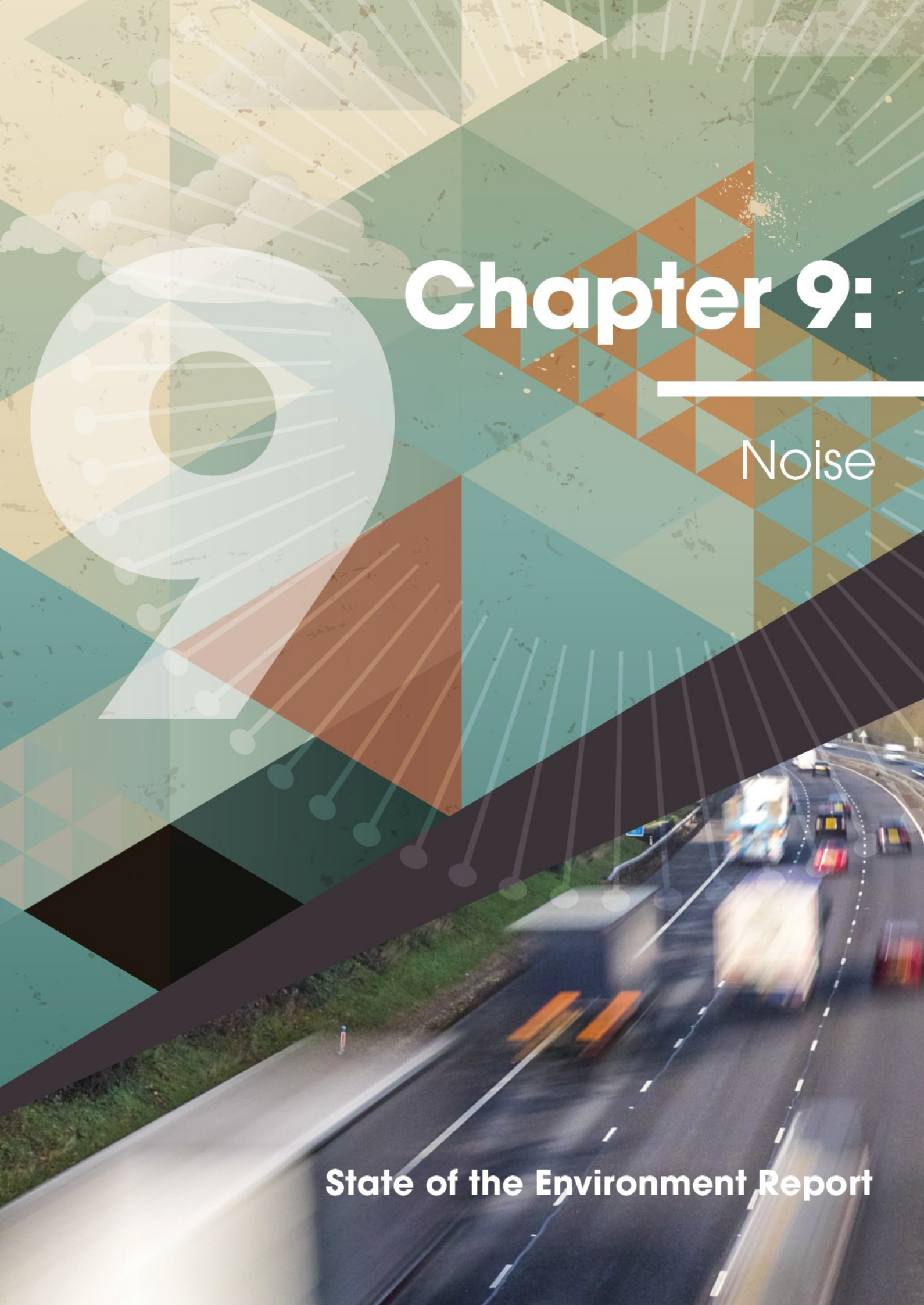
Chapter 9:

Noise



State of the Environment Report

EAST AYRSHIRE COUNCIL
STATE OF THE ENVIRONMENT REPORT
CHAPTER 9 – NOISE

SUMMARY

Noise and vibration impacts arising from human activity have the potential to cause annoyance and in more extreme cases sleep disturbance. The levels where these effects are experienced vary widely from individual to individual because of their subjective nature; what is acceptable to one person may be considered unacceptable to another.

Acceptable levels of noise and vibration are regularly researched and criteria amended in the light of these studies. European and UK wide legislation and standards, as well as legislation and guidance prepared specifically for Scotland, reflect the desire to limit the numbers of the population exposed to high levels of noise and vibration and to ensure their amenity is not adversely affected.

- Noise is sound in any variation in atmospheric pressure that the ear can detect, the World Health Organisation defines it as 'unwanted sound'.
- For the ear to detect the variation as sound it has to occur at least 20 times per second.
- Noise impacts are typically subjective in that what is noisy for one person may not bother someone else. Noise is measured in decibels on a logarithmic which is similar to the Richter scale for earthquakes.
- Noise is the environmental problem that affects the largest number of people in Scotland. Nearly 1 million people are exposed to noise levels above 55 dBA[1] outside their home (based on a day-evening-night level – Lden).
- Noise can have a range of impacts including sleep disturbance and interference with communication and day to day activity. This can lead to a range of health problems such as stress and conditions caused by stress including high blood pressure and heart disease.
- The main sources of noise are from road traffic, rail and aircraft. Road noise is the dominant source.
- Industrial noise arises from a range of activities such as manufacturing
- In Scotland, Local Authorities report that a rising number of complaints are about neighbour noise and mediation services report that around 50% of neighbour mediation cases are about noise disturbance.
- East Ayrshire Council currently receives an average of 220 complaints annually regarding domestic noise, primarily relating to dog barking.
- In relation to non-domestic noise, an average of 28 complaints are recorded annually, primarily relating to construction noise or the sounding of audible intruder alarms. These are also investigated as Statutory Nuisances and an average of 2 Abatement Notices are served annually.
- In East Ayrshire the only elements that require assessment under the Environmental Noise Directive (END) and Environmental Noise (Scotland) Regulations 2006 legislation criteria are the M77 and A77. Under the END, there is a two stage process – firstly the production of strategic noise maps for major roads, rail, airports, and industry (Round 1) then for Competent Authorities to draw up Action Plans to manage noise (Round 2).
- There are limited co-ordinated records for vibration available for Scotland and East Ayrshire. Vibration is most often perceived by people when associated with transport and infrastructure e.g. HGVs travelling on a surface with potholes close to housing or through development such as minerals extraction.

