

9. Noise and Vibration

Introduction and Methodology

- 9.1 INEOS is proposing to develop an EfW facility at the northern (Weston Point) end of the INEOS Runcorn site. This chapter provides an assessment of the potential noise and vibration effects arising from the construction and operation of the facility. A summary of relevant British Standards (BS) and guidance that have been used to inform the assessment is provided in Appendix 9.1.

Baseline Survey Methodology

- 9.2 The noise assessments require a comparison between the existing daytime and night-time noise environments at the nearest noise sensitive receptors (NNSRs) and the future noise levels that would be expected to occur, at those locations, should the EfW be constructed. Existing noise levels were determined by a field study.
- 9.3 The field study comprised one, long-term unattended noise survey and four short-term attended surveys at separate locations in the area. The noise monitors were installed at locations that were representative of the NNSRs to the EfW facility, which are habitable dwellings to the south and east of the site. The survey locations are shown in Figure 9.1.
- 9.4 The long-term survey logged measurements over a period of 10 days. For the short-term surveys, four 15-minute measurements were made at each location - two during daytime periods and two during night-time periods. All surveys were undertaken at freefield locations with the microphone at a height of 1.5 m above ground level.
- 9.5 The instrumentation was calibrated both prior to and immediately following the surveys to ensure that no significant drift had occurred over the survey period. All instrumentation was within the manufacturers' periods of calibration, as specified in BS 7445.
- 9.6 BS 4142 requires a 'representative background noise level' to be adopted for the assessment. There is no government or BS guidance that states what is considered to constitute 'representative' and the night-time period can be subject to a wide variation as it

includes the evening/night and night/morning shoulder periods. One approach that is commonly adopted, and has been adopted for this project, is to use the average L_{A90} between 07.00 and 23.00 hours for the daytime period and the average between 23.00 and 07.00 hours for the night-time period.

Assessment Methodology and Significance Criteria

Construction

- 9.7 Noise levels due to the construction phase have been predicted using SoundPLAN noise modelling software, implementing the methodology contained within BS 5228 Part 1. Source terms have been obtained from the Defra 2005 update to BS 5228 Part 1 based on plant considered to be 'typical' for the works that would be required.
- 9.8 There is no current BS or other national guidance on construction noise limits or for the determination of significant effect. However, the following method has been adopted to determine whether the predicted levels are significant, which is based upon a method developed for other major infrastructure projects together with current best practice.

Table 9.1: Threshold of Significance for Construction Noise

Noise Change, $L_{Aeq,T}$ (dB)	Significance
≤ 5	Not Significant
> 5	Significant Adverse Effect

Note: T is the period of construction activity

- 9.9 The following semantic scale has been adopted to assess the significance of the effects of noise change associated with construction HGVs on local roads:

Table 9.2: Semantic Scale for Describing Noise Change – Thresholds of Significance (Non-permanent Construction Traffic)

Predicted Noise Change		Scale Rating
Decrease of more than 6 dB	Significant decrease	Significant Positive Effect
Less than 6 dB	No Significant change	No Effect
Increase of 6 – 10 dB	Minor Increase	Significant Negative Effect
Increase of 11 – 20 dB	Moderate Increase	
Increase of more than 20 dB	Major Increase	

9.10 It is considered that the following construction sources would have the potential to give rise to significant vibration effects:

- demolition of existing structures on the site; and
- driven piling or vibratory piling (bored or augured piles would be unlikely to give rise to significant levels of vibration).

9.11 Significant vibration effects due to HGVs are unlikely provided that the haul roads do not contain significant pot holes or ruts.

9.12 Vibration levels arising from the construction phase have been predicted using methods contained within TRL Report 429 'Groundborne vibration caused by mechanised construction works. Transport Research Laboratory, 2000'. BS 5228 Part 4 provides guidance on levels of construction vibration below which cosmetic damage in residential structures is unlikely. These levels have been adopted as the threshold of significance for construction vibration and are provided below.

