hepworth acoustics

PROPOSED DEVELOPMENTS AT DAIRY CREST CREAMERY / WWTP, DAVIDSTOW

NOISE IMPACT ASSESSMENT

On behalf of:

Dairy Crest

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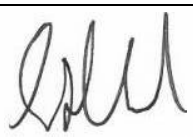
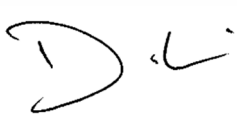
Report prepared by: Graham Bowland BSc MIOA – Technical Director	
Report checked by: Donald Quinn BSc FIOA – Managing Director	

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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned to carry out a noise assessment to accompany a planning application for proposed new development at the Dairy Crest Creamery and WWTP (Waste Water Treatment Plant) at Davidstow.

1.2 The planning application is to be a hybrid application and will include the following elements:

- Detailed application for upgrade/expansion of the Creamery, comprising new silos, an extension to the existing CIP (Cleaning-in-Place) room, and a new ring main unit and transformer.
- Outline application for new Membrane Bioreactor (MBR) and Reverse Osmosis (RO) plant, to be located internally to a new housing immediately to the south of the existing WWTP, itself located ~850m to the east of the Creamery, plus re-purposing of a former blower house towards the northeast of the WWTP to house new Dissolved Air Flotation and Filtration (DAFF) process plant.

1.3 In addition to the plant to be introduced at the site, there is some incremental growth anticipated in vehicular activity to/from the site, in line with the increased production potential.

1.4 The various noise units and indices referred to in this report are described in Appendix I. In most cases, noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 PROPOSED NOISE SOURCES

2.1 A plan of the proposed development, identifying the location of proposed items, is provided in Figure 1.

Creamery Upgrade

2.2 The proposed upgrade/expansion of the Creamery comprises a total of twelve new silos along with other elements.

2.3 Towards the northwest of the site, two new large raw milk tanks are proposed, in the location of two existing smaller cream silos. The new raw milk silos will hence enlarge the existing array of ten raw milk silos to twelve, arranged in two close parallel rows.

2.4 The two cream silos mentioned above are to be removed, however three new milk silos of the same type are proposed to be installed immediately to the west of the array of raw milk silos.

2.5 Each raw milk silo (existing and proposed) includes two agitators, one of which is at low level and fully housed and another which is approximately mid-way up the silo. The higher elevated agitators are positioned with motors located externally to the tank, with each oriented inwards to the centre line between the two rows of silos. The specific model of raw milk silo agitator is an SPX Waukesha Cherry-Burrell S-Series.

2.6 It is understood that agitators do not operate constantly, and their operation depends upon milk levels in the silo. It is understood that at present no more than six will generally operate at any given time and based on the proposed development no more than seven would operate at any given time in the future.

2.7 For the smaller cream silos, the agitators are located on top. The specific model of cream silo agitator is a SPX Lightnin XDQ-117.

2.8 For both above mentioned agitators, it has not been able to definitively confirm reference noise emissions levels. The manufacturer's stated '**maximum'** level is 85dBA at 1m, however the same data sheet that provides this info, the same for both agitators, also states: "*This equipment does not produce high noise or vibration. However, the operator may experience high noise or vibration in the location of this equipment due to another source.*"

2.9 A noise level of 85dBA in fact corresponds to the 'upper exposure action values' as set out in the Health and Safety Executive document The Control of Noise at Work Regulations, 2005 so would certainly be regarded as 'high'. As such there is an apparent conflict in the manufacturers' information.

2.10 Indeed, based on experience of similar cases, we are reasonably confident that the manufacturer's stated '**maximum'** level is simply a statement that emissions do not exceed noise exposure legislative thresholds, rather than being a precise measure of the noise emission from the specific item.

2.11 This view is reinforced by our inspection of similar existing agitators on the existing silos at the site. For these, no noise was discernible as being clearly attributable to the agitators over and above the general noise in the vicinity, albeit that this is based on an inspection carried out from a ground level position due to physical access constraints.

2.12 Despite exhaustive efforts, we have been unable to confirm the precise noise level with the manufacturers, and it is likely that actual test data may not exist, however actual noise emission levels are anticipated to be substantially below 85dB at 1m.

2.13 Further to above, a new transformer unit is proposed to be located within a cutting into the embankment that separates the site road around the northwest of the site, where this land banks up to the adjacent raised level to the north and west. We are informed that the proposed transformer unit is to be an ONAN 1.5MVA , 315/11kV, for which the manufacturer's stated noise emissions level is 54dB L_{pA} at 1m, or similar equivalent.

2.14 Moving southwards along the western side of the Creamery, a single new water silo is proposed in a location adjacent to two existing water silos and the proposed CIP room extension.

2.15 The proposed extension will be of an approximate footprint of 17m x 8m, extending the existing western elevation of the northernmost block of the Creamery by the longer dimension in a southwards direction, returning 8m inwards. The building fabric and internal noise generating equipment, principally pumps, will be the same as is the case for the existing CIP room. The extension height will be slightly lower than the existing building it will abut.