[1] A-weighted decibels, abbreviated dBA, dBa, or dB(a), are an expression of the relative loudness of sounds in air as perceived by the human ear

Overall Trends in Noise

Overall, the number of people exposed to noise above 55 decibels outside their homes has reduced from 1.185 million in 2007 to 991,200 in 2012 in Scotland (based on a day-evening-night level – Lden).

The Pan Ayrshire Environmental Health Out of Hours Noise Team was disbanded in March 2014. The current method for recording noise complaints is through the Environmental Health Service team who accept complaints by phone, email, in writing or in person during standard office hours.

The number of complaints has significantly reduced since the Out of Hours service was closed. It is not clear whether the lack of an Out of Ours service has increased calls to other public service providers such as the police in relation to anti-social behaviour.

The trend in reported noise nuisance is fairly stable according to Scottish Household Survey data although the percentage of those surveyed identifying noise as a problem decreased from 13% in 2012 to 8% in 2017. The level of nuisance from animals increased in 2017from 43% in 2012 to 50% in 2013 (dog fouling is included in this statistic).

Analysis of the END Round 1 data revealed two areas in Kilmarnock as Candidate Noise Management Areas, references 20 and 21, and they have subsequently, in November 2010, been confirmed as the New Farm Loch, Kilmarnock Noise Management Areas adjacent to the A77. Very large parts of East Ayrshire are remote from the major road network identified as requiring to be mapped by END. Where new developments or extensions to existing developments have potential to generate noise, appropriate noise surveys will be requested to determine the particular situation.

State and Trend

OVERVIEW

This overview section provides a definition of noise and vibration and how it is measured along with a description of typical sources of noise in East Ayrshire.

1.1 Noise

The World Health Organisation (1999)[2] defines noise as unwanted sound, and sound is measured in terms of decibels (dB). While the audible range of human hearing extends from 20Hz to 20,000Hz, our ears are not equally sensitive to all frequencies. Consequently, the A-weighting is used to simulate the response of human ear, so environmental noise is generally measured in terms of dB(A). With noise being assessed as a logarithmic ratio of pressure levels, i.e. decibels, it is sometimes helpful to consider the relationship between typical everyday noise levels and the actual objective measured levels.

The following general description may provide some assistance in understanding this relationship:

120 Threshold of pain or concert at 1m from speakers
95 Pneumatic drill (unsilenced); 7m distance
83 Heavy diesel lorry (40 km/h at 7m distance)
81 Modern twin-engine jet (at take-off at 152m distance)
70 Passenger car (60 km/h at 7m distance)
60 Office environment
50 Ordinary conversation
40 Library
35 Quiet bedroom
0 Threshold of hearing

As the decibel scale is logarithmic, a doubling of the power or intensity of sounds generally leads to an increase of 3 decibels and not a doubling of the decibel rating. As an example, two passenger cars, each at 70dB would together produce 73dB. A 3dB change is not considered significant if there is no change to the characteristic of the sound – a change of 10dB is considered significant (doubling or halving of the noise level).

On many industrial sites the allowable sound from the development may be limited to a value over the existing background level. Background level is normally defined as the sound that is exceeded for 90% of a time interval (T).

1.2 Vibration

There are two different types of vibration – ground vibration and airborne vibration:

- **Ground Vibration** can be caused by human activity such as construction as well as natural sources such as earthquakes. Ground vibration is made up of seismic waves which are transferred through the ground from the source of the vibration. The effects of ground vibration are greatest closest to the source e.g. at the epicentre of an earthquake or from HGVs on a road. It is measured in terms of the maximum particle velocity in a vibration event, termed the “peak particle velocity (ppv) and this measurement is used to determine potential impacts on people or sensitive structures.
- **Airborne Vibration** is generally associated with activity which includes an explosion e.g. blasting in a quarry. Whenever an explosive is detonated transient airborne pressure waves are generated. As these waves pass a given position, the pressure of the air rises very rapidly to a value above the atmospheric or ambient pressure. It then falls more slowly to a value below atmospheric pressure before returning to the ambient value after a series of oscillations. The maximum pressure above atmospheric is known as the

[2] Berglund B, Lindvall T, & Schwela D (Eds) (1999) *Guidelines for Community Noise*. World Health Organisation.

"peak air overpressure". Energy above 20 Hz is perceptible to the human ear as sound, whilst that below 20 Hz is inaudible, although it can be sensed in the form of concussion. The sound and concussion together is known as "air overpressure" which is measured in terms of decibels (dB). Wind speed and direction, temperature and humidity at various altitudes can have an effect upon air overpressure.

1.3 Legislative Framework and Guidance

There are many pieces of European and National legislation that have been enacted to control or minimise the impact of noise and vibration. In addition, there are recognised standards and guidance which are frequently referred to when assessing noise and vibration effects:

- **Environmental Protection Act, 1990** – gives Scottish Local Authorities considerable and wide-ranging powers to tackle noise nuisance. Section 79 of the 1990 Act imposes a duty on Local Authorities to take reasonable steps to investigate complaints of nuisance and to inspect their area from time to time to detect statutory noise nuisances. Where a Local Authority is satisfied that the noise emitted is prejudicial to health or constitutes a 'nuisance', it must serve an abatement notice on the person responsible for the noise. The notice may require the noise to be stopped completely, reduced, or limited to certain times of the day. Local Authorities can exercise these controls at any time if satisfied there is a statutory nuisance, regardless of the terms of any planning permission.

