
Project:	Queensferry Wastewater Treatment Works and Sewage Treatment Centre Environmental permit variation application		
Our reference:	B16383-123532-XX-XX-AS-ZA-DH0109 –	Your reference:	n/a
	QUY Noise Impact Assessment January 2024		
Prepared by:	J Chan	Date:	18 January 2024
Approved by:	R Perkins	Checked by:	A Monk-Steel
Subject:	Noise Impact Assessment		

1 Background

As part of Welsh Water's application to vary a bespoke Environmental Permit for the Queensferry Welsh Water wastewater Treatment Works (WwTW) and Sludge Treatment Centre (STC) in Queensferry, Deeside, CH5 2DW, Mott MacDonald has been commissioned to undertake an assessment of the associated operational noise impacts.

2 Purpose

The purpose of the technical note is to present an assessment of the operational noise impact of the anaerobic digestors and sludge treatment activities of the STC. The assessment is made by way of a desk study in accordance with British Standard 4142 'Methods for rating and assessing industrial and commercial sound' (2014+A1:2019) and is based on a comparison of:

- Calculated operational noise impacts based on reference measurements of the same types of equipment installed at similar facilities
- Representative baseline noise levels for the closest residential receptors obtained from a noise survey undertaken in October 2018¹

The approach to the assessment follows the guidance described by:

- Environment Agency (EA) Guidance 'Noise and vibration management: environmental permits'²
- British Standard (BS) 4142 'Methods for rating and assessing industrial and commercial sound' 2014+A1:2019³
- BS 8233 'Guidance on sound insulation and noise reduction for buildings' 2014⁴

¹ Mott MacDonald, Queensferry Pumping Station Operational Noise Impact Assessment, Document reference: 395318 | 0133 | A, November 2021

² <https://www.gov.uk/government/publications/noise-and-vibration-management-environmental-permits/noise-and-vibration-management-environmental-permits> [Last accessed 28 July 2022]

³ British Standards Institution (2014+A1:2019) BS 4142 Methods for rating and assessing industrial and commercial sound.

⁴ British Standards Institution (2014) BS 8233 Guidance on sound insulation and noise reduction for buildings

- ISO 9613 (1996) Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation⁵

3 Site location and receptors

The existing site is located south of the River Dee in Queensferry, Deeside, as shown in Figure 3.1. An industrial area comprising Scottish Power is to the east, Interlinq Trade Park is to the south, and residential and commercial areas are to the west. The North Wales Coast railway line separates the site from the Interlinq Trade Park and is approximately 125m to the south. The A494 Queensferry Bypass separates the site from residential and commercial areas and is approximately 188m to the north-west.