2.16 Currently, break-out of internal noise from this space is not audible externally, principally due to the dominant source of noise in the immediate vicinity, which is an externally located extract fan and open exhaust termination located against the south facing elevation of the existing CIP room. This is the elevation from which the building will be extended, and hence it is proposed to relocate the same equipment to the new south facing elevation of the extended CIP room, 17m southwards.

2.17 The extract system will serve the existing and extended area of the CIP room without any requirement to increase fan speed or otherwise affect noise emissions. It is anticipated that the relocated extract fan and exhaust termination will remain the dominant noise source in that area of the site.

2.18 Towards the southeast corner of the Creamery, further new and replacement silos are proposed. No manufacturers' noise data is available in respect of these units, and hence an inspection and survey of existing noise levels was undertaken in this part of the site on 6 August 2018. Noise measurements at were undertaken using a using a Bruel & Kjaer 2260 Type 1 Integrating Sound Level Meter (s/n. 2467014). Calibration checks were carried out before and after the measurements using a Rion Acoustic Calibrator, Model NC-76 (s/n 35173596), and no variation in the calibration level was noted. The measurement microphone was fitted with a windshield

2.19 The new silos include two new silos immediately to the south of three existing silos of the same type, that are stepped away from the main Creamery building. All noise generating equipment (pumps) associated with these silos are located within a small enclosed building that abuts the silo sides at low level. A noise measurement was undertaken at a distance of 1m from two of the existing three existing silos. The relevant noise source was not dominant even at this distance, and hence a residual noise measurement was also undertaken at greater distance but where noise from other sources was perceived comparable. The measured noise levels were 57dB L_{Aeq} at 1m from two silos and 56dB L_{Aeq} at greater distance. It is therefore be calculated that the reference specific noise level per unit is no more than 50dB L_{Aeq} at 1m.

2.20 Another single new silo is proposed adjacent to the Creamery building alongside existing silos of the same type. The existing and proposed silos abut the building and all noise generating equipment (pumps) is internally housed. It was not possible to perceive any noise from the existing silos (a faint hum is audible when pressing an ear to the side of the units) due to other noise in the area. It is therefore considered that noise from the proposed silo will be negligible.

2.21 The proposed two replacement silos in this area of the site will be larger than the existing ones they will replace but the noise generating equipment will be the same as existing, and this is internally housed, and hence this presents no noise impact.

WWTP Upgrade

2.22 Outline proposals for the MBR / RO building include for a rectangular pitched roof structure of footprint measuring about 16m x 7.5m with a height of 5.5m to eaves and 6.2m to ridge.

2.23 The proposed building fabric is to comprise 60m thick composite panels for the walls, and 80mm thick composite panels for the roof. A 3m x 4m industrial roller shutter door and a standard personal entry door are also proposed.

2.24 The proposed noise emitting MBR plant to be housed within the building is a set of Aerzen Delta Blower G5 units, up to 4 of which may operate at any one time. The manufacturer's stated noise emissions level, per individual unit, is 86dB L_{pA} at 1m, however this can be reduced to 69dB L_{pA} at 1m by application of manufacturer-supplied acoustic hoods.

2.25 The proposed noise emitting RO plant to be housed within the building will be a set of multistage pumps that are used to pump the water through the RO membranes, up to 4 of which may operate at any one time. Typically, these will be Grundfos CRN 15 15kW pumps or equivalent, for which the manufacturer's stated noise emissions level, per individual unit, is 72dB L_{pA} at 1m.

2.26 Based on the above and assuming an internal reverberation time of 2 seconds within the building, the internal reverberant noise level in the MBR / RO building is predicted to be up to 90dB L_{pA}. This would be reduced to up to 78dB L_{pA} if the above-mentioned acoustic hoods were applied to the blowers.

2.27 Further, the former blower house towards the northeast of the WWTP will house new DAF plant. It is understood that, at this outline stage, the precise requirements and arrangement of equipment install is yet to be confirmed. However, we are informed that internal noise levels not exceeding 65dB L_{pA} are anticipated.

2.28 It is also understood that further upgrades to the building fabric will be introduced as necessary for noise control purposes.

Vehicular Movement

2.29 In addition to the fixed plant discussed above, as a result of increased production, it is understood that vehicular activity to/from the site is expected to increase, albeit gradually over a number of years.

2.30 Based on the Transport Assessment prepared in relation to the proposals, based on the lower existing daily rate of milk tanker deliveries (to hence provide the worst case assessment), 24 arrive/depart via the A39 from the south, 23 arrive/depart via the A39 from the north and 22 arrive/depart via the A395 from the east. There are 10 product HGVs that depart the site daily via the A395. There are currently 200 staff at the Creamery, that arrive/depart principally via the A39 (north and south) and the A395.