- **World Health Organisation (WHO) "Guidelines for Community Noise"**[3] - concerned with community noise, defined as "noise emitted from all sources except noise at the industrial workplace." In setting community noise guidelines the experts considered such aspects as; interference with communication, sleep disturbance effects, physiological effects and annoyance responses.

- **WHO Night Noise Guidelines for Europe**[4] **-** WHO published further, updated, guidance for night time noise. The need for "health-based" guidelines originated in part from the Environmental Noise Directive which compels European Union Member States to produce noise maps and data about night exposure from mid-2007.

- **Environmental Noise (Scotland) Regulations 2006 -** enacts the requirements of European Directive 2002/49/EC, the Environmental Noise Directive (END).The required noise mapping and action planning process is based on a five-year rolling programme. There have been two rounds of mapping to date (2007 and 2012) based on varying size of agglomerations, the busiest major roads and railways and all major airports. The data indicates numbers of people exposed to noise above 55 dB, 65dB and 70dB.

- **Planning Advice Note 1/2011; Planning and Noise and Technical Advice Note** - Assessment of Noise - provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. The document refers to the noise maps produced in accordance with the END legislation and highlights that Quiet Areas within urban areas are to be protected. The guidance lists Potentially Noisy Developments; roads, railways, aerodromes, heliports, wind turbines, landfill sites, etc, and gives advice on how noise from these sources should be treated. Interestingly, mineral extraction is not listed as a potentially noisy development. PAN 1/2011, in relation to wind turbines, refers to ETSU-R-97 and a Salford University report as sources of advice on the associated noise aspects. More recent guidance on the assessment of noise from wind farms has been published by the Institute of Acoustics.

[3] Berglund B, Lindvall T, & Schwela D (Eds) (1999) *Guidelines for Community Noise*. World Health Organisation.
[4] Charlotte Hurtley (Ed) (2009) *Night Noise Guidelines for Europe.* World Health Organisation

- **Planning Advice Note 50; Controlling the Environmental Effects of Surface Mineral Workings -** This advice note deals in general terms with the environmental effects of surface mineral working and highlights that more detailed guidance is available for specific topic areas.

STATE AND TREND - DETAILED ANALYSIS

2.1 Scottish Noise Mapping

State

As described in 1.3 above, The Environmental Noise Directive and legislation requires that noise mapping is undertaken at relevant locations in Scotland. The locations to be considered during the first and second round mapping are detailed below.

Table 1 – Scottish Noise Mapping – First and Second Round Locations[5]

	Round 1	**Round 2**
Major roads	Roads with more than 6,000,000 (six million) vehicle passages per year	Roads with more than 3,000,000 (three million) vehicle passages per year
Major Railways	Railways with more than 60,000 (sixty thousand) train passages per year	Railways with more than 30,000 (thirty thousand) train passages per year
Agglomerations	Agglomerations with a population of more than 250,000 (two hundred and fifty thousand)	Agglomerations with a population of more than 100,000 (one hundred thousand)
Airports	Airports with more than 50,000 (fifty thousand) air traffic movements per year and airports within agglomerations	Airports with more than 50,000 (fifty thousand) air traffic movements per year and airports within agglomerations

Within East Ayrshire the only category that meets either the round 1 or 2 criteria are major roads.

The table below is taken from Draft Transportation Noise Action Plan[6] and shows the numbers of the population exposed to noise from major roads exceeding the levels given. The L_{den} parameter is calculated from daytime, 0700 – 1900 hours, evening 1900 – 2300 hours and night, 2300 – 0700 hours, levels. The L_{night} is the level for the period 2300 – 0700 hours on its own.

Table 2 – Population Exposure (numbers in light blue) from Major Roads Outwith the agglomerations mapped for Environmental Noise Directive (Scottish Government - Scottish Noise Mapping).

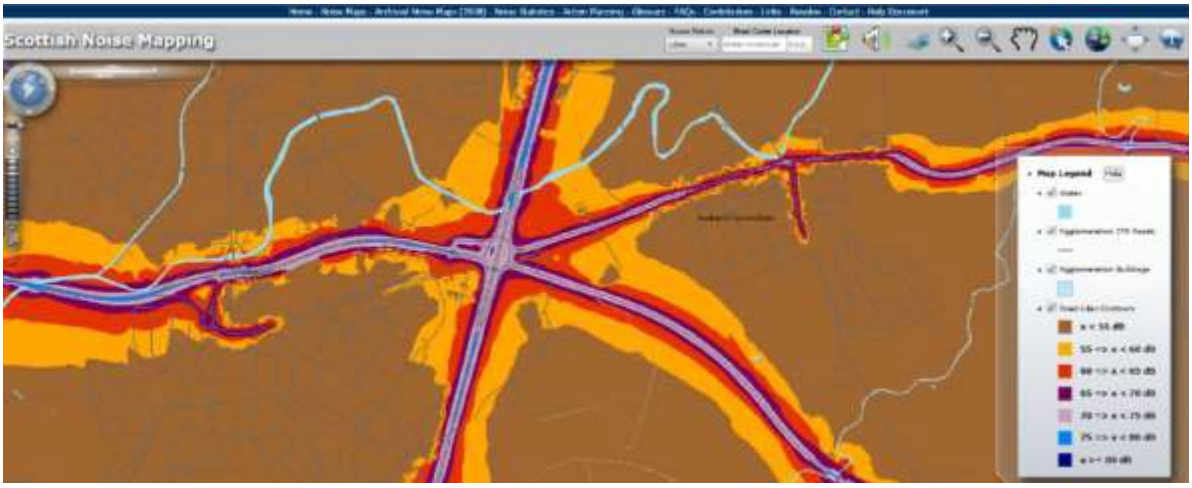
[5] http://www.scottishnoisemapping.org/
[6] Transportation Noise Working Group, *Draft Transportation Noise Action Plan,* The Scottish Government, October 2013.

