AQMAU Acoustics & Air Quality Modelling & Assessment Unit

Environment Agency

Air quality audit report

AQMAU reference: AQMAU-C2871-RP02

Site name: Canford EfW CHP Facility

Permit reference: EPR/SP3112SF/A001

Date requested: 12th August 2024

AQMAU response date: 19th November 2024 (WD01)
19th November 2024 (WD02)
19th November 2024 (RP01)
26th November 2024 (RP02)

AQMAU recommendation	Conditions / noted
• The consultant's conclusions for human health can be used for permit determination. • The consultant's numerical predictions for human health can be used for permit determination.	• Contributions from the proposed facility are unlikely to be significant or be the cause of exceedances of the environmental standards set for the protection of human health. • Predicted intakes from dioxins and furans, and dioxin-like polychlorinated biphenyl emissions are not considered a risk to health.
• The consultant's conclusions for ecological receptors cannot be used for permit determination. • The Habitats Assessment Team should be consulted on the potential significance of acid deposition process contributions at Dorset Heaths SAC, Dorset Heathlands SPA/Ramsar and Canford Heaths SSSI. • The consultant's numerical predictions and contour plots for ecological receptors can be used for consultation.	• Our checks confirm the acid deposition process contributions could be significant at Dorset Heaths SAC, Dorset Heathlands SPA/Ramsar and Canford Heath SSSI, relative to the most stringent critical load function (maxN) of 0.553 keq/ha/yr (bog woodlands). • Our checks confirm that the consultant's acid deposition process contributions and predicted area of exceedance are reasonably worst-case. • At all other sites, the proposed facility is unlikely to contribute significantly to any exceedances of the critical levels and critical loads set for the protection of the ecological sites.

Detailed response and evidence starts on Page 2.

1 Summary of work request

1.1 The Environment Agency's Permitting Installations Regime asked the Acoustics and Air Quality Modelling and Assessment Unit (AQMAU) to audit an air quality assessment[1] (AQA) for a bespoke permit application for the Canford Energy from Waste (EfW) and Combined Heat and Power (CHP) Facility (the installation). The AQA includes an Abnormal Emissions Assessment (AEA) and a Human Health Risk Assessment[2] (HHRA) were submitted along with the AQA. The AQA was completed by Gair Consulting Limited (the consultant) on behalf of MVV Environment Limited (the applicant).

1.2 The proposed single-line facility would recover energy in the form of electricity and steam from with a nominal capacity of up to 260,000 tonnes of residual waste and refuse derived fuel each year. The risk assessments were based on the maximum continuous rating of 40.8 tonnes per hour. There is also a back-up diesel engine designed for emergency use which the consultant has included in their modelling.

2 Conclusions that lead to AQMAU recommendations

2.1 In the case of human health, the consultant concluded that:

- Either process contributions (PC) are below 1% and 10% of the long-term (LT) and short-term (ST) environmental standards (ES) or predicted environmental concentrations (PEC) are below the ES for all pollutants.
- There are no predicted exceedances of LT or ST ES associated with abnormal operations.
- For the HHRA, the risks to health due to emissions of dioxins and furans, and dioxin-like PCBs are not significant.

2.2 In the case of protected conservation sites, the consultant concluded that:

- At local nature sites, the PCs are less than 100% of the relevant critical levels and loads.
- At Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites and Sites of Special Scientific Interest (SSSI):
    - PCs cannot be screened out as not significant as the acid deposition PC exceeds 1% of the critical load function at Dorset Heaths SAC, Dorset Heathlands SPA/Ramsar and Canford Heath SSSI.

2.3 We have audited the consultant's assessment and have made observations relating to their methods and assumptions. We have conducted our own check modelling and have analysed model sensitivities. We find that the consultant's conclusions for human health can be used for permit determination but the conclusions for ecological sites cannot be used.

2.4 The acid deposition impacts at Dorset Heaths SAC, Dorset Heathlands SPA/Ramsar and Canford Heath SSSI cannot be ruled out as not significant against the most sensitive habitat feature critical load function (maxN) of 0.553 keq/ha/yr (bog woodland).

1 MVV Environment Limited. Canford Energy from Waste Combined Heat and Power Facility: Air Quality Assessment, C67-P03-R01. Gair Consulting Limited. May 2024.
2 MVV Environment Limited. Canford Energy from Waste combined Heat and Power Facility: Human Health Risk Assessment, C67-P03-R02. Gair Consulting Limited. March 2024.