Table 9.3: Threshold of Significance for Construction Vibration

Significant Effect is PPV at building foundation exceeds: (mm/s)	
Continuous Vibration (e.g. vibratory piling)	5
Transient Vibration (e.g. impact piling)	10

Operation

- 9.13 Noise levels arising from the operation of the facility have been predicted using SoundPLAN noise modelling software, implementing the methodology contained within ISO 9613 Parts 1 and 2. Source terms have been obtained from Poyry Energy, the technology advisor for the project, and the Defra update to BS 5228 Part 1 for items of mobile plant.
- 9.14 The operational effects of static sources have been assessed using the methodology contained within BS 4142. In addition, consideration has also been given to the ambient noise change that would occur as a result of both static and mobile sources associated with the introduction of the EfW.
- 9.15 For this site, the baseline background noise levels at NNSRs are influenced by noise from the existing industrial facilities. On this basis, it is considered that the design target should be that there is no increase in existing background noise level at NNSRs. This requires that the Rating Level from the proposed EfW facility should be at least 10 dB below the existing background noise level and has been adopted as the threshold of significance for the BS 4142 assessment.
- 9.16 The following semantic scale has been adopted to assess the significance of the effects of noise change associated with the cumulative noise emissions from both static and mobile noise sources associated with the operation of the facility and of delivery HGVs on local roads.

Table 9.4: Semantic Scale for Describing Noise Change – Thresholds of Significance (Permanent Sources and Operational Traffic)

Predicted Noise Change		Scale Rating
Decrease of more than 3 dB	Significant decrease	Significant Positive Effect
Increase or Decrease of Less than 3 dB	No Significant change	No Effect
Increase of 3 – 5 dB	Minor Increase	Significant Negative Effect
Increase of 6 – 10 dB	Moderate Increase	
Increase of more than 11 dB	Major Increase	

- 9.17 Significant operational vibration effects are unlikely and, therefore, a quantitative assessment is not required.

Measures Adopted as Part of the Project

- 9.18 The project would be designed to comply with current Health and Safety Executive requirements as provided in the Control of Noise at Work Regulations 2005. Sound attenuation measures would be incorporated into the design of the project to ensure that noise levels in the external and internal general plant areas do not exceed 80 dB(A).
- 9.19 In addition, the following measures would be adopted as part of the project:
- a 2 m high noise barrier along the southern side of the access ramp to the tipping hall;
 - acoustic barriers along the southern edge of the main EfW site;
 - noise attenuated inlet on the southern face of the southern cooling tower with a sound power level of 89 dB(A) per cell;
 - remaining cooling tower inlets attenuated to a sound power level of 94 dB(A) per cell;
 - enclosed ID Fans such that the noise emission from each fan is no greater than a sound power level of 93 dB(A); and
 - the entrance/exit to the tipping hall will incorporate an automatic closing device such that the door is only open during HGV ingress/egress.
- 9.20 For the purposes of this assessment it has been assumed that acoustic barriers would be provided either side of the access road and these would be up to 3.15m above ground level (north of the access road, consisting of a combination of the existing sloping topography and acoustic barrier) and up to a maximum of 5m above ground level (south of the access road). The extent, optimum height and location required for acoustic barriers would be determined during the detailed design for of the project and agreed with the planning authority prior to construction.

- 9.21 During the commissioning and testing of the facility it would be necessary to discharge high-pressure steam to the atmosphere. The high noise levels associated with this activity would be reduced through the inclusion of silencers on the vents.

Baseline Conditions

Site and Area Description

- 9.22 The proposed location of the EfW facility is within the Runcorn Site, which is owned and operated by INEOS. The Runcorn Site lies around the southern and western edge of the Runcorn peninsula, in Halton. The proposed EfW site occupies an area in the northern part of the Runcorn Site, lying between Picow Farm Road and the A557 Runcorn Expressway to the east and the Weston Docks and Weaver Navigation to the west.
- 9.23 Residential development occupies land to the south of the site and to the east of the A557. The Mersey Estuary lies to the west of the site. The site is approximately 4km to the west of the centre of Runcorn, includes an existing rail facility and is close to the Weston Point Expressway.

Survey Locations and Noise Environment

Long-term – Sandy Lane (west)

- 9.24 The survey was undertaken at the site boundary with the car park to the north of Sandy Lane. This area of the site is used for storing parts and materials. There are residential areas on Sandy Lane and Clarks Terrace to the south and west, respectively. There is the salt works to the north of the survey location and site offices and a storage area to the east. Baseline noise levels were dominated by noise from the Runcorn Site. The results from the long-term survey are provided in Table 9.5. A chart of the long-term survey results is provided in Figure 9.2.