	Lden (dB)			Lnight (dB)		
	> = 55	> = 65	> = 75	> = 50	> = 60	> = 70
END Round 1	191,000	44,600	1,600	115,900	20,200	100
END Round 2	201,200	60,300	600	153,200	15,600	0

The maps produced following completion of Round 1, in relation to transportation noise, were for an average weekday in 2005 and identified the M77 and A77 road corridor. The noise contour levels shown on the maps are based on computer generated levels at the centre of 10m x 10m grid squares, at a height of 4m above the ground. The same procedure was used for Round 2, when additional roads were mapped in accordance with the above criteria. The Round 2 maps were published in 2012.

An example of a Round 2 map, for the area close to the A71 / A76 / A77 roundabout is shown in Figure 1.

Figure 1 – Extract from the Scottish Noise Mapping (Scottish Government) showing the increased noise levels the closest to the road corridor (highest levels shown as purple and blue areas along the roads themselves are 70 and 75dB respectively). The way noise travels is dependent on elements such as topography as well as weather conditions.



Trend

Analysis of the Round 1 data revealed two areas in Kilmarnock as Candidate Noise Management Areas, references 20 and 21, and they have subsequently, in November 2010, been confirmed as the New Farm Loch, Kilmarnock Noise Management Areas adjacent to the A77.

The Scottish Government is committed to reducing noise exposure from the transport network and has identified 5 options for this outcome that will be implemented during the period 2013 – 18;

1 Hard and soft engineering solutions
2 Network operational management of roads and rail
3 Proposals and Policies
4 Desktop: Research, appraisal and tool development
5 Communications and stakeholder engagement

The results of the above actions will be evaluated during the next round of noise mapping. The 2007 and 2012 data shows an increase in the numbers of people exposed to levels 55dB or above and 65dB and above but a decline in exposure to levels of 75dB or above. Initiatives such as Noise Management Areas will target areas with existing issues and assessment of new schemes will ensure noise is addressed through planning and design.

The noise levels calculated and presented in the mapping exercises discussed above cannot be used as an accurate baseline value in a noise impact assessment for a new development. They are calculated to a height of 4 metres, which is around first floor level and not where the majority of the population would be at daytime. The computer generated noise contours do not take into account any localised features, for example, garden walls and fences. They will however give an indication of what the baseline noise levels might be. In addition, the maps only show areas where the L_{den} (day-evening-night level) is equal to or above 55 dB.

Very large parts of East Ayrshire are remote from the major road network identified as requiring to be mapped by END. Therefore, for any new developments or extensions to existing developments where it is deemed a noise assessment is required an appropriate noise survey will be required to determine the particular situation.

Noise levels close to a moderately busy road, for example the A70 around Muirkirk, during daytime could approach 60 dB $L_{Aeq,1h}$ (LA_{eq} - equivalent continuous noise level over period of 1hr) whilst at a location away from any highways during the same period could be just above 40 dB $L_{Aeq,T}$ ($LA_{eq,T}$ - equivalent continuous noise level)

2.2 Noise Nuisance

Status

Noise can affect overall quality of life that residents experience. The Scottish Household Survey includes questions regarding nuisance from noisy neighbours or pets and this shows a similar level of exposure in East Ayrshire as for the rest of Scotland.

Table 3 – Scottish Household Survey for 2017 – Neighbourhood Data which includes responses on noise. This data suggests that 10% of those surveyed felt that noise issues were fairly common with 8% having experienced noise as an issue. Animal nuisance which includes noise was experienced by 40% of those surveyed with 50% stating that the issue was fairly common.

	% very of fairly common	% with experience of problem
East Ayrshire		
Vandalism, graffiti or other deliberate damage to your property	8	5
Groups or individuals intimidating or harassing you	6	2
Drug misuse or dealing	16	7
Rowdy behaviour e.g. drunkenness, hooliganism or loutish	10	6
Noisy neighbours or regular loud parties	10	8
Neighbour disputes	4	3
Rubbish or litter lying around	33	30
Animal nuisance such as noise or dog fouling	40	50
Abandoned or burnt out vehicles	1	0
Base	*250*	*250*
Scotland		
Vandalism, graffiti or other deliberate damage to your property	9	6

	% very of fairly common	% with experience of problem
Groups or individuals intimidating or harassing you	6	3
Drug misuse or dealing	13	7
Rowdy behaviour e.g. drunkenness, hooliganism or loutish	12	11
Noisy neighbours or regular loud parties	11	11
Neighbour disputes	6	5
Rubbish or litter lying around	30	29
Animal nuisance such as noise or dog fouling	32	37
Abandoned or burnt out vehicles	2	2
Base	*9,810*	*9,810*

Trend

The trend is fairly stable although percentage of those surveyed identifying noise as a problem decreased from 13% in 2012 to 10% in 2017. The level of nuisance from animals reduced from 43% in 2012 to 40% in 2017.

Table 2 - Percentage of people saying a problem is very/fairly common in their neighbourhood (Scottish Household Survey for 2017)

	2012	**2013**	2014	2015	2016	2017
East Ayrshire						
Vandalism, graffiti or other deliberate damage to property?	12	10	12	12	5	8
Groups or individuals intimidating or harassing others?	11	6	9	5	6	6
Drug misuse or dealing	23	16	22	19	17	16
Rowdy behaviour e.g. drunkenness, hooliganism or loutish behaviour	15	11	14	14	11	10
Noisy neighbours or regular loud parties?	13	9	13	9	9	10
Neighbour disputes?	8	7	12	5	11	4
Rubbish or litter lying around?	32	39	35	44	32	33
Animal nuisance such as noise or dog fouling	43	30	43	47	38	40
Abandoned or burnt out vehicles	2	-	2	1	1	1
Base	*220*	*190*	*230*	*220*	*210*	*250*
Scotland						
Vandalism, graffiti or other deliberate damage to property?	11	10	8	8	8	9
Groups or individuals intimidating or harassing others?	8	7	6	6	6	6
Drug misuse or dealing	13	12	11	12	12	13
Rowdy behaviour e.g. drunkenness, hooliganism or loutish behaviour	15	13	12	11	11	12
Noisy neighbours or regular loud parties?	12	11	11	10	10	11
Neighbour disputes?	6	6	6	6	6	6
Rubbish or litter lying around?	29	27	27	28	30	30
Animal nuisance such as noise or dog fouling	30	31	31	31	31	32
Abandoned or burnt out vehicles	1	1	1	1	2	2
Base	*9,890*	*9,920*	*9,800*	*9,410*	*9,640*	*9,810*

