decisions about the scale and location of development in the Sittingbourne part of the Thames Gateway contrary to the spatial strategy being promoted in Policy ST 3 of the new Local Plan and Policy TG 1 of the SBLP.

Although Interim Findings from the Inspector require that the Council identifies additional housing sites, it is appropriate at this stage in the plan-making process that the Council reviews its evidence and makes a robust assessment of which sites could contribute. Any new sites identified through this process should be subject to consultation and proper scrutiny, including their scale, location and phasing. As noted above, this process has started with a recently updated SHLAA which explicitly excludes this site from going forward for inclusion as an allocation towards the housing target for the Borough.

In particular this large greenfield site will undermine the Council's efforts to secure town-centre regeneration and the emphasis on the use of previously developed land that the strategy of both the adopted and new local plans seek to secure.

With regard to (b) the emerging plan is now at a very advanced stage with the Examination in Public in progress and the Inspector's Interim Findings being acted upon by Swale Borough Council. As such, any benefit associated with addressing any shortfall in the housing land supply must be balanced against the advanced stage of the emerging plan. The Interim findings where the Inspector directed the Council to proceed to allocate sites to meet a revised target of 776 dwellings per annum is being acted upon. The Council's most recent SHLAA illustrates that the site is not considered suitable for development and as such it is unlikely to be incorporated as a deliverable site in the Council's main modifications to the emerging Local Plan.

We believe that because this application, and other similar greenfield applications elsewhere in Swale which raise similar issues on housing land supply, the Council is in an extremely unusual situation that can fully justify invoking refusal on grounds of prematurity because of the impact that approval would have on the spatial strategy of the new local plan.

Specific Points

Our Committee wishes to raise the following specific points regarding this application.

1. Location – loss of countryside and impact on landscape character

The site is located outside of the built-up-area of Newington as defined on the Proposals Map of the SBLP and ELP. Consequently, the proposal should be considered as a significant and large-scale development in the open countryside. This is contrary to the provisions of saved **Policy E6** of the SBLP and **Policy ST 3** of the ELP. The latter clearly states,

> "*Locations outside the built-up area boundaries …. fall in the open countryside where development will not normally be permitted, unless supported by national planning policy and able to demonstrate that it would contribute to protecting and where appropriate enhancing the intrinsic value, tranquillity and beauty of the countryside, its buildings and the vitality of rural communities.*"
>
> *pp*. 48-49

Were **Policies E6** and **ST 3** to be ignored or over-ridden, it would mean essentially that housing development can be seen as acceptable, in principle, anywhere in the countryside, which is clearly an untenable position and contrary to the importance placed on the plan-led system advocated by the NPPF.

As explained in **Policy E6** of the SBLP and in **Policy ST 3** of the ELP, built-up area boundaries have been defined to ensure that planning proposals protect the quality of the countryside, and thus steer development to the most appropriate and sustainable locations. As explained earlier, this location site has never been considered a potential housing site and it is clear, therefore, that Swale Borough Council has never considered that the environmental and land-use aspects of the site could conceivably be over-ridden by other considerations.

Map 5.6.1 of the new Local Plan show this area as merely *other countryside* but *para*. 17 of the NPPF sets out a number of Core Planning Principles. One of these requires local planning authorities to recognise *"the intrinsic character and beauty of the countryside"* whilst another requires them to *"prefer land of lesser environmental value"* for development. As such it is an area of countryside that the NPPF would be likely to view as inappropriate for development.

The application should, therefore, be refused for not complying with *para*. 17 of the NPPF, policy E 6 of the SBLP and policy ST 3 of the ELP.

2. Location – encroachment in a countryside gap

The proposed site is located on the A2 in one of the last remaining gaps between Rainham and Sittingbourne. The preamble to **Policy DM 25** of the ELP states,

> "*With the settlement strategy of the Local Plan focusing development pressures at the major settlements in the Borough, there is a need to prevent the coalescence and the erosion of the intrinsic character of settlements close by.*"
>
> *p*. 223

The policy itself identifies a number of gaps, but the one between Newington and Hartlip Hill is not included. However, it is likely that this results from the absence, at the time of plan drafting, of any

expected pressure on this gap. As explained above, this site has never been considered as a potential housing site. Thus, we would argue that the preamble above is a material planning consideration and, given the explicit desire in the ELP to prevent coalescence of community this important gap should be protected.