Table 9.5: Long-term Noise Survey Results

Date	Day	Daytime (07.00 to 23.00 hours)		Night-time (23.00 to 07.00 hours)	
		$L_{Aeq,16h}$ (dB)	L_{A90} (dB)	$L_{Aeq,8h}$ (dB)	L_{A90} (dB)
09/10/2006	Monday	53	50	52	50
10/10/2006	Tuesday	56	52	53	51
11/10/2006	Wednesday	53	49	51	48
12/10/2006	Thursday	54	51	51	49
13/10/2006	Friday	54	52	50	48
14/10/2006	Saturday	54	51	51	49
15/10/2006	Sunday	54	52	51	49
16/10/2006	Monday	56	55	51	48
17/10/2006	Tuesday	55	52	50	47
18/10/2006	Wednesday	55	52	52	49
<i>Weekdays¹</i>		<i>55</i>	<i>52</i>	<i>51</i>	<i>49</i>
<i>Saturday¹</i>		<i>54</i>	<i>51</i>	<i>51</i>	<i>49</i>
<i>Sunday¹</i>		<i>54</i>	<i>52</i>	<i>51</i>	<i>49</i>
<i>All Week¹</i>		<i>54</i>	<i>52</i>	<i>51</i>	<i>49</i>

¹ Average noise levels over stated period

Short-term 1 – Clarks Terrace

- 9.25 The survey was undertaken on the pavement in front of 6 and 7 Clarks Terrace. There is a car workshop to the north, site offices/storage to the east, residential properties to the south and the Mersey River to the west. The car workshop dominated noise levels when undertaking noisy activities, such as grinding. However, for the majority of the time, daytime and night-time noise levels were dominated by noise from the Runcorn Site.

Short-term 2 – Sandy Lane (east)

- 9.26 The survey was undertaken on the pavement in front of 62 Sandy Lane. Daytime noise levels are dominated by road traffic noise from Sandy Lane, which included HGVs turning in and out of the Picow Farm Road junction. Night-time noise levels were dominated by road

traffic noise from the A557 Weston Point Expressway and Sandy Lane. Noise from the Runcorn Site was occasionally audible at this position.

Short-term 3 – Caravan Storage Area

- 9.27 The survey was undertaken on the southern boundary of the stores area of the site with the caravan storage area. Daytime noise levels were dominated by a combination of road traffic noise from the A557 Weston Point Expressway, noise from aircraft overhead and from the Runcorn Site. The noise from the Runcorn Site was mainly from extraction fans and dominated higher frequencies. Night-time noise levels were dominated by a combination of road traffic noise from the A557 Weston Point Expressway and the Runcorn Site.

Short-term 4 – Russell Road

- 9.28 The survey was undertaken at the junction of Russell Road and Hillside Avenue. Daytime and night-time noise levels were dominated by a combination of road traffic noise from the A557 Weston Point Expressway and Russell Road. The Runcorn Site was audible, but not dominant, at this location.

Summary

- 9.29 The results of the short-term surveys are provided in Tables 9.6 and 9.7 for the daytime and night-time periods, respectively. Table 9.8 provides a summary of the baseline noise levels used in the assessment. The full day and night period levels at the short-term locations have been estimated based upon a comparison with the corresponding simultaneous measurement at the long-term location. The differences between values at the long and short-term locations are applied as an adjustment to the measured levels at the long-term location to obtain estimates of the noise levels throughout the long-term survey period. The daytime, night-time, L_{Aeq} and L_{A90} were calculated separately.

Table 9.6: Summary of Short-Term Measured Daytime Noise Levels

Location	Start Time / Date	Duration	Day	L _{Aeq,15min} (dB)	L _{A90} (dB)
ST1: Clarks Terrace	12:45 10/10/2006	15-mins	Tuesday	50	48
	15:30 11/10/2006	15-mins	Wednesday	52	46
ST2: Sandy Lane (east)	12:15 10/10/2006	15-mins	Tuesday	64	55
	16:00 11/10/2006	15-mins	Wednesday	63	54
ST3: Caravan Storage Area	13:45 10/10/2006	15-mins	Tuesday	57	51
	17:00 11/10/2006	15-mins	Wednesday	54	52
ST4: Russell Road	11:45 10/10/2006	15-mins	Tuesday	66	59
	16:30 11/10/2006	15-mins	Wednesday	66	62