2.2 East Ayrshire Council Noise Complaints

State

East Ayrshire Council currently receives an average of 220 complaints annually regarding domestic noise, primarily relating to dog barking.

Dog barking accounts for approximately 60% of complaints received, and are investigated using the Statutory Nuisance provisions of the Environmental Protection Act 1990. Where Statutory Nuisance cannot be identified, complainants are advised to consider raising an action themselves under the provisions of Section 49 of the Civic Government (Scotland) Act 1982 (Dangerous and Annoying Creatures). Of the other complaints relating to domestic noise, on average this results in the service of 1 or 2 Abatement Notices annually.

In relation to non-domestic noise, an average of 28 complaints are recorded annually, primarily relating to construction noise or the sounding of audible intruder alarms. These are also investigated as Statutory Nuisances and an average of 2 Abatement Notices are served annually.

In all cases of noise, the Environmental Health Service seeks to remedy the situation by informal means where possible, and this has a high level of success in removing sources of complaint.

The Council can address unacceptable construction noise under Section 60 of the Control of Pollution Act 1974.

Trend

A Pan Ayrshire Environmental Health Out of Hours Noise Team was established in 2005 to seek to tackle noise issues throughout Ayrshire. The 24 hour free phone noise helpline number allowed recording of complaints at any time of the day.

The Out of Hours Noise Team was tasked with addressing domestic noise complaints between 2300 hours and 0600 hours and covered the period of Thursday to Sunday when most noise complaints were raised. During the period 1 April 2010 to 31 March 2011, the Team dealt with 1069 complaints. This resulted in 561 visits to complainers, as a result of which 83 Warning Notices were issued together with four Fixed Penalty Notices; 73 complaints were fully resolved using only a verbal warning. Typically complaints regarding domestic antisocial noise numbered an average of 450 complaints annually during 2005 to 2014.

The Pan Ayrshire Environmental Health Out of Hours Noise Team was disbanded in March 2014. The current method for recording noise complaints is through the Environmental Health Service team who accept complaints by phone, email, in writing or in person during standard office hours.

The number of complaints has significantly reduced since the Out of Hours service was closed (1069 complains over course of a year reducing to 220 per year when the service was only available during office hours). It is not clear whether the lack of an Out of Ours service has increased calls to other public service providers such as the police in relation to anti-social behaviour.

2.3 Vibration Data

State

There are no National or Regional records of vibration levels in Scotland or East Ayrshire to draw from. Vibration is most often perceived by people when associated with transport and

infrastructure e.g. HGVs travelling on a surface with potholes close to housing. Unless a receptor is located very close to a poorly maintained road surface, it is unlikely that perceptible ground vibration impacts will occur. Similarly, for railways, unless the track is poorly maintained, the passage of trains is unlikely to give rise to perceptible vibration effects beyond the boundary. In both cases, vehicles carrying freight, HGVs or freight trains, have a greater potential to give rise to higher vibration effects than passenger vehicles. Where issues are identified, measures to address the cause of vibration can be agreed where appropriate.

Vibration associated with mine working / quarries and blasting is discussed in the pressures section as well as the specific section on minerals below.

Trend

As stated above, there are limited co-ordinated records for vibration available for Scotland and East Ayrshire so it is also difficult to ascertain a trend.

Schedule Four of the Environmental Impact Assessment (Scotland) Regulations 2011[7] requires the consideration of vibration and this will capture potential impacts arising from major development to ensure they are within acceptable limits:

'an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the development'

As for noise, the Environmental Health Service will be the main point of contact for members of the public with concerns over vibration.

PRESSURES

3.1 Development

Construction and development activity by their very nature, generate noise. Construction activity is generally temporary and short term in duration and therefore a degree of nuisance is accepted e.g. for activities such as piling. In many locations, noise from development activities is acceptable, however, where development occurs in more built up locations with a range of residential receptors and sensitive locations such as schools and hospitals, noise is considered an adverse effect.

Noise generated through construction is controlled through the planning process where conditions intended to minimise noise impact are often included, both during the construction phase and afterwards, during the life of the development. Developers themselves are becoming more aware of how their activities impact on the environment and work within schemes such as 'Considerate Constructors'[8] to demonstrate responsible working.

3.2 Mineral Extraction

Noise on surface coal mines and other mineral extraction sites is generated by the use of large equipment and vehicles, as well as by HGVs involved in the transport of materials from the sites to market.

The most significant source of vibration on surface coal mines or mineral extraction sites is from the use of explosives to fracture or break the rock in advance of excavation. On wind turbine sites this may occur if the developer is sourcing rock close to the site from borrow pits. The movement of vehicles on any of these sites is unlikely to give rise to perceptible vibration

[7] http://www.legislation.gov.uk/ssi/2011/139/schedule/4/made

[8] http://www.ccscheme.org.uk/

effects outside the boundary. However, there is potential for vibration issues to arise where HGVs travel on the wider road network / within settlements, particularly when empty.

Blast induced vibration, either resulting in ground vibration or air overpressure, has the potential to damage, property, structures and services as well as to cause subjective concern to the inhabitants of property.

As was the case for noise, the levels of ground vibration can be predicted and assessed against criteria to determine if they are acceptable or not. Although it is possible to calculate levels of air overpressure the vagaries of UK weather make this difficult and, as discussed in the above section, is better controlled by implementing a scheme to minimise the effect.