3. Loss of Best and Most Versatile Agricultural Land

The site comprises land that is in agricultural production. The application is accompanied by a desk-based *Agricultural Land Use Quality* study that shows the site to be about 75% Grade 2 and 25% Grade 1 agricultural land, *i.e.* the highest quality. At the moment the land is under productive orchards or berry production.

Food security and maintaining the ability to feed a growing population is an increasingly important national and social issue, meaning that giving up precious high quality land for development should be robustly justified. This is why national planning policy seeks to protect such land and to steer development to land of lower quality. This is explicitly explained in *para*. 112 of the NPPF, which states,

> "*Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of a higher quality.*"

This requirement is echoed in **Policy ST 1 (11 g.)** of the new Local Plan.

Further guidance on using agricultural land is provided in **Policy DM 31** of the new Local Plan, which states,

> "*Development on agricultural land will only be permitted when there is an overriding need that cannot be met on land within the built-up area boundaries. Development on best and most versatile agricultural land (specifically Grades 1, 2 and 3a) will not be permitted unless:*
>
> *1. The site is allocated for development by the Local Plan;*
>
> *2. There is no alternative site on land of a lower grade than 3a or that use of land of a lower grade would significantly and demonstrably work against the achievement of sustainable development ….*

Even if it is accepted that there is an overriding need for development, the applicants have not shown that there are no other sites involving lower quality land. In accordance with the NPPF, it is the responsibility of the local planning authority to make sure that other, lower quality land is not available - not just in the Newington area, but throughout the Borough.

We consider that the Council does not have sufficient evidence to conclude that the proposal overrides *para*. 112 of the NPPF or the requirements of **Policies ST 1 and DM 31** of the new Local Plan.

For these reasons the application should be refused.

4. Sustainable Development

The NPPF seeks to ensure that development is sustainable, and it explains in *para*. 7 that sustainable development has three roles – economic, social and environmental. *Para*. 8 goes on to explain that these three roles should not be undertaken in isolation, and that sustainable development is achieved by ensuring that economic, social and environmental gains are sought jointly and simultaneously. This proposal does not comprise sustainable development in accordance with these requirements of the NPPF. The proposal fails to bring the necessary environmental gains demanded of sustainable development, and in fact results in environmental losses *i.e.* loss of an area of countryside, of high agricultural land quality and of green infrastructure.

The site comprises a large area of greenfield land. It is the policy of the SBLP, as expressed in saved policies SP1, SP4 and TG1, that the amount of greenfield land needed for development should be kept to the minimum in order to promote efficient use of previously-developed land. This focus is continued under policies ST1 and ST3 of the ELP. This approach accords fully with the Core Planning Principle listed in *para*. 17 of the NPPF which seeks to *"encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value".* This is reiterated in *para*. 111 of the NPPF.

The ELP echoes this in Policy DM 31 which states that

> *Development on agricultural land will only be permitted when there is an overriding need that cannot be met on land within the built-up area boundaries. Development on best and most versatile agricultural land (specifically Grades 1, 2 and 3a) will not be permitted unless:*
> *1. The site is allocated for development by the Local Plan; or*
> *2. There is no alternative site on land of a lower grade than 3a or that use of land of a lower grade would significantly and demonstrably work against the achievement of sustainable development;*

This site clearly fails the first point and the second point is unlikely to be significant. The range of alternative sites are currently being considered by the Council. At this advanced stage of Local Plan preparation it would not be appropriate to permit (prefer) a site simply because the applicant has sought to pre-empt and undermine the plan-led approach. This view is reinforced by the fact that the site failed at stage two of the SHLAA process (suitability) and this application is clearly an attempt to gain permission before it is excluded from the final plan.

