

Lostock Sustainable Energy Plant Ltd
**Air Quality Analysis for Environmental Permit
Application**
Lostock Sustainable Energy Plant

1 Introduction

Lostock Sustainable Energy Plant Limited (LSEP Ltd) was granted an Environmental Permit (EP) for a waste incineration facility (LSEP or the 'Facility') on 16 December 2013. The EP has been subject to one variation since it was granted.

LSEP Ltd is applying for the following changes to the EP:

1. Increase the capacity of the Facility from 600,000 tonnes per annum (based on a throughput of 72.2 tonnes per hour and an availability of around 8,000 hours) to 728,000 tonnes per annum (assuming a throughput of 91 tonnes per hour and an availability of 8,000 hours);
2. Amend the Site Layout to align with the design of the Facility allowing for its design evolution since the original EP was granted;
3. Amend the Operating Techniques/permit conditions to align with the design of the Facility allowing for its design evolution since the original EP was granted; and
4. Introduce two additional EWC codes to the EP.

A detailed description of the activities to be undertaken at the Facility is included within the Supporting Information within the EP application pack.

To support the planning application an Environmental Impact Assessment Report (EIAR) was produced which included an Air Quality Environmental Impact Assessment (EIA). This was supported by a number of documents as technical appendices which have also been submitted with this EP application:

- Appendix E1: Baseline Analysis (Ref: S3179-0310-0011HKL);
- Appendix E2: Process Emissions Modelling (Ref: S3179-0310-0012HKL);
- Appendix E3: Human Health Risk Assessment (Ref: S3179-0310-0013HKL); and
- Appendix E4: Ecological Interpretation of Air Quality Assessment.

Appendix E2 sets out the dispersion modelling methodology and results. All modelling was carried out in line with the Environment Agency's (EA's) requirements. The results are presented as concentrations and then drawn upon in the EIAR chapter. This note draws upon the results presented in Appendix E2 and Appendix E3 and screens the impacts in line with the EA's requirements to support the EP application.

When considering the impact on ecology the results of the dispersion modelling were drawn upon in the Ecology EAIR chapter. The project ecologist determined the significance of the impacts at ecological sites. This has also been provided for reference.

2 Screening criteria for permitting

2.1 Human health

The EA's 'Air Emissions Risk Assessment for your Environmental Permit'¹ (hereby referred to as the Air Emissions Guidance) states that to screen out 'insignificant' process contributions:

- the long-term PC must be less than 1% of the long-term environmental standard; and
- the short-term PC must be less than 10% of the short-term environmental standard.

As part of this assessment, predicted process contributions have been compared to the Air Quality Assessment Levels (AQALs) stated in Appendix E2.

Consultation with the EA has confirmed that if the above criteria are achieved, it can be concluded that "it is not likely that emissions would lead to significant environmental impacts" and the process contributions can be screened out.

The long-term 1% process contribution threshold is based on the judgement that:

- it is unlikely that an emission at this level will make a significant contribution to air quality; and
- the threshold provides a substantial safety margin to protect health and the environment.

The short-term 10% process contribution threshold is based on the judgement that:

- spatial and temporal conditions mean that short-term process contributions are transient and limited in comparison with long-term process contributions; and
- the threshold provides a substantial safety margin to protect health and the environment.

For the purpose of this assessment, if the process contribution can be screened out as insignificant at the point of maximum impact, further assessment is not required. However, if the process contributions cannot be screened out, assessment has been undertaken for the following:

- the Predicted Environmental Concentration (PEC) (defined as the process contribution plus the baseline concentration) at the point of maximum impact; and
- the process contribution and PEC at areas of public exposure.

In these cases, consultation with the EA has revealed that if the long-term PEC is below 70% of the AQAL, or the short-term process contribution is less than 20% of the headroom² it can be concluded that 'there is little risk of the PEC exceeding the AQAL', and the impact can be considered to be 'not significant'.

2.2 Ecology

The Air Emissions Guidance states that to screen out impacts as 'insignificant' at European and UK statutory designated sites:

- the long-term PC must be less than 1% of the long-term environmental standard (i.e. the Critical Level or Load); and
- the short-term PC must be less than 10% of the short-term environmental standard.

