Planning Appeal
APP/M1900/W/21/3278097

Land at Hatfield Aerodrome, off Hatfield Road

Summary Proof of Evidence of Jenny Lightfoot

Issue | 19 October 2021

Job number 280446-61

Ove Arup & Partners Ltd
9th Floor 3 St Paul's Place
Norfolk Street
Sheffield S1 2JE
United Kingdom
www.arup.com

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Summary Proof of Evidence

Introduction and scope

1. This is the Summary Proof of Evidence of Jenny Lightfoot. I am a Chartered Geologist, a Chartered Scientist and a Specialist in Land Condition and have 29 years of relevant experience.

2. I have been instructed by Hertfordshire County Council (HCC) to provide an objective expert opinion on the proposed quarry operations at Hatfield Aerodrome off Hatfield Road, and specifically the possible implications associated with the extensive existing plume of groundwater contaminated with bromate and bromide present to the north of the quarry site.

3. I have reviewed relevant documentation on the Hertfordshire County Council planning portal associated with the appeal and previous planning application submissions relating to the 2016 planning application (planning ref: 5/0394-16 CM0961). The proof does not assess the 2021 revised planning application, as instructed by HCC, although I comment on the possible impacts of no pumping from LMH.

4. I have had open and constructive expert-to-expert meetings with the Environment Agency (15th October 2021); SLR (15th October 2021); Dr Mike Rivett (13th October 2021); and Affinity Water (18th October 2021).

5. The proof of evidence succinctly presents the most important issues I have identified and does not present a comprehensive commentary of my review.

6. I received a draft Statement of Common Ground (SoCG) on 18 October 2021, jointly drafted by the Environment Agency (EA) and Affinity Water (AW) and seeking input from HCC. I have not had the chance to consider the SoCG in preparation of the proof.

Background

7. A plume of contaminated chalk groundwater has resulted from historical release of contamination into the ground at a former industrial site in Sandridge (c.3km northwest of the application site). Groundwater flow in the chalk aquifer has distributed the bromate and bromide contamination dissolved in groundwater across an extensive area to the southeast and east of Sandridge, referred to as ‘the bromate plume’.

8. The plume is one of the most significant recorded groundwater pollution incidents in the UK and has been investigated and monitored over the last 20 years. Pumping from the Affinity Water’s Hatfield source ‘scavenges’ contaminated groundwater and prevents it from adversely affecting public water sources, including Essendon (c.6.5km east of the application site) operated by Affinity Water, and other sources further east operated by Thames Water. AW also operate two public supply sources at Roestock and Tyttenhanger to the south of the site.

9. The bromate plume passes the application site close to the northeast site boundary within the chalk and the overlying Lower Mineral Horizon (LMH), which are effectively hydraulically continuous.

10. The proposed quarry ('the site') will progressively extract the Upper Mineral Horizon (UMH), remove the interburden followed by extraction of the LMH. The LMH void will be backfilled with surplus site won material, overlain by a clay layer to reinstate the interburden, and the UMH will be backfilled by inert landfill. The UMH extraction and inert landfill placement are not considered in the proof as they are hydraulically separate from the LMH and chalk.

Issues of potential concern

11. My review identified four main issues of potential concern arising from the proposed quarry operations relating to the bromate/bromide plume:

- Pumping from the LMH to facilitate removal of interburden has the potential to draw bromate-contaminated groundwater towards and onto the site
- Placing lower permeability backfill material into the LMH void has the potential to create a permanent barrier to groundwater flow in the LMH and divert groundwater around the site.
- Placing lower permeability backfill material into the LMH void has the potential to reduce future contamination storage capacity.
- Change in the pumping regime at AW Hatfield source has the potential to cause plume movement, including movement towards and onto the site.

Assessment of the issues of potential concern

LMH pumping drawing plume onto quarry site

12. An estimated range of LMH pumping rate is provided by the appellant as 2500-4500m^3/d. The estimated maximum daily pumping rate is very large and could have a major effect on LMH water levels and potentially the southern edge of the plume. No calculations to underpin the pumping rate estimates and no numerical assessment of the impact of the LMH pumping on the groundwater flow regime and the bromate plume have been viewed. It is understood a pumping test has been completed by the appellant to inform an abstraction licensing application but I have not seen the pumping test data or interpretation. The EA is satisfied that the pumping test provided evidence the pumping effects would not affect the bromate distribution (EA, verb. comm.).

13. The EA has recommended planning conditions that require the operator to produce a water monitoring and management plan, including contingency actions, to be approved prior to each phase of workings. I consider that this condition gives some reassurance that the quarrying operations will be monitored and managed appropriately.

14. The appellant has produced an initial Groundwater and Water Management Plan ('GWMP') in response to the draft planning conditions. Whilst the initial GWMP is reasonable in its approach it does not identify the hierarchy of contingency actions that could or would be implemented if control levels were exceeded and it does not demonstrate how these contingency actions would be successful. This is an important deficiency when considering the LMH pumping.

15. In addition the spacing of the monitoring wells proposed in the initial GWMP is so large that it may not effectively identify plume movement. However the appellant has indicated more monitoring wells will be proposed in the phase-specific GWMP.