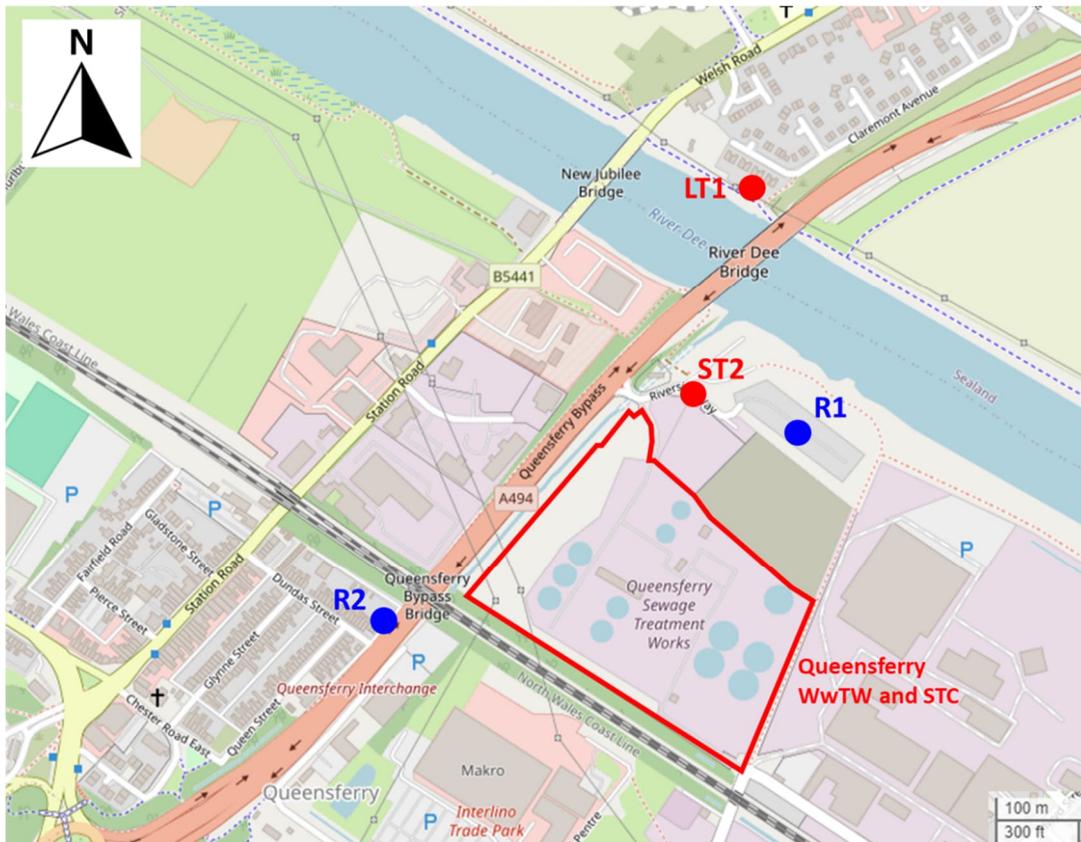
The closest Noise Sensitive Receptors (NSRs) to the Queensferry WwTW and STC site, as shown in Figure 3.1, are:

- R1: Traveller site, By-Pass Road, Queensferry, Deeside, CH5 2DU, approximately 110m to the north-east of the site boundary
- R2: 47 Dundas St, Queensferry, Deeside, CH5 1SZ, approximately 110m to the west of the site boundary

The site location and layout plan are detailed in the drawing B16383-123532-XX-XX-DR-ZA-DH0116 - QUY Site Layout Plan October 2024.

⁵ ISO the International Organization for Standardization (ISO 9613-2:1996) Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation

Figure 3.1: Queensferry WwTW and STC site location, the closest NSRs and locations for the measurement of background sound and ambient noise levels



Source: www.openstreetmap.org OpenStreetMap® is open data, licensed under the Open Data Commons Open Database License (ODbL)

4 Methodology

4.1 BS 4142 Methods for rating and assessing industrial and commercial sound

The British Standard BS 4142 'Methods for rating and assessing industrial and commercial sound' 2014+A1:2019 (hereafter referred to as BS 4142), provides guidance for assessing the noise impact of a new industrial sound source that is introduced within mixed residential and industrial areas. The methods described in this standard assess the likely effects of the new sound source on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

The level of sound due to the operation of the STC, the 'rating level', is calculated in terms of the A-weighted equivalent continuous sound level $\text{dB } L_{Aeq}$ and compared with the existing 'background sound level', in terms of L_{A90} statistical descriptor that is representative of the period being assessed (e.g. daytime or night-time). If the new sound source is impulsive, intermittent, or tonal in nature, then a penalty is added to the 'rating level' to account for the character of the noise. On a precautionary basis, a penalty of 3 dB has been added to all calculated values of the operational noise of the STC incident on the NSRs to account for the intermittent operation of plant items.

BS 4142 presents a method to determine the potential significance, depending on context, based on the difference between the background sound level and the 'rating level' of the new source of industrial sound as follows:

- Typically, the greater this difference, the greater the magnitude of the impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

4.2 Environment Agency Guidance

The Environment Agency guidance supplements BS 4142 with regard to permitting and the responsibilities of the operator as set out in Table 4.1.