2.31 The Transport Assessment projects that initially a 7% increase in milk intake will be required up to 2019, rising to 26% by 2021. There is understood to be spare capacity within the existing tankers to be able to carry most of the additional milk such that only 4 additional tankers are anticipated to provide the 7% increase (projected to be 1 via A39 south, 1 via A39 north and 2 via A395) and 13 additional tankers are anticipated to provide the 21% increase (projected to be 4 via A39 south, 5 via A39 north and 4 via A395).

2.32 The Transport Assessment also projects that there will be an increase in product HGVs departing the site daily, equivalent to 0.6 based on a 7% production increase, and 2.49 based on a 26% production increase. For assessment purposes, these values have been rounded upwards to the nearest whole number of HGVs, i.e. 1 and 3 for 7% and 26% production increase, respectively.

2.33 The upgrade proposals are also likely to create an additional 10 staff and 8 additional milk tanker drivers by 2021. The additional milk tankers and staff will enter and exit the site utilising the existing site access and will arrive/depart principally via all the A39 (north and south) and the A395 as per existing.

3.0 AMBIENT / BACKGROUND NOISE SURVEYS

3.1 A set of surveys of prevailing ambient and background noise levels has been undertaken at locations representative of the nearest residences to the proposed developments.

3.2 Night-time noise levels have been measured at five locations close to residential properties around the Creamery Site, identified as Locations 1-5 in Figure 2, on two separate occasions, in contrasting conditions specifically with regard to wind direction.

3.3 Noise measurements were carried out at Locations 1-5 over the period 0026-0238hrs on 27 July 2018 in light southwest/south-southwesterly winds, and subsequently over the period 0021-0228hrs on 7 August 2018 in light north/northwesterly winds. The assessment has focused upon the night-time period as the proposed plant will operate day and night.

3.4 The noise climate at each of Locations 1-5 was due to the existing operation of the Creamery site and intermittent road traffic. In certain instances, parts of noise events were excluded from the measurements to ensure representative readings. For example, at Locations 1 and 2 for vehicles passing on the A39, some of the noise of the vehicles approach and moving away from the measurement location was allowed to affect the measurement, as this would be representative of conditions at the actual residential areas of interest, however the measurements was paused for the moments of vehicles passing-by at closer proximity than is representative.

3.5 For each survey date, noise levels were measured in 5-minute samples in rotation around Locations 1-5. This was considered to be an appropriate sample time due to the generally steady nature of the noise, and in order to maximise the number of measurements over time across each of the locations.

3.6 The measured noise levels are summarised in Table 1.

Table 1 : Summary of Noise Measurements at Locations 1-5

Location	SW/SSW winds			N/NW winds			Average of SW/SSW and N/NW winds	
	dB L_{Aeq}	dB $L_{A90,5mins}$		dB L_{Aeq}	dB $L_{A90,5mins}$			
		Range	Mean		Range	Mean	dB L_{Aeq}	dB $L_{A90,5mins}$
1	45	36-39	37	44	29-34	31	44	34
2	45	41-42	41	49	29-31	30	48	36
3	41	31-36	34	42	34-39	37	41	36
4	44	37-42	40	45	41-44	43	45	42
5	46	42-43	42	43	32-34	33	45	38

3.7 Further to above, continuous monitoring of noise levels was undertaken at a single location to the south of residential properties at Trewassa, which is a hamlet to the northwest of the WWTP, identified as Location 6 in Figure 2, over the period 1700hrs on 26 July 2018 until 1300hrs on 7 August 2018.

3.8 Noise measurements were undertaken at Location 6 in sequential 15-minute samples throughout the monitoring period, and hence in a range of wind conditions.

3.9 Sample audio recording and continuous weather monitoring was also undertaken over this period. Further to analysis of the weather data and audio recordings, all data recorded over the 48-hour period commencing at 1900hrs 27 July 2018 has been removed from the analysis, due to strong winds and rain precluding measurement of representative noise levels for the majority of this time.

3.10 Accounting for this, the measured noise levels over the remaining monitoring period are summarised in Table 2.

Table 2 : Summary of Noise Measurements at Locations 6

Location	dB $L_{Aeq,15mins}$		dB $L_{A90,15mins}$	
	Range	Mean	Range	Mean
6	40-56	45	38-49	43

Survey Details

3.11 All measured noise levels are detailed in Appendix II.

3.12 All noise measurements at Locations 1-5 were undertaken using a Bruel & Kjaer 2260 Type 1 Integrating Sound Level Meter (s/n. 2467014). All noise measurements at Location 6 were undertaken using a Rion NL-52 Sound Level Meter (s/n. 420711).

3.13 The equipment was field calibrated on 26/27 July 2018 using a Norsonic 1251 Acoustic Calibrator (s/n. 20804) and on 7 August 2018 using a Rion Acoustic Calibrator, Model NC-76 (s/n. 35173596). No variation in the calibrated noise levels was observed.