Therefore, for this reason and for the reasons we explain above, the proposal does not comprise sustainable development as required by the NPPF. It fails to ensure the most effective use of land to meet the future development needs of the Sittingbourne part of the Thames Gateway and it involves the use of land of best and most versatile quality when alternative land of lower quality should be used in preference. The loss of this high quality agricultural land will be an environmental, economic and social loss.

Consequently, the proposed development is contrary to *paras* 8, 17, 111 and 112 of the NPPF; saved policies SP1, SP4 and TG1 of the SBLP; and policies ST1 and DM 31 of the new Local Plan in these regards.

Furthermore, because it does not comprise sustainable development, the 'presumption in favour' of sustainable development, as outlined in *para*. 14 of the NPPF, does not come into play.

5. Air Pollution

The applicants offer an *Air Quality Assessment* as one of the accompanying documents. This is in response to fears of increased pollution in the Newington High Street area. Poor air quality in Newington has been identified as a "weakness" in the draft local plan, and *para*. 4.3.58 of the draft local plan states,

> "*Parts of the town and the wider A2 corridor experience poor air quality and Air Quality Management Areas have been declared for …. and Newington High Street. Development affecting air quality in these areas will need to be consistent with the local air quality action plans.*"

In the past, planning applications for Newington centre have been refused on the grounds of air quality, *e.g.* SW/06/0115. **Policy ST 5** of the ELP explicitly states that developments should be "*consistent with local air quality action plans for Newington High Street*".

The *Air Quality Assessment* provided by the applicants concludes that the "*impact of the operation of the proposed development is predicted to be 'slight adverse' to 'negligible/not significant*'". However, closer examination of the *Assessment* suggests that these results are highly dubious.

In reaching their conclusion, the authors use a typical modelling technique. The model is verified against existing data. We have no objection to modelling being used in this context, as clearly some form of prediction is needed. But our analysis of their results shows that the verification procedure, when conducted on a sounder statistical basis, indicates little or no relationship between the modelled (and therefore forecast) pollution levels and actually recorded ones – (see technical appendix for details of this).

We conclude that the evidence is the *Air Quality Assessment* is fatally flawed and its conclusions should be ignored. Given the already high pollution levels actually recorded in Newington High Street, a safety-first approach means that the application fails the test of **Policy ST 5 (12)** in the draft local plan and so should **be refused permission**.

6 Habitat Regulations Assessment

Although there is a discussion in the ecological assessment about the impact of development on the nearby Natura 2000 sites, there does not appear to be a submitted Habitats Regulations Assessment. This is an essential requirement, and should be submitted as part of the application. Where it relates to the North Kent Marshes, it is essential that an appropriate contribution to the SAMM is agreed with Natural England before the Council conclude 'no likely significant effect' on the SPA. This need not go beyond the screening step if it can identify that the likely impacts upon Natura 2000 sites, either alone or in combination with other projects or plans are not likely to be significant.

Conclusion

The application should be refused for being contrary to important Core Planning Principles and requirements of the NPPF and for being contrary to a range of policies in both the adopted SBLP and in the ELP. Because of these adverse impacts we do not believe that the proposal comprises sustainable development, and thus the 'presumption in favour' of development does not apply.

We also consider that the application should be refused on the grounds of prematurity because it will fundamentally undermine the spatial strategy of the new Local Plan and the focus it places on the use of previously developed land and the regeneration of Sittingbourne town centre. This is particularly so if regard is given to the cumulative effects of this application and other applications that have been made in Swale which similarly seek to undermine the local plan strategy.

We trust that the Council will give full regard to the points we make in this response and that planning permission will be refused.

