



Odour Assessment Review
Land at Ford Airfield, Ford,
West Sussex
February 2022

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Review of Odour Assessment

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1. Review of Hoare Lea's Further Response

Background

- 1.1 Phlorum has been commissioned by Arun District Council (ADC) to provide odour consultancy services associated with a review of the odour assessment that supports planning application F/4/20/OUT.
- 1.2 The proposed development is located in the vicinity of Ford wastewater treatment works (WwTW) and a waste management facility operated by Grundon.
- 1.3 Phlorum carried out an initial review of the applicant's odour assessment, which was undertaken by Hoare Lea in association with Isopleth and Air Pollution Services Ltd.
- 1.4 Phlorum found the odour assessment lacked a clear discussion that ought to have drawn together the results from the individual assessment tools used, explaining how each contributed to the assessment's conclusions. Furthermore, Phlorum had two major queries relating to the applicant's assessment. These were the shape of the odour contour from dispersion modelling and the discrepancy between the data derived from observational sniff test and the model (the model was relied on heavily in producing the outline plan for the proposed development). Phlorum also had concerns that there was insufficient observational data on the residential parcel to the west of the WwTW, which was located at a similar distance to locations to the north-west that were recorded as experiencing "significant adverse" odour exposure, if residential dwellings were situated there.
- 1.5 The applicant provided a *Response to Phlorum Odour Assessment Review and Southern Water Comments* and addressed the query regarding the shape of the contour. The argument was reasonable. Nevertheless, the applicant's odour experts disagreed that there was a discrepancy between the observational data and the modelling. A meeting was therefore arranged so that any differences of opinion could be thoroughly discussed. A meeting was held but its outcome was not conclusive, and it was agreed that Hoare Lea would produce a further response to clarify their position.
- 1.6 In January 2021, the applicant produced a *Further Response to Phlorum*, which included a discussion setting out the most common type of odours that were detected off-site, close to the application site. This was helpful in explaining that the most commonly detected odours at off-site locations were associated with the aerated sludge plant at the WwTW, which was operating normally, and which generally has a more "earthy" character than more offensive odours sometimes associated with WwTWs.
- 1.7 It also explained that odour sniff tests are subject to "*practical constraints such as weather (wind speed and direction), site operation and access permission*" and that "*Hoare Lea is in general agreement that it would have been ideal if additional locations*

(such as directly to the north, where the Grundon Waste Management facility is located) had been accessible". They explained that Ford Airfield could only be accessed infrequently and that large parts of the application site were completely inaccessible.

- 1.8 However, Hoare Lea re-affirmed their reasoning why they considered there was no conflict between the results of modelling and sniff tests, and that these assessment tools serve different purposes – i.e. in that sniff tests can be used to assess short term impacts and that odour modelling can be used to determine long term impacts. For the reasons set out below, we consider that this does not follow best practice and there remains insufficient "weight of evidence" to support the conclusions Hoare Lea have drawn.

Grundon Waste Management

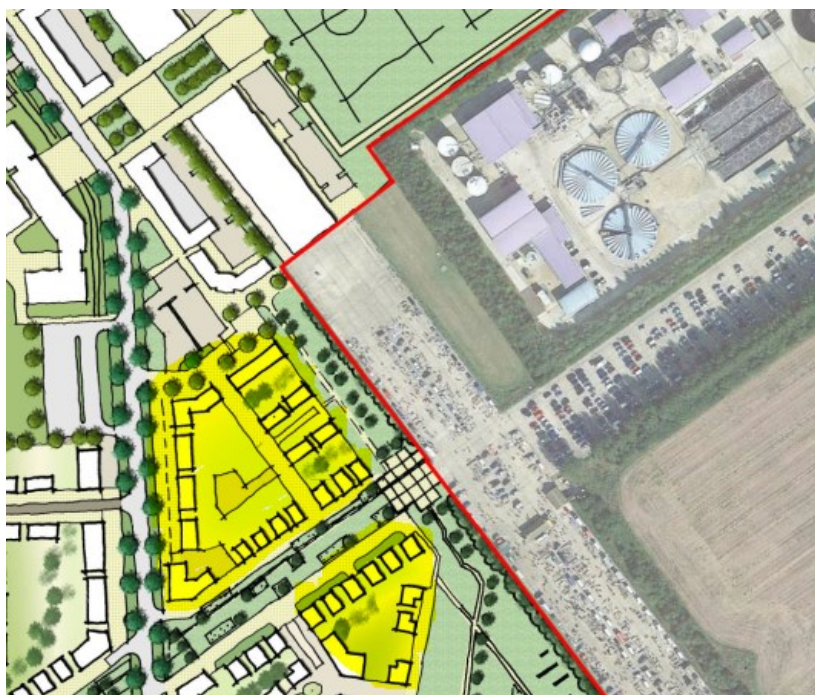
- 1.9 Regarding the waste management facility operated by Grundon, Phlorum agree that Hoare Lea's assessment approach was reasonable and appropriate, given that: highly sensitive residential uses would be located at least 100m from the facility's boundary, upwind of the prevailing wind; more than three surveys were undertaken, downwind of the facility, which detected no odours associated with the facility; and the conditions of the environmental permit which states the following.

"Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable, to minimise, the odour. 3.2.2 The operator shall: (a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, an odour management plan; (b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency."

Phlorum's concerns

- 1.10 The odour assessment concludes that whilst the application site is, and would not be, odour-free, the proposed development would not be significantly impacted.
- 1.11 Odour assessments have a number of inherent uncertainties, including the short-term and long-term variation in odorous emissions, the subjectivity of nuisance effects, and the range in composition and character of emissions. IAQM guidance goes some way to address these issues by recommending a multi-tool assessment approach to provide a "weight of evidence" from which conclusions should be drawn. Phlorum's review of Hoare Lea's latest submission considers this principle to determine whether it has been carried out in line with best practice guidance.
- 1.12 No sniff tests were undertaken by Hoare Lea in the area of proposed residential units that are considered most at risk of odour nuisance, due to access (See Figure 1 below). These are those units that are, at their closest point, approximately 100m from the WwTW, to its west.

**Figure 1: proposed residential dwellings to the west of the WwTW
(Extract from Illustrative Masterplan)**



- 1.13 The absence of observational data at the most at risk part of the proposed development is concerning and does not provide a weight of evidence in support of the conclusions drawn. However, it is noted that this was, in part, due to access limitations for odour surveys (although it is not understood why the applicant did not have rights of access to the land it is proposing to develop).
- 1.14 Given the access issues, which prevented repeat odour surveys near this parcel, and the lack of existing sensitive receptors at this location, Hoare Lea's assessment relies heavily on the results of a dispersion model, which was constructed using site-specific sampling at locations agreed with Southern Water's representative, Atkins. It has significant bearing on the results that odour samples were only taken from the WwTW on one day and that emissions from WwTWs in general can vary considerably, seasonally and over much shorter timescales (as is discussed below in paragraph 1.30). Hoare Lea's odour sampling snapshot was extrapolated to predict impacts on an annual average basis. This is not necessarily poor practice, but it does add uncertainty to the results of one important assessment tool. This can unbalance the weight of evidence principle if this tool is relied on more heavily compared to the other assessment tools used.
- 1.15 The modelling aspect of the assessment is thorough. The applicant does recognise the inherent uncertainty in odour modelling and explores this uncertainty by using 5 years of meteorological data from Shoreham and Thorney Island and some reportedly conservative assumptions. However, IAQM guidance does state that even good models that contain reasonable assumptions can still have "*considerable*" uncertainty. On this basis, the precautionary principle ought to have been adopted with regard to the conclusions drawn from this single assessment tool.
- 1.16 Phlorum agree that the use of sniff tests, modelling and complaints analysis is appropriate and in line with best practice guidance. However, there is disagreement

over the relative importance applied by Hoare Lea to the observational and predictive tools they have used.

1.17 Hoare Lea state that

“According to the IAQM guidance¹, the main difference is that for modelling, a consensus has been reached on what levels correspond to annoyance effects; whereas for sensory tests (e.g. sniff tests) there is no consensus.

For this reason, greater emphasis is placed on the modelled contours in the assessment.”