3.14 The measurement microphone was fitted with a windshield and mounted in free-field conditions at 1.5m above local ground at Locations 1-5 and at ~3m above local ground at Location 6. The higher mounting height was employed at Location 6 to minimise noise from wind in long grass on the adjacent Cornish hedge.

4.0 ACOUSTIC CRITERIA

4.1 Cornwall Council Public Protection Service stipulate specific noise criteria for new development in its document '*Development Sound Standard – Guidance for developers on the assessment of noise for planning applications*' published February 2017. This document sets out two criteria. The elements of the criteria applicable to this assessment are extracted as follows:

- **Sound criterion 1**: *The ambient sound level $L_{Aeq,T}$ in the presence of the new sound source shall not exceed 50dB for the day period 0700-1900hr and 45dB for the evening/night period 1900-2300hrs at the curtilage of amenity areas at noise sensitive receptors. Where the existing ambient sound level in the absence of the new sound source already exceeds the external guideline values in Table 1, in most cases it will not be acceptable for any increase in this sound level. Sound from the development should therefore not contribute to the existing ambient sound level.*

- **Sound criterion 2**: *The rating level L_{Ar} of sound from the proposed development at the curtilage of amenity areas at noise sensitive receptors should not be greater than the L_{A90} background sound level. The rating level is to be determined in accordance with the methodology prescribed in BS 4142: 2014.*

4.2 Based on BS 4142, an initial estimate of the potential impact may be obtained by comparing the 'rating' level of the sound and the 'background' level in the absence of that sound, however it is also noted that this assessment is context specific.

4.3 The 'rating' level is derived based on the 'specific' L_{Aeq} sound level attributable to the operation with an 'acoustic feature' penalty added for any sound sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.

4.4 BS 4142 stipulates that impacts should be assessed over a reference time interval of 1-hour during the daytime (0700-2300hrs) and 15-minutes during the night-time (2300-0700hrs).

4.5 Regarding background sound levels, BS 4142 requires *that "values are reliable and suitably represent the particular circumstances and periods of interest… the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*". It is also stated that "*diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes*".

4.6 Where the initial estimate of the impact needs to be modified due to the context, BS 4142 states that all pertinent factors should be taken into account in determining whether the initial estimate of the impact needs to be modified, including:

- The absolute level of noise, including "*where background noise levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds background*"
- The character and level of the residual noise
- The sensitivity of the receptor

4.7 Based on the provisions of BS 4142, the Cornwall Council criteria and the results of the background noise surveys/monitoring around the site, the limiting rating levels at the curtilage of the noise sensitive receptors to each of Locations 1-6 set out in Table 3.

Table 3 : Recommended Limiting Rating Levels at Locations 1-6

Location	Recommended Limiting Rating Level
1	34
2	36
3	36
4	42
5	38
6	38

4.8 The above recommended limiting rating levels at Locations 1-5 are based on the arithmetic average of all measured background noise levels over the course of both survey dates. This is considered to be a robust approach in the context of this assessment as the background noise levels are primarily due to existing Creamery noise sources. Accordingly, as prevailing noise levels at Locations 1-5 fluctuate with wind direction, so commensurately will noise associated with the proposed development.

4.9 In the case of Location 6, for a cautious approach, given that the existing background noise levels are primarily due to existing WWTP noise sources and taking into account potential consideration of further noise control measures to be applied to some of that equipment, the recommended limiting rating level for the proposed development is based on the single lowest background noise level measured.

4.10 With respect to potential noise relating to increased vehicle activity attributable to the development, it is noted that BS 4142 states that the assessment methods set out the Standard are applicable to "*sound from the loading and unloading of goods and materials at industrial and/or commercial premises*" and "*sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site*". However, it is also stated that *"sound of an industrial and/or commercial nature does not include sound from the passage of vehicles on public roads and railway systems."*

4.11 Notwithstanding, it is nonetheless appropriate to undertake assessment of increases in vehicle noise on the public highway where this is attributable to the development, and this is considered the most relevant aspect of vehicle noise in the context of this assessment.

4.12 As such, increases in vehicle noise, including on the public highway, have been assessed by comparison of the existing situation with the projected future situation in terms of vehicle numbers, with reference to the IEMA guidelines for environmental noise impact assessment. This provides include examples of tables of impacts relating to changes in noise level. A scale of significance of vehicle noise impacts has been developed taking account of the IEMA guidelines, as set out in Table 4.

Table 4 : Significance Scale for Potential Changes in Vehicle Noise

Vehicle Noise Level Increase	Subjective Response	Significance
0dB - 0.9dB	No perceptible increase	Negligible impact
1.0dB - 2.9dB	Low but perceptible increase	Minor adverse impact
3.0dB - 4.9dB	Noticeable increase	Moderate adverse impact
5.0dB - 9.9dB	Up to a doubling in loudness	Substantial adverse impact

5.0 NOISE IMPACT ASSESSMENT

Creamery Upgrade

5.1 As set out in Section 2.0, it has not been possible to determine precise noise level of the new raw milk and cream silo agitators, however, for the reasons set out these are not expected to be significant. It is noted that these are additional examples of plant already in operation in that part of the site. As discussed, at present no more than six raw milk silo agitators will generally operate at any given time, and based on the proposed development no more than seven would operate at any given time in the future. This hence equates to a 1dB increase in noise from this bank of noise sources, which in isolation would be imperceptible and hence negligible. In the context of this noise source operating alongside all other operational noise in this area of the site, given that this noise is not readily disguisable against the residual, the potential for impact is even lower.