Peter Blandon B.Sc., M.Phil., Ph. D.
Chairman of the CPRE Swale District Committee

Technical appendix

The basic process

The *Air Quality Assessment* uses the air dispersion model "ADMS-Roads" to assess the potential impact of the traffic generated by the development generated traffic on air quality. This model requires the input of detailed traffic flow information and provides, as output, the resulting pollutant levels. Paragraph 3.3.14 of the *Assessment* states,

> "*Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads model is achieved by modelling concentrations at existing monitoring locations in the vicinity of the proposed development and comparing the modelled concentration with the measured concentration.*"

Once verified (although no real verification seems to have been undertaken, "calibration" would be a better term) the model can use the forecast road traffic information to predict pollutant concentration in the future that would result from the development.

The modelling approach used can, therefore, be summarised as follows.

1. Predict pollution at sites for which actual data are available (in this case twelve sites in 2013).
2. Compare predicted results with actual, monitored values.
3. Undertake a verification procedure (really a calibration procedure) to create a mathematical function that transforms modelled results into actual results. This will take the general form below.

Modelled pollution → Transformation function → Measured pollution

4. Model future pollution using estimates of traffic, *etc*.
5. Using the transformation function arrived at earlier, derive forecasts of measured pollution.
6. Draw the appropriate conclusions.

It is clear that, if the transformation function does not transform modelled data accurately (or at least with acceptable error levels) into actual, measured pollution, steps 5 and 6 above lose their meaning. An inaccurate transformation function would mean that future modelled pollution levels would not be capable of meaningful transformation into actual pollution levels.

This paper shows that this is, indeed, the case. As a result, the conclusion drawn in the *Assessment* are to treated with some scepticism.

Verification procedure

The verification procedure in the *Assessment* used data from 2013 which are shown in Table 1. These figures are extracted from the first table in the section headed *Model Verification Procedure* in the *Assessment*. As can be seen the modelled NO_x figures are much lower than the actual measured figures. The *Assessment* offers this explanation.

> "*… the monitoring locations within the AQMA measured surprisingly very high annual mean NO_2 concentrations, in most cases in excess of the annual mean objective of*

40µg/m^3, …… [b]ased upon the extremely high NO_2 concentrations recorded within the AQMA, it is assumed that the monitoring locations are influenced by local factors, i.e. congestion and a lack of dispersion due to street canyon effects."

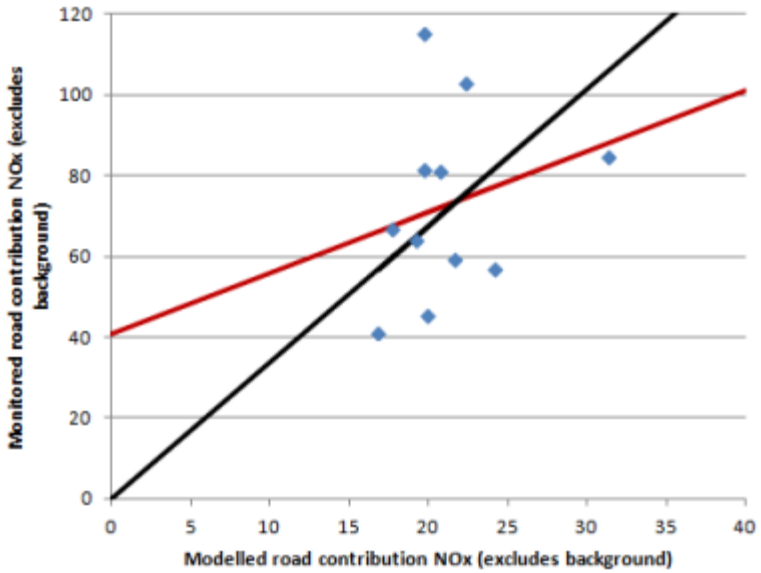
Table 1 2013 actual data and modelled output

	Road NO_x (Y)	Modelled NO_x (X)
V1	41.30	16.80
V2	45.67	19.84
V3	57.11	24.15
V4	102.92	22.29
V5	59.27	21.61
V6	64.02	19.17
V7	67.05	17.70
V8	115.18	19.64
V9	81.63	19.64
V10	81.4	20.70
V11	84.86	31.28

The same page in the *Assessment* on which this table of data is presented gives, without explanation, the equation below which is the first step in the derivation of the transformation function described above[1]. The verification procedure actually consists of fitting a regression line without intercept through the data in the table, and this results in the equation below which is found in the original document[2].

$$y = 3.3791x$$

The equation is illustrated by the black line in the diagram below, where the blue squares show the results in Table 1. This equation can be used to relate the modelled NO_x to the actual NO_x and is the first stage of the process outlined above that allows modelled results to be translated into what might happen "on the ground".