The levels of either noise or vibration at which annoyance or subjective concern are expressed will vary from individual to individual. Noise or vibration just above the threshold of perceptibility may annoy someone because they consider the source of the effect is inappropriate to their particular setting and this may include mineral extraction where permissions were granted at a time when environmental assessments were not required or legislation was not as robust. This can give rise to complaints relating to noise and vibration which the local authority has a duty to investigate.

3.3 Transport

Ground borne vibration from site HGVs on highways is sometimes cited as a potential environmental impact but in practice it is only perceptible within a few metres of a very bad pothole and imperceptible on roads complying with the design standards.

Airborne noise from HGV exhausts can sometimes be perceived as vibration by causing loose windows to rattle and in rare cases for suspended floors to vibrate. These effects are perceptible up to about 25 m from the road. Research by the Transport Research Laboratory has found that people's reaction to vibration arising from HGV movements is very similar to their reaction to HGV noise but is less marked. In other words, people would complain more about the effect of vehicle noise than about any associated vibration.

3.4 Renewable Energy

Noise from wind turbine developments can occur during their construction and then during the operational phase of a development. Assessment of noise from windfarms is undertaken in accordance with ETSU-R-97 guidance published in 1996 and ‘A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise’ produced by the Institute of Acoustics in 2013.

3.5 Industrial Processes

Industrial or commercial premises can be a source of noise pollution through activities such as manufacturing of goods and processing of materials through to operation of plant and equipment such as refrigerators and generators. Under section 80 of the Environmental Protection Act 1990 local authorities have a duty to investigate complaints about noise, and must serve notice on the author of any noise they consider to be a ‘statutory nuisance’. Where a proposed development is anticipated to give rise to noise, the local authority will request a noise assessment is carried out and appropriate mitigation implemented. A noise assessment would also typically be required for new housing proposed close to an existing industrial user.

CONCLUSION

4.1 Conclusion

Noise is often referred to as 'the Cinderella pollutant' as it can be difficult to tackle and legislation has typically lagged behind that for water and air pollution where impacts tend to be more tangible.

East Ayrshire Council includes large swathes of rural land where pressures associated with urban forms of noise pollution such as construction and traffic are less prevalent, however these areas are often the locations for other forms of development including mineral extraction and wind development which can introduce forms of noise to the receiving environment and local receptors. In terms of urban noise, the sources of impacts tends to be from development and construction and from neighbourhood noise (dogs barking, car alarms, music etc.).

In East Ayrshire the only elements that require assessment under the Environmental Noise Directive (END) and Environmental Noise (Scotland) Regulations 2006 legislation criteria are the M77 and A77. Under the END, there is a two stage process – firstly the production of strategic noise maps for major roads, rail, airports, and industry (Round 1) then for Competent Authorities to draw up Action Plans to manage noise (Round 2). The 2007 and 2012 data shows an increase in the numbers of people exposed to levels 55dB or above and 65dB and above but a decline in exposure to levels of 75dB or above. Initiatives such as Noise Management Areas will target areas with existing issues and assessment of new schemes will ensure noise is addressed through planning and design.

The number of complaints regarding noise has significantly reduced since the Out of Hours service was closed. It is not clear whether the lack of an Out of Ours service has increased calls to other public service providers such as the police in relation to anti-social behaviour. However, generally the public are more aware of noise issues and how to report incidences which is reflected in the average 220 complaints annually regarding domestic noise. There are similar trends in the reporting of noise from development and construction under statutory nuisance with around 28 complaints recorded annually.

MINERALS - HEALTH EFFECTS ASSOCIATED WITH MINERALS OPERATIONS

5.1 Summary

Noise and vibration impacts arising from major developments have the potential to cause annoyance and in more extreme cases sleep disturbance. The levels where these effects are experienced vary widely from individual to individual because of their subjective nature; what is acceptable to one person may be wholly unacceptable to another.

Acceptable levels of noise and vibration are regularly researched and criteria amended in the light of these studies. European and UK wide legislation and standards, as well as legislation and guidance prepared specifically for Scotland, reflect the desire to limit the numbers of the population exposed to high levels of noise and vibration and to ensure their amenity is not adversely affected.

Attitude studies into the impacts of surface mineral workings in the 1990s[9] suggest that where residents perceived disadvantages associated with a development dust and dirt were of more concern than noise, blasting or vibration. Noise was given as the cause of a perceived disadvantage in 22% of occasions with blasting and vibration, taken together, being the cause in 21% of cases.

In relation to noise, the use of large plant and equipment on quarries, landfill sites and surface mines clearly has the potential to raise pre-existing noise levels in an area. On surface mine sites working 24 hours per day this has a greater potential to become noticeable and lead to concerns being raised by residents. The operation of windfarms will also take place on a continual basis and therefore noise complaints, particularly when people are trying to get to sleep or begin waking up, are possible. These concerns or complaints can originate even when the operation is meeting its planning permission noise conditions / restrictions.

A resident being aware of the impacts from blasting; shaking windows, perceptible vibration effects etc may consider that damage is being caused to their property and is likely therefore to complain to the operator. PAN 50 states that '*The susceptibility of individuals to vibration will vary from person to person depending on factors such as age, health and, to a large extent, previous exposure. It is usually the case that adverse comments are less likely once a neighbour has become accustomed to the perceived effects of blasting. An explanation of the need to blast and the significance of the vibration levels being received by a site's neighbours are paramount as is an understanding and sympathetic attitude from the operator.'*

The above impacts are experienced throughout the country, not only at developments located within East Ayrshire. Reducing allowable levels of noise and vibration is not the answer as this would place unreasonable burdens on the operators and developments would not be viable.