¹<https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmentalstandards-for-air-emissions>

² Calculated as the AQAL minus twice the long-term background concentration

If the above criteria are met, no further assessment is required. If the long-term PC exceeds 1% of the long-term environmental standard, the PEC must be calculated and compared to the standard. If the resulting PEC is less than 70% of the long-term environmental standard, the Air Emissions Guidance states that the emissions are ‘insignificant’ and further assessment is not required. In accordance with the guidance, calculation of the PEC for short-term standards is not required.

The Air Emissions Guidance states further that to screen out impacts as ‘insignificant’ at local nature sites:

- the long-term PC must be less than 100% of the long-term environmental standard; and
- the short-term PC must be less than 100% of the short-term environmental standard.

In accordance with the guidance, calculation of the PEC for local nature sites is not required.

3 Analysis – impact on human health

Table 19 of Appendix E2 Process Emissions Modelling sets out the impact of the Facility at the point of maximum impact assuming operation at the daily Emission Limit Values (ELVs), and Table 20 sets out the impact assuming operation at the half-hourly ELVs. As shown, the impact is less than 1% of the long term and less than 10% of the short term AQAL and can be screened out as ‘insignificant’ with the exception of the following:

- Annual mean nitrogen dioxide impacts;
- Annual mean volatile organic compounds (VOCs) impacts (as 1,3-butadiene);
- Annual mean cadmium impact; and
- 99.9th percentile of 15-minute mean sulphur dioxide assuming operation at the half-hourly ELV.

The above analysis does not account for any difference in the spatial distribution of impacts. Therefore, additional consideration has been made to the spatial distribution of the impacts and the assumptions used.

3.1 Further analysis – annual mean nitrogen dioxide

Oxides of nitrogen would be released from the process and are converted to nitrogen dioxide via complex atmospheric chemistry involving the ozone and sunlight.

The following table provides a breakdown of the maximum impact of annual mean nitrogen dioxide emissions at any grid point and the maximum impact at any residential receptor. This is calculated as the maximum over the 5 years of weather data.

Table 1: Annual mean nitrogen dioxide further analysis

Area	Maximum PC		PEC (PC +Bg)	
	µg/m ³	as % of AQAL	µg/m ³	as % of AQAL
Maximum point of impact	0.53	1.31%	17.58	43.94%
Maximum impact at a residential receptor	0.45	1.13%	17.50	43.76%

Figure 7 of Appendix E2 shows the location of the point of maximum impact is to the north of the LSEP, within fields to the north of Manchester Road (i.e. an area where the annual mean AQAL does not apply). Baseline concentrations in the area where the point of maximum impact occurs are

likely to be similar to the mapped background concentration (i.e. 17.05 µg/m³). Applying this baseline concentration, the PEC at the point of maximum impact would be 43.94% of the AQAL.

Although all other areas will have a lesser impact than at the point of maximum impact as described above, the impact at local residential receptors has also been investigated, the detailed results table is provided in Annex A of Appendix E2 and spatially shown in Figure 7 of Appendix E2. Figure 7 of Appendix E2 shows there are two areas in which the impact exceeds the 1% of the AQAL; to the east of the LSEP site where R8 (the maximum impacted receptor) and R9 are located, and in a mostly rural area to the north of the site above Manchester Road. Using the mapped background concentration of 17.05 µg/m³, the PEC at R8 is 43.76% of the AQAL, well below the 70% screening criteria. All other areas PECs are also well below 70% of the AQAL. As shown, there are two of the identified sensitive receptors at which the PC exceeds 1% of the AQAL. The maximum impacted receptor is R8 (Birches Lane 2), at which the impact is 1.13% of the AQAL.

3.2 Further analysis – annual mean VOCs

The LSEP EP (to be varied) will include a limit on total organic compounds (TOCs) these consist of a range of VOCs of which AQALs have been set for benzene and 1,3-butadiene. There are two VOCs for which an AQAL has been set: benzene and 1,3-butadiene. For the purpose of this analysis it has been assumed that the entire VOC emissions consist of only benzene or 1,3-butadiene. This is a highly conservative assumption as it does not take into account the speciation of VOCs in the emissions and the modelling does not take into account the volatile nature of the compounds.

The maximum impact of annual mean VOC emissions from the Facility is predicted to be 0.84% of the AQAL for benzene and 1.86% of the AQAL for 1,3-butadiene at the point of maximum impact. The following table provides a breakdown of the maximum impact at any grid point and the maximum impact at any residential receptor for 1,3-butadiene. This is calculated as the maximum over the 5 years of weather data.