Table 4.1: Assessment criteria based on EA guidance

Difference between rating level over background sound level	BS 4142 assessment	EA guidance	Operator responsibility
+10 dB or more	Significant adverse impact	Unacceptable level of audible or detectable noise	You must take further action or you may have to reduce or stop operations. The environment agencies will not issue a permit if you are likely to be operating at this level.
Around +5 dB	Adverse impact	Audible or detectable noise	Your duty is to use appropriate measures to prevent or, where that is not practicable, minimise noise. You are not in breach if you are using appropriate measures. But you will need to rigorously demonstrate that you are using appropriate measures.
Equal to or lower	Low or no impact	No noise or barely audible or detectable noise	Low impact does not mean there is no pollution. However, if you have correctly assessed it as low impact under BS 4142, the environment agencies may decide that taking action to minimise noise is a low priority. Note that BS 4142 is unlikely to be the appropriate methodology on its own to assess low frequency noise.

4.3 BS 8233 Guidance on sound insulation and noise reduction for buildings

BS 8233 provides guidance on the control of noise within internal spaces in terms of design aspects limiting the ingress of noise from external and internal sources. It provides design ranges for noise levels within internal spaces considered satisfactory for various uses.

The guidance presents desirable values for indoor ambient noise levels within dwellings. For sleeping and daytime resting, the following guideline values are given:

- Bedroom
 - Daytime resting: 35 dB $L_{Aeq,16 \text{ hour}}$
 - Sleeping: 30 dB $L_{Aeq,8 \text{ hour}}$

It also states:

“If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB.”

It notes:

“..the level difference through a window partially open for ventilation can vary significantly depending in window type and the frequency content of the external noise.”

However, it is assumed that an outdoor noise level of 45 dB(A) corresponds with an internal ambient level of 30 dB(A) to indicate the onset of a potential adverse effect on conditions for sleeping.

4.4 ISO 9613 Acoustics — Attenuation of sound during propagation outdoors

The calculation of operational noise applies the procedures of ISO 9613-2 within a three-dimensional acoustic model developed using DataKustik CadnaA software. The model includes:

- Noise source elements which represent operational activities
- Geometrical divergence
- Downward-curving propagation path (downwind)
- Topographic data
- Atmospheric absorption
- Ground effects
- Screening elements such as buildings and plant enclosures
- Sensitive receptor elements at first floor level if applicable

5 Baseline noise data

The noise survey undertaken between Tuesday 16 and Wednesday 24 October 2018 were selected to describe baseline conditions affecting the closest NSRs considered by the assessment. A long-term unattended measurement (LT1) was undertaken within the back garden of a residence at Claremont Avenue, and a short-term attended daytime measurement (ST2) was undertaken at position near the entrance to the Travellers site.

The weather conditions were reported to have been generally constant during the periods of measurement, which were dry with wind speeds less than 5m/s.

It was observed that main noise source affecting both measurement positions was road traffic on the A494 road. Hence, it is considered that the measurement positions LT1 and ST2 are representative of the NSRs (R1 and R2) due to the similarity in noise climate and proximity to the A494 road.

The results of the background sound measurements are given in Table 5.1 and Table 5.2.

Table 5.1: Long-term Noise Measurements at LT1

Date	Period	L _{Aeq,T} dB	L _{A10,18hour} dB	L _{A90,15min} dB	L _{Amax,15min} dB
17 to 23 Oct 2018	Daytime (T=16hour)	64 - 65	65 – 67	61 - 63	79 - 84
	Night-time (T=8hour)	57 - 61		36 - 44	76 - 82

Source: Mott MacDonald

Table 5.2: Short-term Noise Measurements at ST2

Date	Start time	L _{Aeq,15min} dB	L _{A10,15min} dB	L _{A90,15min} dB	L _{Amax,15min} dB
16 Oct 2018	13:53	64	65	62	72
16 Oct 2018	15:12	66	67	64	71
24 Oct 2018	11:23	62	64	60	71

Source: Mott MacDonald

6 Assessment

6.1 Representative background sound levels at NSRs

The two closest NSR locations to the proposed site have been identified as being the most exposed to any potential noise impacts from the scheme. The representative background sound levels for the assessment of impacts on these NSRs are summarised in Table 6.1 below. The night-time levels measured at LT1 are considered representative of both key receptors R1 and R2.