5.2 For the new transformer unit to northwest of the site, accounting for distance attenuation and acoustic screening from the adjacent embankment / creamery building, this is expected to be negligible at all nearby residences, e.g. <5dB L_{pA}.

5.3 For the fan noise associated with the CIP room extension, no change in prevailing noise is expected and hence it is appropriate to discount this from the assessment. Also, the proposed new water silo adjacent to the CIP room extension does not generate noise.

5.4 For the new silos to the southeast corner of the site, it has been possible to determine indicative reference noise emissions for one of the silos, essentially because the units are so quiet in operation, especially in the context of other operational noise in the area. Based on the reference determined, even if applied to each of the new silos individually, at the two nearest residential locations (i.e. Locations 3 and 4), the predicted noise levels accounting for distance attenuation only are 7dB L_{pA} and 15dB L_{pA} respectively. Due to additional distance and/or acoustic screening, at all other nearby residences this is expected to be negligible.

5.5 To provide a robust and highly cautious assessment, a +2dB acoustic feature penalty to account for potential tonality and a further +3dB acoustic feature penalty to account for potential intermittent operation may be added to the above noise levels to hence derive a rating level, in line with BS 4142 of 12dB L_{Ar} at Location 3 and 20dB L_{Ar} at Location 4. Realistically, however, it is likely that this will over-estimate the potential impact given that the noise itself is unlikely to be audible or distinguishable.

5.6 Nonetheless, comparison of these rating levels to the recommended limiting rating levels set out in Table 3 for the corresponding locations, demonstrates that the predicted levels are well within the recommended limits.

WWTP Upgrade

5.7 It is noted that application element relating to the WTP Upgrade is outline only.

5.8 Notwithstanding, based on the predicted internal reverberant noise level in the MBR / RO building (90dB L_{pA} without acoustic hoods applied to blowers), based on the proposed building fabric, a resultant noise level of up to 32dB L_{pA} is predicted at the nearest residential locations at Trewassa.

5.9 Assuming a comparable building envelope sound insulation performance for the DAFF building, it is anticipated on the basis of current information that noise from that source will not cumulatively impact upon the overall noise.

5.10 Again, to provide a robust and highly cautious assessment, a +2dB acoustic feature penalty to account for potential tonality and a further +3dB acoustic feature penalty to account for potential intermittent operation may be applied to derive an indicative rating level, in line with BS 4142 of 37dB L_{Ar} at the nearest residential locations at Trewassa. However, again it is realistically unlikely that any such characteristics will be audible or distinguishable.

5.11 Comparison of this indicative rating level to the recommended limiting rating level set out in Table 7 for the Location 6 (Trewassa), demonstrates that the predicted level is within the recommended limits.

5.12 Notwithstanding the above, it is clear that the above information will require refinement during the detailed design stage to ensure that final plant selections and building fabric design achieve the recommended limits.

5.13 If necessary, this may be achieved by way of the following potential measures:

- Use of manufacturer-supplied acoustic hoods for MBR blowers
- Selection of inherently quietly operating plant
- Use of adequately sound insulation structures
- Careful siting and orientation of noise generating elements
- Deployment of proprietary noise control hardware (e.g. acoustic louvres)

5.14 It is considered that achieving the recommended limits for the proposed WWTP will be readily achievable by way of the above methods, where required. This can be controlled for planning purposes by way of a suitably worded planning condition.

Vehicle Noise Increases

5.15 Based on the Transport Assessment data set out herein, comparison of the existing vehicle numbers with the projected future situation indicates the following increases in vehicle noise:

- Milk Tankers
  - up to 0.4dB increase based on 7% increased production
  - up to 0.9dB increase based on 26% increased production
- Product HGVs
  - up to 0.4dB increase based on 7% increased production
  - up to 1.1dB increase based on 26% increased production
- Staff Vehicles
  - 0.4dB increase based on 76% increased production

5.16 Consideration of the above with reference to the impact significance scale in Table 4 indicates that the likely noise impact of increase in vehicle noise is negligible based on 7% increased production, Based on 26% increased production, the predicted vehicle noise level increases are generally negligible to the very low end of the 'minor adverse impact' range, however even this potential very minimal increase would be offset by the gradual increase in production up to this upper level. Accordingly, it is concluded that increases in vehicle noise will have no appreciable noise impact.