16. I have discussed my concerns regarding potential for plume movement as a result of LMH pumping with the EA and AW. Both the EA and AW consider the long-term dataset relating to the bromate plume provides a robust basis for characterisation of the plume behaviour and pointed to the stability of the plume under wide-ranging conditions (EA & AW verb. comm.). The EA is satisfied that the planning condition and licensing regime are adequate regulatory mechanisms (EA, verb. comm.) and AW is similarly confident in the adequacy of a private agreement they have established with the appellant, in addition to the EA's regulatory controls (AW, verb. comm.) (see below).

Backfill in LMH forming barrier to flow

17. Backfilling of the LMH void with lower permeability material has the potential to create a barrier to groundwater flow in the LMH, resulting in diversion of groundwater around and/or beneath the site.

18. The LMH to be replaced with low permeability deposits is c.5m thick. A minimum of 1m thickness of unworked LMH will remain at the base (SLR, 2015). The chalk effective aquifer thickness is typically considered to be c.60m.

19. I consider the barrier effect of LMH backfill is highly unlikely to result in significant adverse impact for several reasons, the main reason being the backfill layer forms a thin barrier when compared to the full aquifer thickness and groundwater can be diverted beneath as well as around the site with local effects only predicted.

Removal of contamination storage capacity in LMH

20. Whilst there have been occasional elevated results, the majority of the groundwater quality data from the site indicates the bromate plume is not beneath the site. Therefore the LMH is not currently providing significant contaminant storage. Replacement of the LMH with low permeability backfill removes the *future* potential for the LMH to provide contamination storage, in the scenario of the plume moving across the site.

21. As noted above the LMH backfill is thin compared to the full aquifer and predicted plume thickness and the majority of the plume contaminant mass is in the chalk and not the LMH beneath the site. Therefore I consider the removal of future storage capacity in the LMH by replacement with low permeability material is unlikely to make an appreciable difference.

Change in AW Hatfield abstraction causing plume movement onto quarry site

22. Whilst not within the appellant's control, change in pumping rate at AW Hatfield has the potential to influence the location of the plume and therefore the likelihood of: a) the LMH pumping pulling the plume onto the site during LMH pumping (discussed above); and b) the margin of the plume being diverted around the south of the site after backfilling.

23. For contaminated-water in the plume to be diverted to the south of the backfilled quarry a significant plume movement to the south would be needed. Under no groundwater conditions in the last 20 years has such movement been indicated (EA & AW, verb. comm.).

24. At AW's request the appellant has undertaken additional assessment of the effects of pumping at Hatfield on groundwater contours at the site and has developed monitoring and associated control levels that specifically address AW's concerns (AW & SLR, verb. comm.). I understand Affinity Water and the appellant have entered a private agreement that satisfies AW that their sources will be protected (AW, 2019).

Residual concerns and possible solutions

25. Of the four initially identified issues of potential concern, I am satisfied that there are no residual concerns associated with the second and third (the barrier effect and contamination storage capacity). Residual concerns associated with the first and fourth initially identified issues (LMH pumping and AW Hatfield changes) are now considered.

26. In my opinion groundwater pumping from LMH to be the most significant residual issue as it results in the potential to expand the area of affected aquifer and draw bromate-contaminated water onto the site.

27. If the proposal requires LMH pumping, the assessments presented by the appellant that I have viewed are inadequate to demonstrate that the impacts of LMH pumping can be effectively managed. The assessment of the required pumping rate, the effects of the pumping, the groundwater monitoring during pumping and the contingency actions have not been adequately presented. No calculations have been provided to underpin the pumping rate estimates by the appellant. Moreover no numerical assessment of the impact of the LMH pumping on the groundwater flow regime and the bromate plume has been presented. In my opinion detailed analysis, preferably with a groundwater model, is necessary to assess whether the proposed LMH pumping will potentially draw contaminated water into the site and thus cause expansion of the plume.

28. The appellant has indicated that the quarry can be worked without LMH pumping and that the new 2021 application does not include any LMH pumping (SLR, verb. comm.). A planning condition that prevents the appellant from undertaking LMH pumping would address my concerns in the preceding paragraph.

29. In my opinion the most significant limitations of the initial GWMP (SLR, 2020a) relate only to the LMH pumping scenario and are: a) the lack of defined hierarchy

of contingency actions that would be implemented if site monitoring indicated exceedance of control levels; and b) the lack of demonstration that measures are available that would prevent significant irreversible water resources impact. If no LMH pumping is proposed, plume movement onto the site is considered unlikely, as no quarry activities will substantially lower water levels or draw the plume onto the site and the plume has been observed to be stable over many years.

30. The wording of the EA-recommended planning conditions requires review to provide greater clarity, in my opinion. Draft planning condition 26 (Appendix A) includes three points i) to iii) the meaning of which has been debated (Rivett, 2020) and should be clarified. Also both EA-recommended conditions require a 'water management plan' to be produced with different objectives, leading to potential confusion.

31. Additional assessment of the effects of pumping at AW Hatfield on groundwater contours at the site has been undertaken by the appellant at AW's request. These assessments and an agreement between the appellant and AW that I understand includes monitoring, data provision and contingency actions, are not in the public domain and I have not seen them. Therefore I am unable to undertake my own assessment of the adequacy of these provisions.

32. I have discussed with the EA and AW their understanding of the bromate plume behaviour, based on over 20 years of monitoring data. I have also queried how the EA and AW have assessed the quarry proposals and the potential implications for the bromate plume and groundwater resources. Both the EA and AW have indicated they have undertaken detailed assessment and satisfied themselves of the acceptability of the proposals in terms of groundwater protection (EA & AW, verb. comm.).