Table 6.1: Representative baseline noise levels

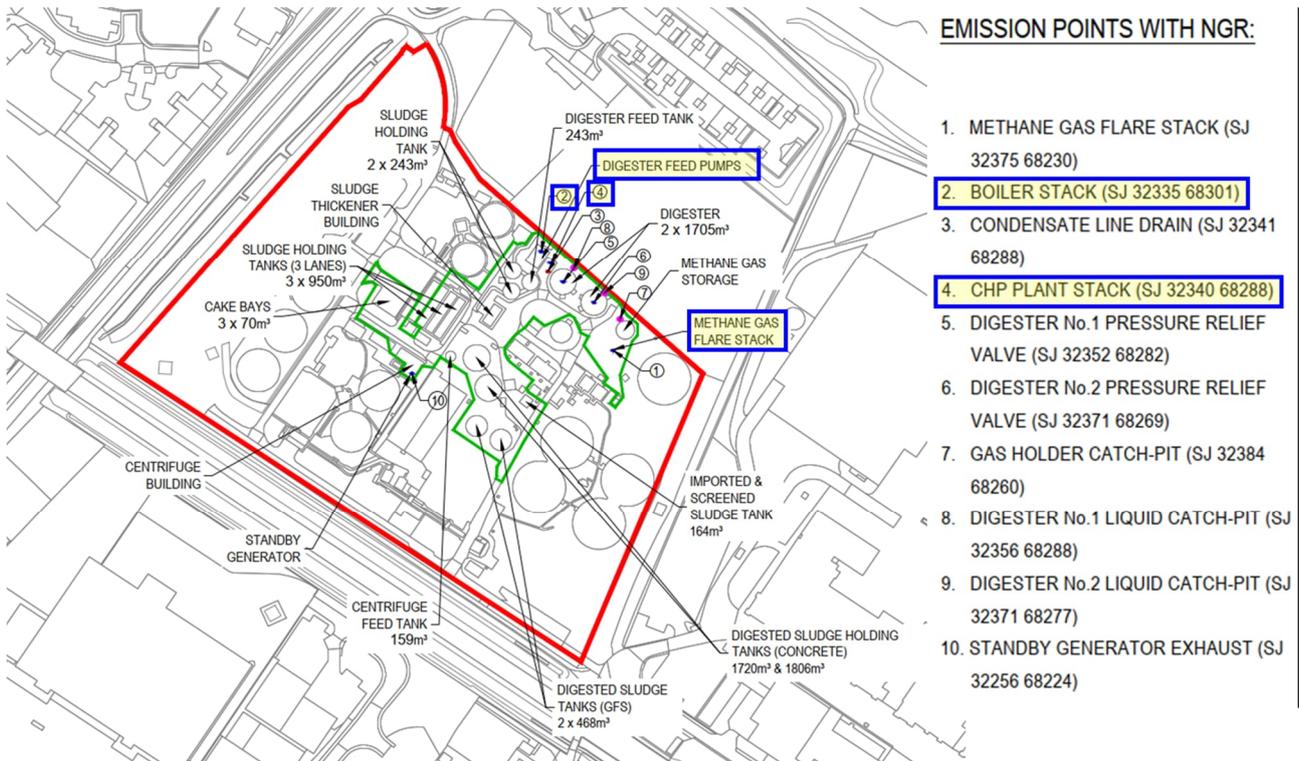
NSR and description	Daytime		Night-time	
	L _{Aeq,T} dB	L _{A90,T} dB	L _{Aeq,T} dB	L _{A90,T} dB
R1 - Travellers Site (adjacent to the proposed site boundary)	64	61	59	40
R2 – Dwelling at Dundas Street, adjacent to A494	64	61	59	40

Source: Mott MacDonald

6.2 Noise emissions

Reference noise measurements undertaken by Mott MacDonald for the types of equipment installed at similar facilities have been used. The noise emission values used in the calculations are presented in Table 6.2. The steady state sound power levels (SWL) have been applied within the acoustic model. The noise emission data for plant items of the STC have been obtained for plant items specified within other similar projects and with similar specifications. The combined SWL for this collection of items is used to represent the overall noise impact of the STC. The item numbers correspond with the equipment layout presented at Figure 6.1. It is assumed that all plant will operate continuously with no significant tonal or impulsive features. However, a 3 dB penalty has been applied to the calculated rating levels on a precautionary basis.