- 1.18 Phlorum disagree that just because no consensus has been reached on what levels correspond to annoyance effects for sensory tests, they should be given less weight than modelling, if this is what Hoare Lea are saying. In fact, best practice IAQM guidance states that modelling should “*complement*” observational methods, noting that models are “*simplified versions of the real situation*” and that even good models can contain “*considerable*” uncertainty.
- 1.19 Phlorum agree that the use of the 3 ou (98th percentile) criterion is generally appropriate for WwTW and the arguments included in the original report and the sniff tests suggest that the majority of odours in the vicinity of the WwTW would not constitute highly offensive odours (e.g. not septic effluent or sulphurous smells). Indeed, the most common odours from the sniff tests were associated with the aerated sludge plant, which generally has a more “earthy” / moderately offensive odour. Hoare Lea’s response to Phlorum’s previous comments was helpful in illustrating that the majority of odours detected off-site (which would have caused significant adverse odour exposure to residential receptors were they located there) were of this character (i.e. earthy / mildly offensive).
- 1.20 Phlorum recognise that Hoare Lea’s carrying out of six odour surveys in the vicinity of the WwTW exceeds the minimum requirement of three in IAQM guidance. Although multiple surveys are meant to cover a range of conditions, such that the sniff tests could be considered representative of up to 70% of commonly occurring conditions, by Pasquill stability class. It is a concern that Hoare Lea / Isopleth suggested in their recent meeting with Phlorum and Arun District Council that their surveys were carried out in an attempt to find the “*100th percentile*” worst odours. The 100th percentile is the worst-possible odour in a year, and as the worst conditions usually occur due to abnormal operation, they can’t be predicted and it has not been made clear how Hoare Lea believe they can determine that any of their sniff tests included the worst possible odour conditions.
- 1.21 Furthermore, in their response, Hoare Lea suggest that sniff tests are only appropriate to assess “*short-term impacts*”. This suggests that perhaps too narrow a range of environmental conditions, referencing the Pasquill sensitivity classes, might have been chosen for the surveys, meaning that comparison with the results from other odour tools could be even more difficult (e.g. comparison of supposed 100th percentile sniff test results with 98th percentile odour concentrations from dispersion modelling).

1.22 It is of greater concern that Hoare Lea consider that sniff tests allow a “full picture of short-term odour impacts to be determined”. However, the results they have collected have not been used to robustly assess accidental releases or abnormal operations, which also make up the short-term impacts associated with WwTW and which could occur relatively frequently. Complaints records are often particularly useful in determining the significance of such emissions. Hoare Lea’s stated difficulties in collecting reasonable location data from Arun District Council does not reflect Phlorum’s experience of numerous EIR/FOIA requests from numerous other local authorities. It should be possible to obtain full postcodes or reasonably focused locations of complaints without compromising an authority’s GDPR requirements.

1.23 It is Phlorum’s understanding that sniff tests ought to cover a range of environmental conditions, with their principal purpose being to provide confidence to the assessor that the prevailing odour situation can be gleaned from multiple surveys undertaken, so that any outlier data (e.g. from abnormal operations at that time) does not significantly skew the interpretation of the results. IAQM guidance states that:

“Modelling (and probably monitoring) is only likely to characterise normal operations of the odour source, whereas it is known that unexpected events (e.g. breakdowns) and abnormal operations at some facilities can account for a significant proportion of high odour episodes. If there are already receptors in the locality, analysis of historical complaints data can provide an alternative perspective on the impact that is inclusive of such unexpected events and abnormal operations”

1.24 Whilst it is recognised that Hoare Lea reported some abnormal operating conditions during their surveys, their response shows that the ASP (which was operating normally) dominated the emissions detected.

1.25 The key disagreement between Isopleth / Hoare Lea and Phlorum is with the comparison of results from dispersion modelling with sniff tests.

1.26 Phlorum agree that a single sniff test provides a snapshot and therefore cannot be compared directly to the modelled contours, which discount the top 2% of detected odours (partly to account for accidental releases and abnormal operations). However, the majority of sniff tests reported by Hoare Lea recorded easily recognisable (and significant) odours from the WwTW to its northwest, during what was likely to have included normal operations under conditions which likely fell outside the top 2% of the worst odour concentrations (it is considered highly unlikely that all surveys were carried out under the worst-case conditions for both meteorology and WwTW emissions).

1.27 The aim of multiple sniff tests is to provide the assessor with confidence that they can effectively describe and understand the odour situation at the locations they are assessing. As such, from reviewing Hoare Lea’s report and subsequent submissions, they have either carried out an appropriate number of sniff tests but have found that their model has not provided an accurate representation of the actual odour situation, or they have not carried out enough appropriate surveys

and this is why their model results seem to disagree with their sniff test observations.