6.0 SUMMARY AND CONCLUSION

6.1 The potential noise impact associated with proposed new development at the Dairy Crest Creamery and WWTP at Davidstow has been assessed.

6.2 A background noise survey has been undertaken at a location representative of the nearest residential properties.

6.3 An assessment has been undertaken in accordance with the guidelines set out in relevant guidelines.

6.4 It has been concluded that the predicted noise emissions associated with the detailed application for upgrade/expansion of the Creamery, comprising new silos, an extension to the existing CIP room, and a new ring main unit and transformer will be within recommended limits.

6.5 It has been also concluded that there is no anticipated constraint in adequately controlling noise emissions associated with the outline application for new MBR/RO and DAFF process buildings at the WWTP, subject to any necessary detailed design measures, to with recommended limits. This may be enforced by way of planning condition.

6.6 Finally, it has been concluded that increases in vehicle noise associated with the proposals will have no appreciable noise impact.

Figure 1: Proposed Development Plan

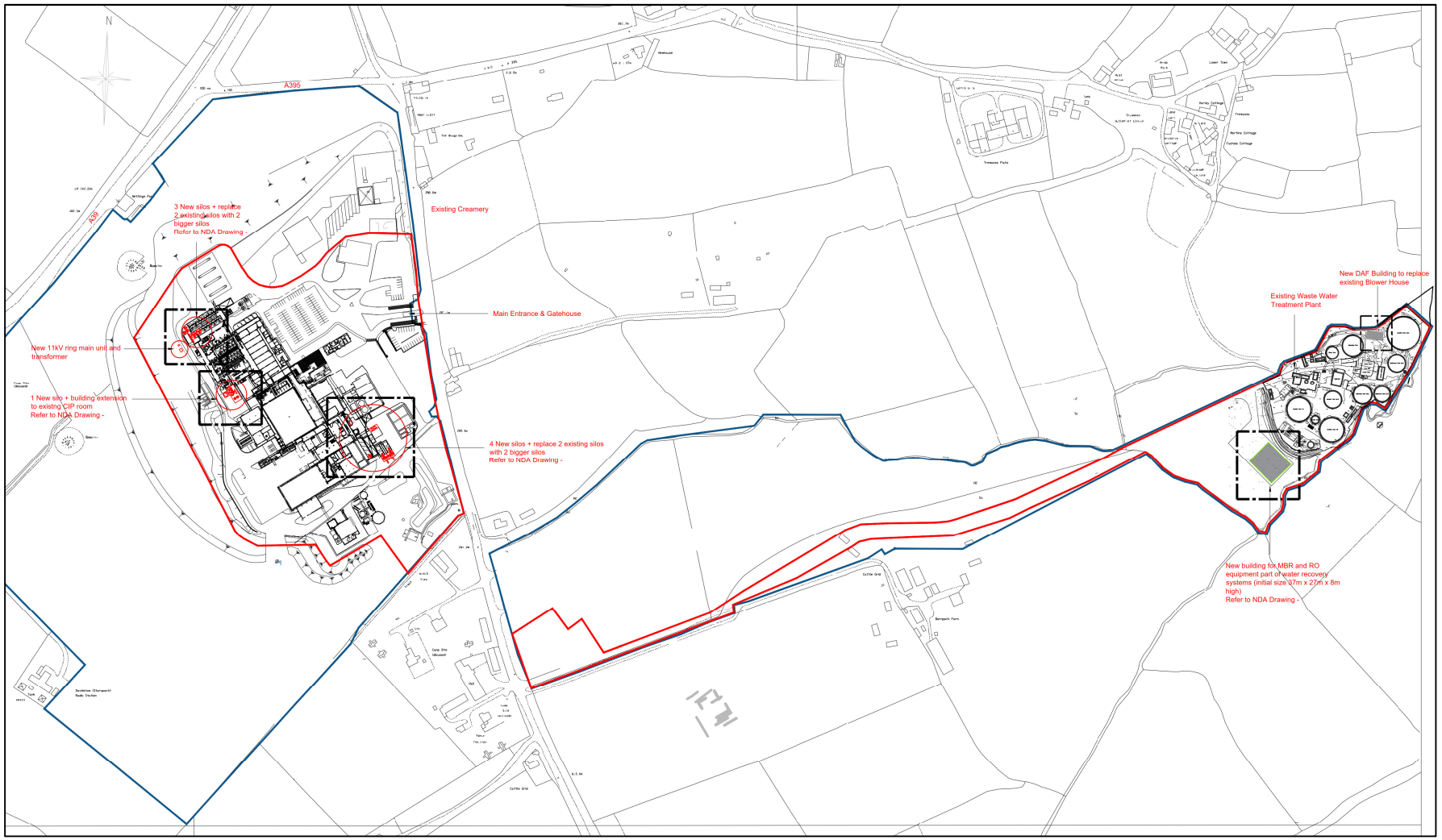
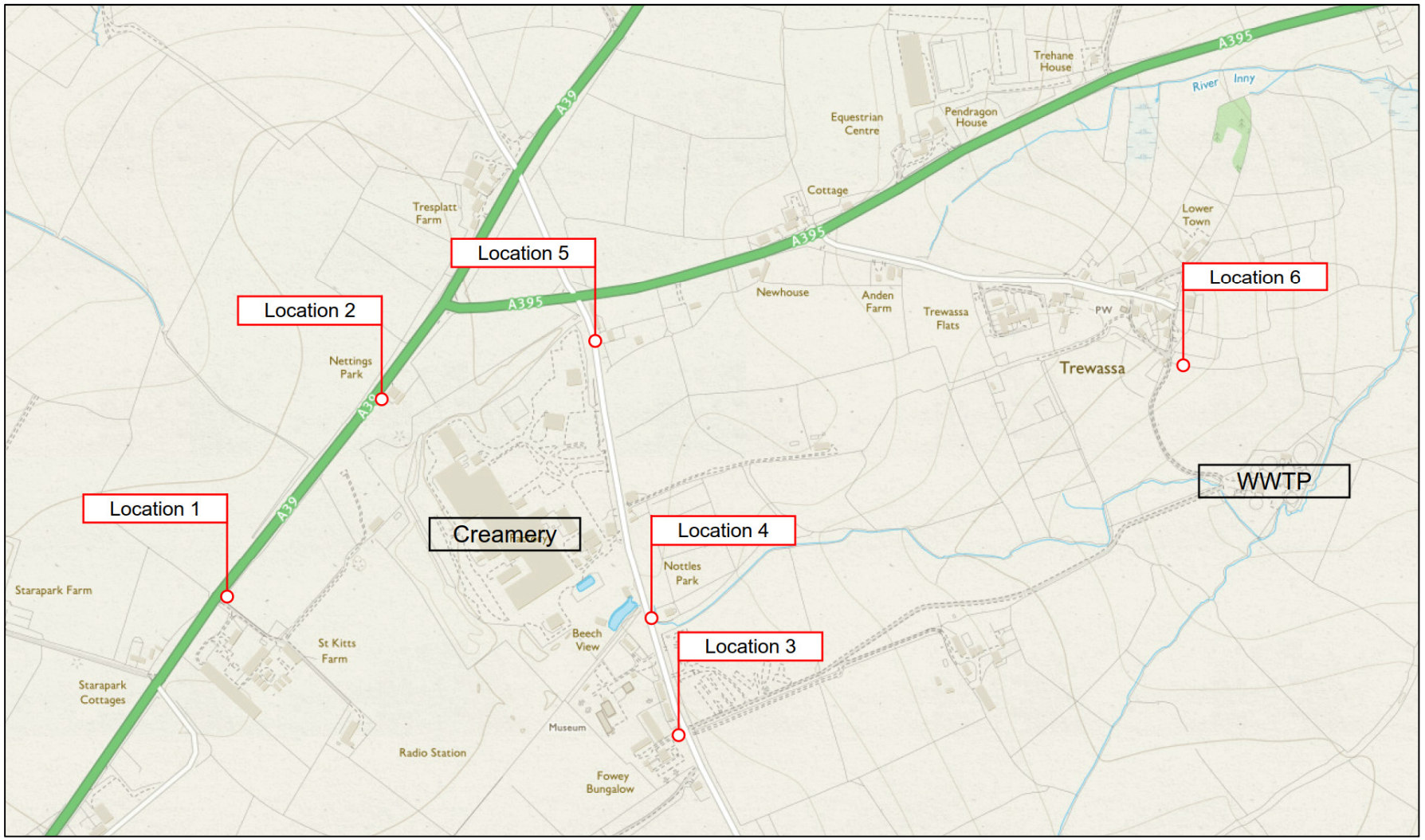