Table 9.7: Summary of Short-Term Measured Night-time Noise Levels

Location	Start Time / Date	Duration	Day	L _{Aeq,15min} (dB)	L _{A90} (dB)
ST1: Clarks Terrace	01:30 10/10/2006	15-mins	Tuesday	52	51
	05:00 11/10/2006	15-mins	Wednesday	47	45
ST2: Sandy Lane (east)	03:45 10/10/2006	15-mins	Tuesday	49	44
	04:33 11/10/2006	15-mins	Wednesday	51	46
ST3: Caravan Storage Area	02:45 10/10/2006	15-mins	Tuesday	47	44
	03:15 11/10/2006	15-mins	Wednesday	49	47
ST4: Russell Road	03:15 10/10/2006	15-mins	Tuesday	50	46
	04:08 11/10/2006	15-mins	Wednesday	54	47

Table 9.8: Summary of Assessment Baseline Noise Levels

Location	Daytime (07.00 to 23.00 hours)		Night-time (23.00 to 07.00 hours)	
	$L_{Aeq,16h}$ (dB)	L_{A90} (dB)	$L_{Aeq,8h}$ (dB)	L_{A90} (dB)
LT: Sandy Lane (west)	54	52	51	49
ST1: Clarks Terrace	55	50	52	49
ST2: Sandy Lane (east)	65	56	50	45
ST3: Caravan Storage Area	55	53	50	47
ST4: Russell Road	67	61	53	46

Predicted Effects

Construction Effects

Noise from General Activities

9.30 It is anticipated that the construction period would be approximately three and a half years excluding site clearance. Normal working hours on site would be between 07.00 and 19.00 hours, with some flexibility for weekend working when required. During the concrete pours for the foundations, it would be necessary to work 24-hours a day, although only for a limited duration. During commissioning, the plant would become operational on a 24-hour basis. Four representative periods during the construction phase have been assessed quantitatively:

- demolition of the existing buildings;
- ground excavations, including piling;
- building construction and equipment installation; and
- night-time concrete pours.

9.31 Piling during civils works may be either augured or driven and driven sheet piling may be required for deep excavations. The assessment has considered driven piling on a 'worst-case' basis.

- 9.32 The noise sources and source terms included in the construction models are provided in Appendix 9.2. The results of the construction assessments are provided in Appendix 9.3. Noise contour maps of the results of the four assessments are provided in Figures 9.3(a) to (d).
- 9.33 The results of the construction noise assessment indicate predicted noise levels would vary, depending upon the area of the site upon which work is being undertaken and the activities on the site. The predicted temporary change in noise level would be most likely to be noticeable to the residents closest to the site, including Clarks Terrace and Sandy Lane West. With reference to Table 9.1, significant effects are not expected to occur. No further mitigation in addition to the working practices described within the draft Code of Construction Practice (CoCP) would be required.
- 9.34 The project also includes construction of workshops at the secondary site to accommodate the existing Weston Workshops. There are no residential receptors close to this secondary site and, therefore, a significant noise effect would not be expected to occur.

Vibration

- 9.35 The only construction source that has the potential to give rise to significant vibration effects is driven piling. The construction vibration assessment determines the distance at which effects would be significant for a typical impact piling rig, based upon the thresholds of significance provided in Table 9.3.
- 9.36 Appendix 9.4 contains the results of the construction vibration assessment. Relatively low hammer energies are used for sheet piling to prevent the pile from bending. It is considered that hammer energies could be in the order of 5 to 15 kJ, in which case a significant effect would not be expected to occur provided that the piling was undertaken at least 10 to 16m from the nearest building. All proposed structures on site are at least 70m from the nearest houses. The foundations of the bunker are likely to require piling and are at least 180m from any houses. Therefore, a significant vibration effect is unlikely to occur during the construction phase of the project and no mitigation would be required.

Noise From Construction Traffic

- 9.37 The assessment has considered the noise effects of all construction traffic accessing the site via Picow Farm Road and along both the Expressway North and Expressway South. The construction traffic assessment is provided in Appendix 9.5.
- 9.38 The results of the construction noise assessment indicate that a significant noise effect would not occur as a result of construction traffic using local roads. The noise effect on Picow Farm Road has been predicted to be 1dB during building construction and earthworks and 2dB during concrete pours which with reference to Table 9.2 are not considered to be significant noise effects. No noise change is predicted for Expressway North or South for any scenario.

Commissioning

- 9.39 Some activities associated with the commissioning of the plant are likely to give rise to high noise levels. Steam blowing of pipework is noisy and generally lasts approximately 20 minutes per blow. There would be approximately three blows per day for approximately 10 days for each of the four streams. Testing of safety valves would also be noisy but be of short duration and would occur from time to time during commissioning.
- 9.40 It has not been possible to undertake a quantitative assessment of commissioning activities due to the difficulty in obtaining appropriate source terms. However, these activities are temporary and of a very limited duration. Steam blows and testing of safety valves would, when practicable, be undertaken during normal daytime working hours and, where practicable, using silencers to minimise the noise emissions. It is considered that appropriate community liaison that would inform local residents of the proposed testing schedule is the only effective additional measure that would be practicable for these sources during this phase of the commissioning. This would be undertaken throughout the construction phase as described in the draft CoCP at Appendix 2.2.