[1] The verification process is a two-stage one. This is only the first stage. The second stage will be ignored here without affecting the overall conclusion.

[2] Probably because of rounding of data, the analysis by this author returns a value of 3.3791 against the 3.3792 in the *Assessment*.

This diagram, except for the red line is the same as that found (except for scaling differences) in the *Assessment*.

Regression through the origin (RTO)

The equation above is actually the result of using the figures in the table in a linear regression fitted without intercept term ("regression through the origin" or RTO as it is sometimes called). A general equation of a straight line through the data would take the form,

$$y = \alpha + \beta x$$

Here α shows the value on the y-axis where the line cuts it. In an unconstrained regression, α and β are both determined by the data. In RTO it is assumed that α is zero and the value for β is constrained by the limit placed on α.

However, RTO is a method that should be treated with extreme care. Most statistics textbooks would argue that it *might* be appropriate when the theory implies a zero intercept. In this case, this implies that if modelled NO_x is zero then actual road NO_x **must also** be zero. While it reasonable to assume that the ADMS-Roads model would give zero road contribution with zero traffic and, similarly, zero traffic would lead to zero actual pollution, there is no real justification in using the RTO approach. It is possible, even likely, that the relationship between modelled and actual figures is non-linear so that forcing the model to fit the RTO assumptions would lead to inaccuracies.

Accuracy of prediction

However, more importantly, the unaddressed question in the *Assessment* is how accurate the relationship is that relates measured to actual figures. If the observed pollution is only very loosely related to actual figures *via* the equation above the relationship might be so weak that no real conclusions can be drawn from the model's results.

RTO often gives excellent *apparent* results. This is the case here, the R^2 of the fitted equation is 91%, which in statistical terms would show an excellent fit[3]. However, the diagram above shows that the actual points are quite distant from the black line, suggesting that the black line does not do a good job in relating modelled road output to actual, monitored figures.

The 91% figure for R^2 is not a reliable indicator of the accuracy of the equation when RTO is used. Interpreting it as showing a good fit to the data is, as Maddala[4] points out,

"*...spurious: one has to look at which equation predicts better.*"

Unconstrained regression

An unconstrained regression (the usual way of using the regression technique) using the data in Table 1 results in the red line in the diagram above and has the form shown below.

$$y = 40.98 + 1.5018x$$

[3] The R^2 statistic is ranges from 0 to 100%. A result of 100% would mean that all the points lie exactly on the line (not the case as the diagram shows). A result of zero would mean that there is no real relationship between the actual and modelled figures. 91% suggests a very close relationship.

[4] G. S. Maddala, *Introduction to Econometrics*, 2nd ed. MacMillan, 1992, *p*. 83

Visual inspection of the graph does not immediately suggest the points lie closer to either the black or the red line. So it is not apparent that one of these equations outperforms the other in terms of accuracy.

Table 2 Some diagnostic statistics

	RTO	Unconstrained regression	Naïve average
R^2	0.91	0.07	n.a.
t-stat of α	n.a.	1.01	n.a.
t-stat of β	10.28	0.80	n.a.
RMSE	22.32	21.15	21.88
MAD	18.82	17.03	18.56

Table 2 shows the usual diagnostic results of regression. The R^2 of the RTO line is extremely high and easily "betters" that of the unconstrained regression. The *t*-statistic appears to show that the slope term, β, of the RTO is highly significant.