Figure 2: Noise Measurement Locations



Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

L_{pA} This is the A–weighted sound pressure level.

L_{Aeq} This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A–weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.

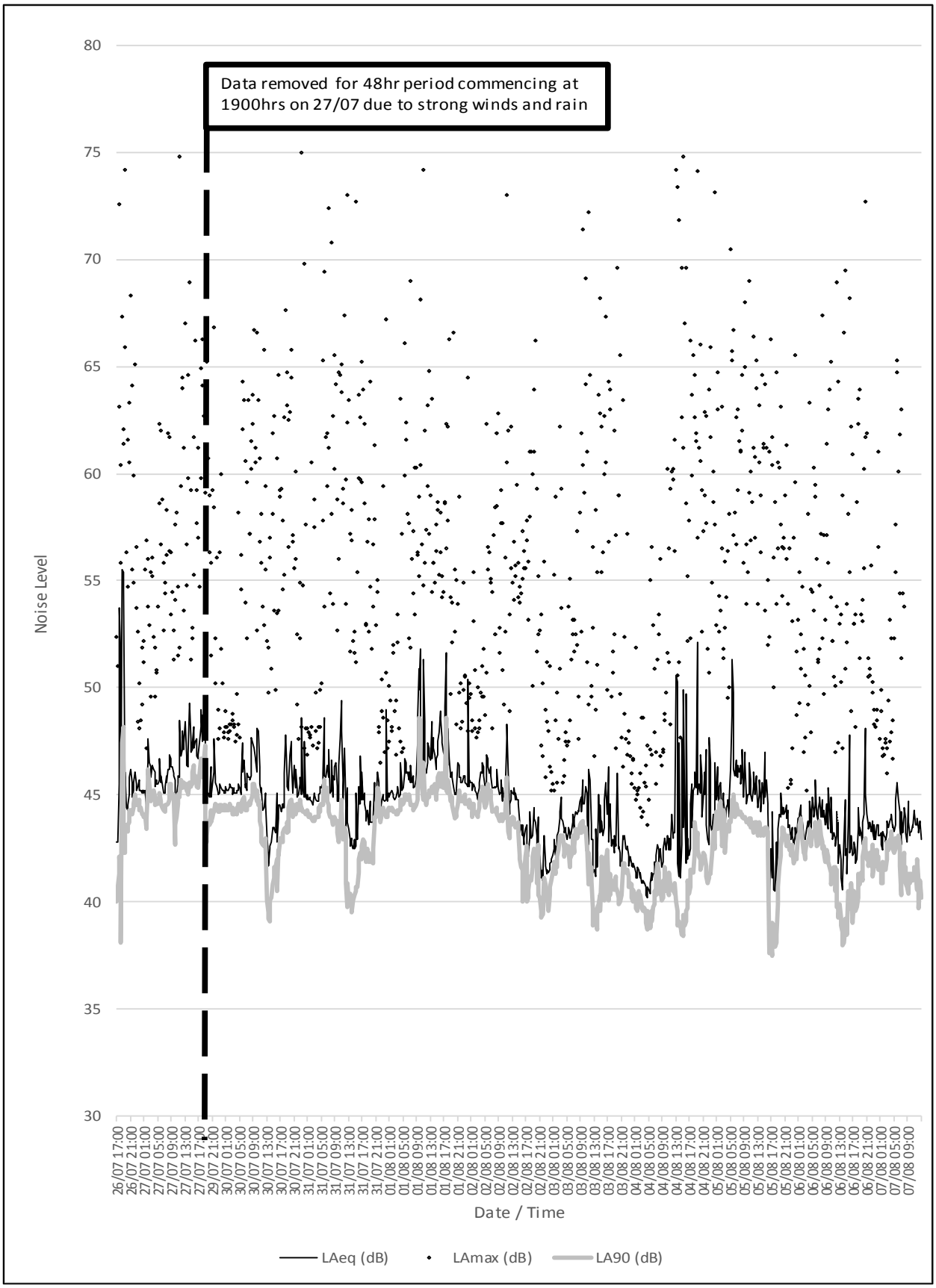
L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{Ar} This is the rating sound level as defined with BS4142: 2014, taking account of the specific noise level generated and any applicable acoustic feature penalties.

Appendix II: Noise Survey Results

Location	Date	Wind Direction	Time		Noise Level		
			Start	End	dB L_{Aeq}	dB L_{Amax}	dB L_{A90}
1	27 July 2018	SW/SSW	00:26	00:31	47	64	36
			01:29	01:34	44	63	36
			02:05	02:10	47	60	39
	7 August 2018	N/NW	00:21	00:26	36	57	29
			01:10	01:15	48	60	34
			01:55	02:00	37	65	31
2	27 July 2018	SW/SSW	00:34	00:38	46	66	41
			01:36	01:41	46	62	41
			02:12	02:17	47	56	42
	7 August 2018	N/NW	00:32	00:39	49	71	31
			01:17	01:22	37	55	30
			02:02	02:07	43	65	29
3	27 July 2018	SW/SSW	00:45	00:50	42	58	36
			01:44	01:49	40	53	31
			02:20	02:25	44	57	36
	7 August 2018	N/NW	00:42	00:47	43	52	39
			01:25	01:30	40	58	34
			02:10	02:15	46	60	39
4	27 July 2018	SW/SSW	00:51	00:56	46	67	42
			01:51	01:56	43	53	37
			02:27	02:32	46	57	42
	7 August 2018	N/NW	00:48	00:53	48	51	44
			01:32	01:36	44	53	41
			02:16	02:21	47	56	44
5	27 July 2018	SW/SSW	01:02	01:07	48	62	42
			01:58	02:03	49	63	43
			02:33	02:38	47	59	42
	7 August 2018	N/NW	00:55	01:00	35	51	32
			01:38	01:43	42	58	32
			02:23	02:28	50	62	34

Location 6


Data removed for 48hr period commencing at 1900hrs on 27/07 due to strong winds and rain
Noise Level
80
75
70
65
60
55
50
45
40
35
30
Date / Time
LAeq (dB)
LAmax (dB)
LA90 (dB)