Table 2: Annual mean VOC further analysis

Area	Maximum PC		PEC (PC +Bg)	
	µg/m ³	as % of AQAL	µg/m ³	as % of AQAL
1,3-butadiene				
Maximum point of impact	0.04	1.86%	0.29	12.97%
Maximum impact at a residential receptor	0.04	1.60%	0.29	12.71%

Figure 8b of Appendix E2 shows the spatial distribution of VOCs as 1,3-butadiene impacts. The location of the point of maximum impact is to the north of the LSEP facility, within fields to the north of Manchester Road (i.e. an area where the annual mean AQAL does not apply). Baseline concentrations in the area where the point of maximum impact occurs are likely to be similar to the mapped background concentration (i.e. 0.25 µg/m³). Applying this baseline concentration, the PEC at the point of maximum impact would be 12.97% of the AQAL.

Although all other areas will have a lesser impact than at the point of maximum impact as described above, the impact at local residential receptors has also been investigated, the detailed results table is provided in Annex A of Appendix E2 and spatially shown in Figure 8b of Appendix E2. As shown, there are 10 of the identified receptors at which the PC exceeds 1% of the AQAL. The maximum

impacted receptor is R8 (Birches Lane 2), at which the impact is 1.60% of the AQAL. Figure 8b of Appendix E2 shows there is an extended area to the north east of the Facility in which the impact exceeds 1% of the AQAL, and two smaller areas to the east and north which exceed 1.5% of the AQAL. Using the mapped background concentration of 0.25 µg/m³, the PEC at R8 is 12.71% of the AQAL, well below the 70% screening criteria. As the background concentration across the area is not likely to vary significantly, the PEC at the point of maximum impact is the highest it will be anywhere in the area, so all other areas PECs are also well below 70% of the AQAL.

3.3 Further analysis – annual mean cadmium

The LSEP EP will include a combined limit for cadmium and thallium for which an AQAL has been set for cadmium

The annual mean cadmium PC from the LSEP facility is predicted to be 1.67% of the AQAL. However, this assumes that the entire cadmium and thallium emissions consist of only cadmium. The Waste Incineration BREF shows that the average concentration recorded from UK plants equipped with bag filters was 1.6 µg/Nm³ (or 8% of the ELV of 0.02 mg/Nm³), the highest recorded concentration of cadmium and thallium was 14 µg/Nm³ (or 70% of the ELV of 0.02 mg/Nm³) and only three lines recorded concentrations higher than 10 µg/Nm³ (or 50% of the ELV of 0.02 mg/Nm³).

Table 35 within Annex A of Appendix E2 shows the annual mean cadmium PC at the identified sensitive human receptor locations, for cadmium emitted at 100%, 50% and 8% of the ELV, referred to as the ‘screening’, ‘worst case’ and ‘typical’ scenarios. Figure 9 of Appendix E2 shows the spatial distribution of emissions of cadmium for each of the scenarios. As shown, there are no areas exceeding 1% of the AQAL when it is assumed that cadmium is emitted at 50 % or at 8% of the combined cadmium and thallium emission limit (i.e. similar to a typical facility).

Table 3: Annual mean cadmium further analysis

Area	Maximum PC		PEC (PC +Bg)	
	ug/m ³	as % of AQAL	ug/m ³	as % of AQAL
Screening – 100% of the ELV				
Maximum point of impact	0.08	1.67%	0.65	13.07%
Maximum impact at a residential receptor	0.07	1.44%	0.64	12.84%
Worst-case – 50% of the ELV				
Maximum point of impact	0.04	0.84%	0.61	12.24%
Maximum impact at a residential receptor	0.04	0.72%	0.61	12.12%
Typical – 8% of the ELV				
Maximum point of impact	0.01	0.13%	0.58	11.53%
Maximum impact at a residential receptor	0.01	0.11%	0.58	11.51%

3.4 Further analysis – short term sulphur dioxide impacts

The impact of 15 min. means of sulphur dioxide if it assumed that the plant operates at the half-hourly ELV, is predicted to be 10.96% of the AQAL at the point of maximum impact. This is located close to a builders merchants and is not classed as an area of relevant exposure.

This impact is based on the assumption that both lines are operating at the half hourly ELVs at the same time, during the worst-case weather conditions. This scenario is extremely unlikely. If just one line is operating at the half hourly ELVs, and the other at the daily ELV, the predicted impact at the point of maximum impact is reduced to 3.06% of the AQAL.