Compared to this, the *t*-statistics of both the slope and intercept term of the unconstrained regression are both insignificant. Thus, it is tempting to conclude that RTO is by far the better equation. But as Maddala points out, this is spurious as the constraint imposed by RTO invalidates this interpretation of the test statistics.

A valid approach to accessing accuracy is to use in-sample prediction. Two typical indicators that are often used are the *root mean squared error* (RMSE) and *mean absolute deviation* (MAD). These figures are shown in Table 2 and are explained below.

Root mean squared error

Consider the right-most point in the diagram (observed = 84.86, modelled = 31.28, V11 in Table 1) Using the RTO equation gives a prediction for the monitored pollution level of 105.7 (3.3791 x 31.28). The error is the actual value, 84.86, minus the predicted value, 105.7. That is minus 20.84. When squared this becomes 434.22.

This process is repeated for all data points and the squared figures are totalled. The square root of this total is found and is the RMSE. It is the 22.32 shown in Table 2.

Mean absolute deviation

The MAD is found in a similar way. As before, consider the right-most point in the diagram (observed = 84.86, modelled = 31.28), predicted value 105.7, error minus 20.84. In this case the absolute error is taken, *i.e.* 20.84. This process is repeated for all data points and averaged. The result is 18.82.

As can be seen from these statistics, the unconstrained regression, although appearing at first glance to be a far worse fit to the data, actually performs better in in-sample prediction. Thus, despite the high R^2 and apparently superior *t*-statistic, the RTO line should be rejected as the correct model verifying equation. However, the error figures are large, suggesting the transformation process from predicted to actual is highly unreliable.

Naïve forecast

Indeed, the RTO equation performs worse than a naïve model. The average monitored road contribution over the eleven data points in Table 1 is 72.76. If a naïve approach is taken by arguing

that, regardless of the modelled output, the monitored pollution will be 72.76, the RMSE is 21.88 and the MAD is 18.56 Both of these are superior to the RTO model.

Thus, marginally better results than those in the *Assessment* could have been obtained by inputting the forecast traffic data into the ADMS-Roads model, calculated the predicted pollution, throwing the result away and saying that pollution will be 72.76.

95% Confidence intervals

A standard piece of statistics allows the calculation of a so-called 95% confidence interval of the predicted value. Consider, again, the right-most point in Figure 1 where the monitored road contribution is 84.86 and modelled contribution is 31.28. Using the marginally superior, unconstrained regression gives a predicted value of 87.95 - (40.95 + 1.5018 x 31.28). This is quite a good result and, as can be seen from Figure 1, the red line is quite close to the actual observation. However, it is clear that the value that the red line predicts is only an estimate. To give an idea of how accurate the estimate actually is it is common to calculate the so-called 95% confidence interval.

The figures here show that there is a 95% chance that the monitored road contribution would lie between 144 and 32. This is an extremely wide range of possible figures.

This level of inaccuracy is carried over to the prediction for the future. Thus, for example, if traffic data for the future suggested that the modelled road contribution is, say, 40 (to the right of the observed points in Figure 1) the predicted road contribution would be 101 (as read from the red line in the diagram). But a more accurate way of stating the result would be to say that there is a 95% chance that the actual road contribution is somewhere between 45 and 157.

Importantly, it should be remembered, that this result does **not** show that actual pollution will be 101. In actual fact, 101 is an unbiased estimate. This means that there is a 50% chance that the pollution will be higher (and a 50% chance it will be lower). From the discussion in the preceding paragraph, it is possible to conclude that there is a 47.5% chance that pollution will lie between 101 and 157.

Conclusion

Given the extreme weakness of the proposed equations to calibrate the model and their extreme inaccuracy, virtually no confidence can be placed on the relationship between modelled and actual pollution levels. What I have called the *transformation function* is actually less accurate than doing no forecasting at all. The movement from the ADMS-Road model's predictions to actual pollution levels is impossible to make given the level of accuracy of the results.

The conclusion that the development will have negligible impact is, therefore, not supported by the modelling procedure. The *Assessment* offers no insight into what actual pollution will result from the increased traffic from this proposed development.