Figure 6.1: Noise equipment layout



Source: Drawing reference B14411-123532-XX-XX-DR-AC-PN8202

Table 6.2: Noise emission values assumed for the calculation of operational noise

Emission point	Assets	Reference SPL dB(A)	Distance from source (m)	Reference SWL (dB)
Digester - 1	Digester feed pump	71.7	2.5	87.7
Digester - 2	Digester feed pump	71.7	2.5	87.7
Methane gas flare stack	Methane gas flare stack	81.5	2.5	97.5
Boiler stack	Boiler	70.5	5	92.5
CHP plant stack	CHP	65.0	10	93.0
				Total 100.2 dB(A)

6.3 Noise Sensitive Receptors

The closest NSRs are located more than 100m to the north-east and west of the site boundary as described above and shown in Figure 3.1.

The three-dimensional acoustic model assumes relatively soft ground absorption ($G = 0.5$) for the intervening ground to calculate the attenuation of noise levels to each NSR. The results give a calculated specific noise level of 44 dB(A) at R1 and 31 dB(A) at R2. A +3 dB intermittency correction has been applied as the operation of some plant items may be intermittent, therefore the calculated rating levels for assessment are 47 dB(A) at R1 and 34 dB(A) at R2.

Representative baseline background sound and ambient noise levels are provided in Table 6.1. Finally, the excess of the rating levels over background sound levels for the daytime and night-time have been calculated by subtracting the L_{A90} values from the rating levels. These values are reported in Table 6.3.

Table 6.3: Assessment of operational noise impact at NSRs

Period	Parameter	NSRs	
		R1	R2
	Calculated specific level dB(A)	45	31
	Rating level dB(A)	48	34
Daytime	Baseline ambient noise level L_{Aeq} dB	64	64
	Background sound level L_{A90} dB	61	61
	Excess of rating level over background sound dB	-13	-27
	Change in ambient L_{Aeq} dB (with and without the project)	+0.1	+0.0
	Baseline ambient noise level L_{Aeq} dB	59	59
Night-time	Background sound level L_{A90} dB	40	40
	Excess of rating level over background sound dB	+8	-6
	L_{Aeq} dB Change (with and without the project)	+0.3	+0.0
	Baseline ambient noise level L_{Aeq} dB	59	59

Source: Mott MacDonald

The results show that the daytime calculated rating levels are significantly below the estimated background sound levels. This is an indication that operational noise is expected to have low or no impact. This applies to R2 during the night-time period. However, the calculated excess of 7 dB over background sound at R1 indicates a potential for adverse impact.

However, considering the context of the noise impact at R1 due to the operation of the STC:

- the calculated change in night-time ambient noise level (+0.3 dB) is small
- the absolute level of the rating level (48 dB(A)) is not significantly greater than the outdoor threshold value used to assess the likelihood of potential sleep disturbance (45 dB(A))
- the existing acoustic character of the area includes existing industrial noise

it is considered unlikely that this noise impact would be noticeable and that there would be no adverse impact due to noise from the operation of the site during the nighttime.

7 Conclusion

This noise impact assessment of the operation of the STC indicates that the calculated rating levels for the operation of Queensferry STC are expected to be significantly below background sound levels during the daytime for both R1 and R2, and night-time for R2. The calculated rating levels do not exceed background sound levels indicating low or no impact. With the consideration of context and the small change in ambient noise level change during night-time at R1, despite a calculated excess of 8 dB over background at night, it is unlikely to result in an adverse impact.