3.5 Heavy metals

Detailed results tables showing the process contribution from the Facility and the calculated PEC are provided in Table 22 and Table 23 of Appendix E2 Process Emissions Modelling. These tables present the impact assuming that each metal is released at the combined ELVs. If the PC is greater than 1% of the long term AQAL, or 10% of the short term AQAL, when it is assumed that each metal is emitted at the total metal ELV, further analysis has been undertaken assuming the release is no greater than the maximum monitored at Municipal Waste Incinerators and Waste Wood Co-Incinerators. This has been taken from the EA's metals guidance³ which details the maximum monitored concentrations of group 3 metals emitted by Municipal Waste Incinerators and Waste Wood Co-Incinerators. The maximum monitored emission presented in the EA's analysis has been used as a conservative assumption over the likely emissions from the Facility.

As shown, if it is assumed that the entire emissions of metals consist of only one metal, the impact is less than 1% of the long term and less than 10% of the short term AQAL, with the exception of annual mean impacts of arsenic, chromium (VI) and nickel. The PEC is only predicted to exceed the long term AQAL for chromium (VI) using this worst-case screening assumption, and this is due to the high background concentrations. If it is assumed that the LSEP facility would perform no worse than a currently operating facility, the PC is below 1% of the long term and 10% of the short term AQAL for all pollutants with the exception of annual mean arsenic and nickel. However, the PECs for arsenic and nickel are predicted to be below the AQALs so the impact on these pollutants can be screened out as 'insignificant'.

3.6 Human health risk assessment

The planning application was supported by a Human Health Risk Assessment (HHRA). This has also been submitted with the EP application. The HHRA considers persistent pollutants released from the proposed Facility which have the ability to accumulate in the environment, and which humans may be exposed to via other ways than air inhalation. An example of this is the ingestion of food grown in the local area. The HHRA considers the pathway intake of pollutants with reference to pollutant specific Tolerable Daily Intake (TDI) values. These have been derived from scientific studies into the health effects of pollutants including both inhalation and ingestion pathways. A TDI is an *"estimate of the amount of a contaminant, which can be ingested daily over a lifetime without appreciable health risk"*.

The detailed assessment has shown that there would not be an appreciable health risk associated with emissions from the Facility.

³ Releases from municipal waste incinerators – Guidance for applicants on impact assessment for group 3 metals stack.

4 Analysis – impact on ecology

Section 7 of Appendix E2 Process Emission Modelling sets out the assessment of the impact of emissions at ecological receptors.

At all European designated sites, the PC is less than 1% of the Critical Level and can be screened out as 'insignificant' for all pollutants considered.

For the UK designated sites, the PC is less than 1% of the Critical Level and can be screened out as 'insignificant' for all pollutants considered, with the exception of annual mean oxides of nitrogen and annual mean ammonia at Plumley Lime Beds SSSI. Further analysis has shown that when the baseline concentrations are considered, the PEC for annual mean oxides of nitrogen is well below 70% and is the impact can be considered not significant. For annual mean ammonia impacts, due to high background levels of 4.24ug/m³, this is not the case.

For locally designated sites, PC impacts are less than 100% of the Critical Levels for all pollutants and no further assessment is required.

For deposition impacts, at all European designated sites, the PC is less than 1% of the Critical Load and can be screened out as 'insignificant'.

For UK designated sites for deposition impacts, the PC is less than 1% of the Critical Load and can be screened out as 'insignificant', except for nitrogen deposition and acid deposition for Broadleaved woodlands at Plumley Lime Beds SSSI.

For the local sites for deposition impacts, the PC impacts are less than 100% of the Critical Loads for all pollutants and no further assessment is required.

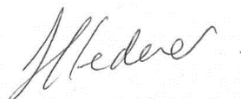
Further analysis by the project ecologist has been undertaken to determine the significance of the impact on the sites identified above. This analysis is provided in Appendix 5.5 of the EIAR and is also attached to this note for the EP Permit application, see Appendix E4. The ecological assessment assessed the significance of effects in the context of predicted changes of LSEP with the proposed tonnage increase compared to LSEP as consented, and concludes that there are no significant changes to the previously assessed (LSEP as consented) conditions as a consequence of the proposed increase in tonnage. No likely significant effects are predicted for European or Ramsar Sites, and no significant harm is predicted for SSSIs or locally designated sites.

5 Conclusion

Emissions to air from the proposed Facility are not expected to have a significant impact on human health or ecology.

Yours sincerely

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