- 1.28 Due to the number of surveys undertaken, there should be better agreement between the results of the modelling and the sniff tests. This calls into question the suitability of the model, which appears to have been the only tool used by Hoare Lea to determine the suitability of locating residential units from approximately 100m of the WwTW to its west (no sniff tests being undertaken at this location due to access limitations).
- 1.29 IAQM guidance notes the following with regard to odour modelling:

Dispersion modelling can be applied when:

-  *The sources of odour are clearly identifiable;*
-  *Where the source characteristics are clearly defined (i.e. physical size, emission characteristics such as temperature and efflux velocity are known);*
-  *Odour emission rates can be reasonably determined;*
-  *Odour emission rates are not subject to large variation;”*

- 1.30 It is this final point which of greatest concern. Odour emission rates from WwTW are often subject to great variation and, whilst the use of summer (May) sampling goes some way to account for this (by attempting to capture more conservative emissions caused by more concentrated sewage effluent and potentially higher bioactivity in warmer temperatures), there is high variation in emissions (as evidenced by the monitoring undertaken by Olfasense in Appendix 6, where odour emissions sampled from the main OCU varied between 1,569 ou/s and 7,155 ou/s). The use of the geometric mean in the replicate sampling goes some way to control for high variability, but probably not enough to justify there being no discussion of the effect of this on the modelling results.

Conclusions and Recommendations

- 1.31 The principal concern Phlorum has with Hoare Lea's assessment and subsequent submissions is that the balance of evidence used to form their conclusions is weighted towards relatively uncertain modelling results and away from relatively clear odour survey observations. There remains discrepancies between the results of these two assessment tools.
- 1.32 The necessary comparison of modelling and observational tools is described in IAQM guidance as follows:

“It [is] therefore useful to use empirical, observational tools where they are available and applicable, and combine these with modelling where appropriate. In some

instances empirical results from observational tools can be used to corroborate or check the reasonableness of the predictions."

- 1.33 We appreciate that Hoare Lea have provided some reasoning as to why more appropriate surveys were not carried out. However, due to the lack of observational data at the most 'at risk' locations, and the sometimes large uncertainties associated with modelling, it is important to combine and compare the results of these assessment tools. Where discrepancies arise, these need to be understood and addressed before robust conclusions can be drawn. Based on the current submissions by the applicant, it does not appear to be the case that such discrepancies have been accepted or appropriately dealt with.
- 1.34 We recommend that further sniff tests are carried out to cover the most 'at risk' locations and under a wider range of environmental conditions in order to properly test the reasonableness of Hoare Lea's modelling results.
- 1.35 It is understood that the shape of the parkland to the southern half of the proposed development is principally based on the shape of the odour contours from Hoare Lea's modelling. This illustrates the high degree of confidence that the applicant has placed on the results of odour dispersion modelling, while disregarding the conflicting results of sniff tests and other assessment tools. The outline design of the proposed development has thus excluded residential units up to 500m from the WwTW's southern boundary, while including them much closer, within 100m, of its western boundary. Due to the uncertainties of the modelling assessment, the poor agreement of model results with sniff tests, the limitations of when and where the sniff tests were carried out, and the vagueness of the complaints records, this focus and reliance on the dispersion model seems weakly founded.
- 1.36 Whilst we understand that Hoare Lea carried out significant sensitivity testing as part of the modelling exercise, including the use of different meteorological data sets, and we recognised that this is excellent practice that shows an appreciation of uncertainty in modelling, the modelling results assume that weather conditions at Shoreham Airport are the same at the site. This is not an unreasonable assumption. However, even minor differences in the frequency of easterly winds could cause the contour shape to change. Perhaps any further assessment could also include the incorporation of suitable, site specific, Numerical Weather Prediction (NWP) meteorological data.
- 1.37 In essence, there remains a discrepancy between odour modelling (which, on its own, is recognised to be an inherently inaccurate tool) and onsite observations. This discrepancy has not been explained such that the model results could be considered robust. As such, until or unless work is done to provide observational data that better fit the model, it is recommended that the precautionary principle is applied. This means that it should be considered likely that unacceptable odours will affect the proposed residential units within 300m of the aerated sludge plant to the west of the WwTW.



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