Operational Effects

- 9.41 The measures included as part of the project are set out above.

- 9.42 The noise sources and source terms are provided in Appendix 9.6. The results of the operational noise assessment are provided in Appendix 9.7. Noise contour maps of the results of the model of the static sources alone and of all of the sources are provided in Figures 9.4 and 9.5, respectively.

BS 4142 Assessment

- 9.43 The results of the BS 4142 assessment indicate that the design criterion would be satisfied and that significant adverse noise effects would not be expected to occur as a result of the development during the daytime or night-time at any of the NNSRs. The greatest effect has been predicted to occur at the first floor of houses on the cul-de-sac at the northern end of Russell Road, during the night-time. At this location, the Rating Level has been predicted to be 10dB below the night-time background noise level, which is 1dB below the level at which a significant effect has been deemed to occur for this project. At the closest NSRs to the facility, which are houses on Clarks Terrace, the Rating Level has been predicted to be 11dB below the night-time background noise level, which is 2dB below the level at which a significant effect has been deemed to occur for this project.

Noise Change Assessment

- 9.44 The results of the assessment of both static and mobile noise sources indicate that a significant adverse noise change would not be expected to occur at any of the NNSRs during the night-time nor at the majority of the NNSRs during the daytime. The greatest effect has been predicted to occur at Clarks Terrace, during the daytime. At this location, the predicted daytime noise change at ground floor level is 4 dB, which with reference to Table 9.4, corresponds to a minor adverse effect. It is considered that this would be an acceptable effect as only approximately 15 residences would be affected and the noise change would only occur during the daytime and therefore would not affect sleep.

Noise from Operational Traffic

- 9.45 The Transport Assessment has provided the predicted future traffic flows for 2011 and 2026 with and without the project and for the cumulative situation with the project with other committed development. The assessment of the effects of traffic noise is provided in Appendix 9.7.

- 9.46 The results of the traffic noise assessment indicate that a significant noise effect would not occur as a result of increased traffic flows on local roads due to either the facility or the cumulative flows of the facility and other committed development.

Summary of Effects

- 9.47 Table 9.9 provides a summary of the effects associated with the construction and operational phases of the project.

Table 9.9: Summary of Effects

Effect	Significance of Effects	
	<i>Construction</i>	<i>Operation</i>
Temporary Increase in Daytime Ambient Noise Levels	Neutral	N/A
Likelihood of Complaints due to Operational Noise	N/A	Neutral
Permanent Increase in Daytime Ambient Noise Levels	N/A	Neutral to Minor Adverse
Permanent Increase in Night-time Ambient Noise Levels	N/A	Neutral
Noise Change due to Increased Traffic on Local Roads	Neutral	Neutral

Further Mitigation

- 9.48 The assessment has indicated that a minor adverse noise effect would only be expected to occur at approximately 15 properties on Clarks Terrace, to the south of the facility during the daytime. The project design includes a noise barrier along the southern boundary. It is considered that it would not be practicable for this barrier to be any higher and, therefore, no further mitigation has been proposed. For the majority of NNSRs during the daytime and for all of the NNSRs during the night-time, no significant effects have been predicted and no further mitigation would be required.

Cumulative Effects

9.49 A number of developments in the local and wider area have planning consent or are the subject of current planning applications. These include:

- Weston Docks: Port of Weston (WA7 4HN)
- SOG Ltd (WA7 4QZ)
- 3MG Mersey Multimodal Gateway
- Widnes Waterfront (Economic Development Zone)
- Mersey Crossing/Gateway
- Liverpool Airport Expansion

9.50 The proposals for the site at Port Weston are for an intermodal transport facility with improved road, rail, inland waterway and deep-sea freight logistics. The Port Weston site is approximately 400 – 500 m to the northwest of the proposed EfW site and, although it is likely to include a number of 24-hour noise sources, it is sufficiently distant that cumulative noise effects are unlikely during the construction or operational phases, even if the construction phases were, in part, concurrent. All of the other developments are significantly distant and cumulative noise effects would not occur during the construction or operational phase.