3 Evidence for conclusions

Consultant's submission

Air quality assessment

3.1 Model software and version – Air dispersion modelling software ADMS 6 has been used.

3.2 Source assumptions – The installation has been modelled to operate at maximum capacity for 8,760 hours per year. The stack height is 110 m, based on mitigation described in section 5.3.3 of the AQA.

3.3 Emission parameters and assumptions – The assessment is predominantly based on the Best Available Techniques Associated Emission Levels (BAT-AEL) obtained from the 2019 waste incineration BAT conclusions (BATC) document[3]. The modelled emissions are presented in tables 3.4 and 3.5 of the AQA. We observe:

- All total volatile organic compounds (TVOC) are assumed to be benzene and 1,3-butadiene for assessment against these ES.
- All polycyclic aromatic hydrocarbons (PAHs) are assumed to be benzo[a]pyrene (B[a]P) and are assessed against the B[a]P ES. An emission concentration of 0.09 µg/Nm^3 was used.
- For polychlorinated biphenyls (PCBs) an emission concentration of 0.0036 ng/Nm^3 was used. The emission concentrations for PAHs and PCBs are both based on the Defra (WR0608) report on emissions from waste management facilities[4].
- Group 3 metal emissions have been modelled following our guidance[5].
- All other emission concentrations are consistent with the BAT-AELs.
- The back-up diesel generator has been modelled using an oxides of nitrogen (NO_X) emission concentration of 2000 mg/Nm^3 which is consistent with the TA-Luft 2G emissions standard.

3.4 Meteorological data – Meteorological data observed at Bournemouth Airport for five years 2016-2020. This site is 8 km west of the installation.

3.5 Surface roughness – A fixed surface roughness of 0.3 m has been used for both the dispersion site and meteorological site, with sensitivity to 0.5 m and 0.7 m.

3.6 Minimum Monin-Obukhov (M-O) length – The default minimum M-O length has been assumed for both the dispersion site and meteorological site.

3.7 Terrain – A terrain file has been used to model terrain effects because there are areas with gradients greater than 1:10.

3.8 Buildings – Seven buildings, as shown in table 3.3 of the AQA have been modelled.

3.9 Receptor grid – A 20 km x 20 km Cartesian grid with a spatial resolution of 160 m has been used.

3.10 Discrete receptors – The consultant has modelled 19 discrete receptor locations to represent relevant public exposure.

3.11 Background concentrations – The background data used is reported in Table 2.7 of the AQA. A variety of sources have been used (presented in section 2.5 of the AQA), including diffusion tubes managed by Bournemouth, Christchurch and Poole Council[6],

[3] Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration.
[4] Defra. Emissions from Waste Management Facilities (WR 0608). July 2011
[5] Waste incinerators: guidance on impact assessment for group 3 metals stack - GOV.UK (www.gov.uk) [Accessed November 2024]
[6] Air quality reports | BCP [Accessed November 2024]

air quality networks spread across the UK[7] and Defra background maps for the pollutants assessed.

3.12 Oxides of nitrogen (NO_X) to nitrogen dioxide (NO_2) conversion – 70% LT and 35% ST NO_X to NO_2 conversion has been assumed.

3.13 Summary of AQA results for normal operations – LT and ST PCs and PECs are reported in tables 4.1 and 4.2 of the AQA. We observe:

- All pollutant PCs are either insignificant (less than 1% for LT or 10% for ST) or the PECs do not exceed the relevant ES.
- Of the group 3 metals, hexavalent chromium (CrVI) progressed to step 2 (presented in Table 4.14) before showing acceptable impacts.

Abnormal emissions assessment (AEA)

3.14 Emission parameters and assumptions – Modelled abnormal emission concentrations are reported in Table 6.2 of the AQA. We observe:

- The ST emission concentrations are within the ranges specified for raw flue-gas in table 3.6 of the 2019 Waste Incineration BREF[8].
- The emission concentration for particulate matter (PM) is consistent with the 150 mg/Nm^3 half-hourly average ELV specified in IED Annex VI Part 3 (2)[9].
- 24-hour abnormal impacts have been factored to reflect the 4 hours of uninterrupted abnormal emissions for up to 60 hours per year from Article 46 (6) of the IED. The remaining 20 hours are assumed to be at the daily permitted ELV.