Mineral extraction, surface coal mining, landfill operations and windfarms are likely to continue in the East Ayrshire Council area. Legislation, standards and guidance is available on how to calculate noise and vibration effects resulting from these developments. The Planning Authority now has in place access to independent consultants who can provide specialist advice on whether appropriate assessments of noise and vibration issues from prospective developments has been carried out. From this, if a development is granted planning permission, the conditions set should ensure that the effects of noise and vibration would not be expected to exceed acceptable levels.

[9] DETR commissioned research by Vibrock Limited 'The Environmental Effects of Production Blasting from Surface Mineral Workings' and Environmental effects of surface mineral workings: report to Department of the Environment Great Britain. Department of the Environment; Roy Waller Associates

Once a development commences, monitoring by the operator should indicate whether or not the noise and vibration criteria are being complied with. Where exceedances are found then further mitigation measures will have to be employed to address the problem. Monitoring by the Local Authority will confirm the levels being reported by the operators, or, if this is not the case, then there may be a need for joint monitoring. East Ayrshire Council conducts compliance monitoring through independent assessors and this will include review of noise and blasting levels.

Noise and vibration are agenda items on Technical Working Group and Community Liaison meetings at surface coal mine sites which will keep operators of these sites focused on the need to minimise these effects to as low levels as possible.

5.2 Issues Associated With Noise and Vibration

Noise on surface coal mines and other mineral extraction sites is generated by the use of large equipment and vehicles, as well as by HGVs involved in the transport of materials from the sites to market.

Noise from wind turbine developments can occur during their construction and then during the operational phase of a development.

It is recognised that exposure to noise can cause annoyance and, in some cases, sleep disturbance, both of which impact on quality of life. It is also agreed by many experts that annoyance and sleep disturbance can give rise to adverse health effects.

Accordingly, the anticipated noise emissions from a site are predicted and then assessed against criteria. Night-time criteria, when residents are likely to be sleeping, are generally lower than for daytime.

The most significant source of vibration on surface coal mines or mineral extraction sites is from the use of explosives to fracture or break the rock in advance of excavation. On wind turbine sites this may occur if the developer is sourcing rock close to the site from borrow pits. The movement of vehicles on any of these sites is unlikely to give rise to perceptible vibration effects outside the boundary.

Ground borne vibration from site HGVs on highways is sometimes cited as a potential environmental impact but in practice it is only perceptible within a few metres of a very bad pothole and imperceptible on roads complying with the design standards.

Airborne noise from HGV exhausts can sometimes be perceived as vibration by causing loose windows to rattle and in rare cases for suspended floors to vibrate. These effects are perceptible up to about 25 m from the road. Research by the Transport Research Laboratory has found that people's reaction to vibration arising from HGV movements is very similar to their reaction to HGV noise but is less marked. In other words, people would complain more about the effect of vehicle noise than about any associated vibration.

Blast induced vibration, either resulting in ground vibration or air overpressure, has the potential to damage, property, structures and services as well as to cause subjective concern to the inhabitants of property.

As was the case for noise, the levels of ground vibration can be predicted and assessed against criteria to determine if they are acceptable or not. Although it is possible to calculate levels of air overpressure the vagaries of UK weather make this somewhat pointless and, as discussed in the above section, is better controlled by implementing a scheme to minimise the effect.

The levels of either noise or vibration at which annoyance or subjective concern are expressed will vary from individual to individual. Noise or vibration just above the threshold of

perceptibility may annoy someone because they consider the source of the effect is inappropriate to their particular setting.

5.3 Overview of Developments Considered

In general, surface coal mines will be larger than sites where other form of mineral extraction is undertaken; hard rock and sand and gravel extraction. On coal sites the mineral recovered is a small percentage of the total material moved whereas on other mineral sites, such as quarries, once the soils are stripped, most of the material can be sold.

To generate working space, coal sites have to store large quantities of material above ground. On rock and sand and gravel sites there is limited material storage requirements. On rock quarries the working face moves quite slowly, clearly being dependant on the annual tonnage. Sand and gravel sites and surface coal mines advance more quickly. The differing methods and phasing of works gives rise to different noise characteristics e.g. blasting for hard rock quarries and extraction over long periods of time within a void where surface coaling tends to be undertaken over a shorter period of time and includes more surface working.

Plant and equipment on surface mine sites is typically larger than that which would be found on quarries or landfills. This increase in size is accompanied by a higher sound output, expressed as a sound power level; dB L_{WA}.

Landfill sites have tended to be formed in suitable voids left after quarrying or mining.

Surface coal mining, the operation of quarries and landfill sites and the development of windfarms give rise to noise and vibration effects in many ways. In the case of noise this is mostly associated with the operation of plant and equipment. Vibration is only likely to give perceptible effects when arising from the use of explosives.

The working of one of the above facilities may give rise to different noise and vibration impacts depending on what stage they are at.

Initial soil stripping at surface mines will utilise only small excavators, in relation to those used on overburden excavation, and the operations will be limited to daytime hours. During night-time overburden excavation on these sites when the void is being developed and the materials are being stored above ground, the resulting noise levels may be higher than when all plant is operating below ground. Background noise levels are also lower at night time therefore making mineral operations noise more noticeable

Explosives may be used during the construction phase of a wind farm when the turbine bases are being excavated or when aggregates are being sourced from a borrow pit, with a potential for associated ground vibration impacts. Vibration impacts are not a concern during the operational phase of a wind farm.

It should be stressed that many, although not all, changes associated with mineral extraction, landfill and wind farms are temporary or reversible – where complaints are raised, operators should, working with the local authority ensure an appropriate response to address the problem.

The likelihood of residents being affected by noise and/or vibration from operations at a development are difficult to quantify, not least because of the differences between what individuals find tolerable and is subject to factors such as proximity to the working, age and health.