3.15 Summary of AEA results for abnormal operations – The consultant reported ST PCs in Table 6.4 of the AQA. We observe:

- At the maximally impacted receptor, the predicted abnormal PCs for all pollutants are either insignificant (less than 10%) or do not exceed the relevant ES. The consultant has not provided numerical values for PECs.
- The LT impacts of abnormal emissions of PCBs have also been reported in Table 6.5 of the AQA. The consultant has not assessed the impacts of long-term abnormal emissions from any other pollutant.

Human health risk assessment (HHRA)

3.16 Model software – Proprietary software Lakes IRAP-h View (version 5.1.1) has been used to conduct the HHRA. IRAP-h View implements the United States Environmental Protection Agency (US EPA) Human Health Risk Assessment Protocol (HHRAP)[10].

3.17 Discrete receptors – 23 receptors have been assessed.

3.18 Pathways – Direct inhalation and ingestion of soil, home grown produce, drinking water, eggs from home reared chickens, home grown poultry, beef, pork, cow's milk, and consumption of breast milk for infants are the pathways that have been considered. Ingestion of locally caught fish has not been included because there are no fish farms within 5 km of the facility.

3.19 Dioxin and furan (PCDD/F) congener profile – The congener profile and emission rates are presented in tables 2.1 and 2.2 of the HHRA. The emissions for each congener in terms of toxic equivalent (I-TEQ) have been based on a standard congener profile for

[7] https://uk-air.defra.gov.uk/interactive-map [Accessed November 2024]
[8] Best Available Technique (BAT) reference Document for Waste Incineration, Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention Control), 2019
[9] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). EUR-Lex - 02010L0075-20110106 - EN - EUR-Lex (europa.eu) [Accessed November 2024]
[10] Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, EPA 2005.

municipal waste incinerators from HMIP 1996[11] and scaled to the BAT-AEL of 0.04 ng I-TEQ /Nm^3.

3.20 Dioxin-like PCBs –The entire dioxin-like PCB emission has been modelled as Aroclor 1016 and 1254 in IRAP-h View.

3.21 Deposition assumptions – The deposition assumptions are shown in section 2.5 of the HHRA. We observe:

- The recommended dry vapour deposition velocity of 0.5 cm/s for organic contaminants has been used.
- The dry particle and particle-bound deposition velocities of 1 cm/s have been used and is a conservative value from our guidance[12].

3.22 Summary of HHRA – The consultant reported their results in Table 4.3 of the HHRA. We observe:

- The Committee on Toxicity tolerable daily Intake (COT TDI)[13] of 2 pg WHO-TEQ/kg(BW)/day has been used.
- The predicted maximum contribution is 0.8% of the TDI for an adult, and 1.2% of the TDI for a child.
- The predicted intakes for dioxins, furans and dioxin-like PCBs have been adjusted for lifetime exposure.

Ecological assessment

3.23 Sites assessed – The consultant has used a screening distance of 15 km for SACs, SPAs and Ramsar sites and 10 km for SSSIs, therefore, they have included a number of additional ecological sites outside of the standard screening distances of 10 km for European sites and 2 km for SSSIs. The consultant has not assessed impacts at Solent and Dorset Coast SPA which is 7.7 km south-east of the facility. The assessed conservation sites are presented in Table 3.2 of the AQA.

3.24 Background concentrations, critical levels and critical loads – The APIS website[14] has been used to establish baseline concentrations and deposition fluxes, critical levels and critical loads for the conservation sites assessed.

3.25 Deposition – AQTAG06[15] guidance was followed to calculate the contribution of pollutants to nutrient nitrogen and acid deposition.

3.26 Summary of ecological assessment – The PCs and PECs at the conservation sites are reported in tables 5.7 to 5.17 of the AQA. We observe:

- At Dorset Heaths SAC, Dorset Heathlands SPA/Ramsar and Canford Heath SSSI as well as some of the component SSSIs, namely Turbary & Kinson Commons SSSI and Parley Common SSSI, the acid deposition PC is not insignificant, and the background already exceeds the relevant critical load function. The most stringent critical load function (maxN) of 0.553 keq/ha/yr (bog woodland) has been applied at Dorset Heaths SAC. The AQA explains that considering the proposed mitigation during operation, it was concluded that habitat fragmentation in relation to Dorset Heath SAC, Dorset Heathlands SPA/Ramsar and Canford Heath SSSI no longer constitute a likely significant effect. The AQA also explains the assessment concluded that with identified mitigation, there will be no adverse

[11] Table 7.2a DOE (1996) Risk Assessment of Dioxin Releases from Municipal Waste Incineration Processes Contract No. HMIP/CPR2/41/1/181.
[12] Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk) [Accessed November 2024]
[13] Tolerable Daily Intake (TDI) of 2 picogrammes toxic equivalent (TEQ) of dioxins and dioxin-like PCBs per kilogramme human body weight per year.
[14] Air Pollution Information System www.apis.ac.uk [Accessed November 2024]
[15] AQTAG06 Guidance on detailed modelling approach for an appropriate assessment for emissions to air. March 2014.

effects on the integrity of the European sites as a result of the proposed development.

- Dorset Heaths SAC, Dorset Heathlands SPA/Ramsar and Canford Heaths SSSI all overlap the same area of exposure adjacent to the southern perimeter of the installation boundary. The most stringent critical load function (maxN) of 0.553 keq/ha/yr is assigned to Dorset Heaths SAC only.
- At all other European sites and SSSIs, either the LT PCs are insignificant, or the PECs do not exceed the relevant critical levels and critical loads.
- At all assessed local nature sites, the LT and ST PCs are less than 100% of the critical levels and critical loads and are insignificant.

AQMAU check modelling and assessment

3.27 We carried out check modelling and sensitivity analysis to several of the assumptions and input parameters made by the consultant. The checks listed in this section were deemed necessary to understand model sensitivity and uncertainties in the consultant's reported predictions:

- ADMS 6, the latest version of the dispersion model.
- Five years of meteorological data observed at Bournemouth Airport.
- Surface roughness lengths of 0.1, 0.3 and 0.5 m for the dispersion site, and 0.1 and 0.3 m for meteorological site.
- The ADMS default minimum M-O length of 1 m as well as 10 m for the dispersion site and the meteorological site.
- Our own terrain file processed from 50 m resolution data.
- Effects with and without buildings.
- An alternative emission concentration for PAHs as B[a]P, to reflect the maximum recorded at a UK plant (2019 Waste Incineration BREF, Figure 8.121).
- An alternative emission concentration for PCBs, taken from the WI BREF 2006 daily averages (Table 3.8, page 156) / IED Annex VI Part 3 daily average & proposed ELV.
- More conservative sulphur dioxide (SO_2) emission concentrations for the abnormal operations.
- An assessment of impacts at Solent and Dorset Coast SPA.

3.28 Our check modelling and sensitivity analysis indicates for human health:

- We agree the proposed installation either has insignificant impacts or will not cause exceedance of the ES set for the protection of human health, for normal and abnormal operations.
- Our checks indicate the dioxin, furan and dioxin-like PC intakes are below 10% of the COT TDI and are not considered a significant risk to health. This also applies to any increased emissions of dioxins, furans and dioxin-like PCBs during worst-case abnormal operations. This is based on the UKHSA advise that:
  - A total exposure including the PC from dioxins, furans and dioxin-like PCBs is without appreciable health risk if the total exposure is below the COT TDI.
  - If total exposure including the PC results in an exceedance of the COT TDI, if the PC from the facility is less than 10% it would be unlikely to result in a significant risk.

3.29 Our check modelling and sensitivity analysis indicates for ecological sites:

- At Dorset Heaths SAC, Dorset Heathlands SPA/Ramsar and Canford Heath SSSI the acid deposition PC is not insignificant, and the background already exceeds the critical load function. We consider the PCs to have the potential to be significant, therefore, we disagree with the consultant's conclusions at this

site. We recommend consultation with the habitats regulation team (HAT) with the following information:
    - The consultant's numerical predictions and isopleth maps[16] can be used for consultation.
    - Assuming the sensitive feature of bogs is present in the area of maximum impact on the site.
    - Assuming the critical load function (maxN) of 0.553 keq/ha/yr provided by APIS is applicable in the area of maximum impact on the site.
- At Turbary & Kinson Commons SSSI and Parley Common SSSI the acid deposition PCs are not insignificant, and the background already exceeds the critical load function. Considering the modelling uncertainties, sensitivities and biases in model assumptions, the predicted PCs are not likely to be significant in practical application. As a result, we agree with the consultant's conclusions at these sites.
- At all other European sites and SSSIs, either the LT PCs are less than 1% and ST PCs are less 10% and are insignificant, or the PECs do not exceed the relevant critical levels and critical loads.
- At all nearby local nature sites, the LT and ST PCs are less than 100% of the critical levels and critical loads and are considered insignificant.

[16] Contour plot drawing title: Maximum Predicted Annual Acid Deposition for Non-Woodland SAC Habitats-Proposed Development Alone, drawing number edp7095_d043, dated 14 February 2024