Considering firstly vibration from the use of explosives, for concerns to be raised an individual must be aware of perceptible effects. In relation to ground vibration this is typically assumed to be at a peak particle velocity level of 1.5 mms^{-1} but can be lower. Maximum instantaneous explosive charge weights (MIC), a parameter used in the calculation of scaled distance from which vibration predictions can be made, vary from around 30 kg on surface mines to 200 kg

on hard rock quarries. A surface mine using a MIC of 60 kg could give rise to a vibration effect of 1.5 mms^{-1} (millimetres per second) at a distance of 0.8 km, increasing to more than 1.5 km for a peak particle velocity of 0.5 mms^{-1}.

The transmission of noise from developments that could potentially give rise to concern being raised depends, in part, on the magnitude of the sound source, the presence or otherwise of obstacles between the source and receiver, the times of the day when the sound source is operational and the existing noise levels in the area.

5.4 Community Liaison and Engagement

Since the late 1970s operators of surface coal mines have recognised the potential benefits that engaging with residents living close to their operations can bring.

We have conducted a review of Liaison Committee minutes available on the East Ayrshire Council website.[10] Detailed in Appendix 9.1 are the numbers of meetings held at each of the surface mine complexes in the East Ayrshire area together with comments made relating to noise and blast vibration raised by committee members, including officials of East Ayrshire Council.

Some 103 meetings have been held since 1999, with the minutes of the meetings available on the Local Authority website noted above. In 42 of these sets of minutes there was no mention of noise or blasting although noise is a standing item on many of the agendas. On several of the others noise and vibration may have been noted as being discussed but not necessarily in relation to complaints or concerns, for example, there may have been a comment that noise levels had been monitored and found to be meeting the planning permission criteria.

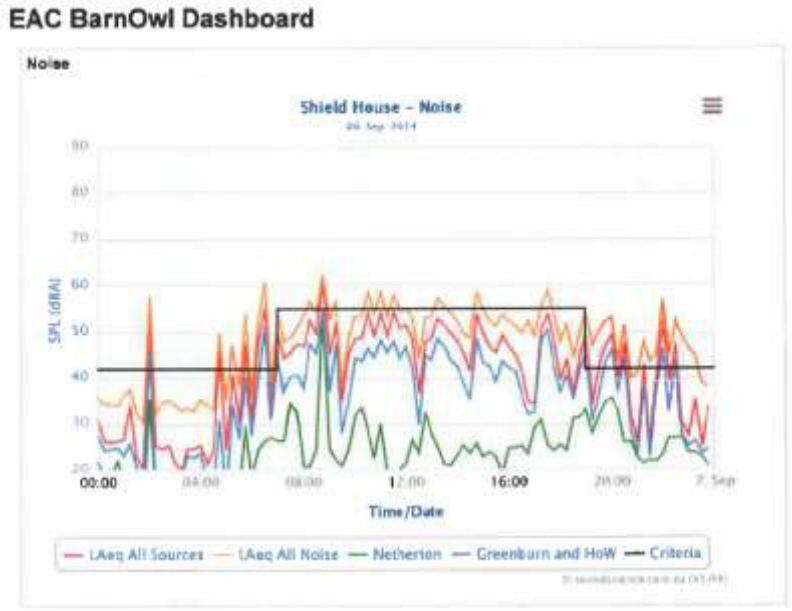
No review of similar information has been carried out for other mineral extraction, landfill or wind farm sites as no information has been made available. East Ayrshire Council operates an independence compliance monitoring framework for major developments and this includes auditing of environmental data (noise and blasting records included) as well as site visits and attendance at liaison meetings where required.

In the latter minutes for Greenburn, Netherton and House of Water complex liaison committee meetings there is mention of the Barn-Owl noise monitoring system and its use at a residential location close to the above 3 sites. The system, according to information received from East Ayrshire Council, is unique in its ability to use a multi microphone array and proprietary software to distinguish source noise by directionality and excludes extraneous noise from results. The system is supported by a weather station which is linked to provide contemporaneous weather data in order for noise measurement data to be excluded from analysis where recognised weather parameters are not met. Monitoring uses continuous measurements of 15-minute dB L_{Aeq} and has yielded high levels of data capture (90%+) since March 2013.

Results from the system have indicated that with insignificant numbers of exceedences the sites have operated within their consented levels. It should also be noted that the owner of the property at which the system is installed has had access to view real-time data on the Barnowl system and since this began the level of complaint has dropped significantly. A typical plot from the system is shown below.

[10] *http://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/MineralsWasteandOnshoreWindSites/Minerals,-Waste-and-Onshore-Wind-Site-Monitoring-Reports.aspx*

Figure 2 – Extract from East Ayrshire Council Noise Monitoring of Greenburn, Netherton and House of Water Surface Coal Sites.



Inspection of this example plot shows that, generally, noise from the 3 surface mines is below both the daytime and night-time criteria but that when this is added to other noise, the levels can be above the criteria for long periods.

The 1998 DETR report[11] contained the results of Local Authority questionnaires and public perception surveys.

Some of the main findings of the local authority consultation were that:

- Levels of vibration monitored from blasts are typically 2 – 3 mms^{-1} with maxima of 8 – 10 mms^{-1}.
- Complaint thresholds varied significantly from 0.5 mms^{-1} up to 10 – 12 mms^{-1} appearing to be independent of vibration magnitude once the threshold of perception is exceeded.
- Public relations, especially on behalf of the operator, are considered most significant.
- No proven damage instances from blasting vibration and very few suggested cases have been found.

Findings from the public perception surveys include:

- Overall in both quarries and surface coal mine sites complaints are largely independent of vibration magnitude and frequency of blasting as generated routinely at such sites.
- Public relations are considered most important, including the attitude of the local MPA/EHO as perceived by neighbours of a site.
- Any unusual happening on site, not necessarily restricted to blasting operations, is liable to result in an increase in complaints in general, including blast-related complaints.

In the above study, as was the general case in earlier DoE report[12], the environmental impact most likely to result in complaint from mineral workings was that of dust.

[11] Department of the Environment, Transport and the Regions, *The environmental Effects of Production Blasting from Surface Mineral Workings,* April 1998.
[12] Department of the Environment, Minerals Division, *The Environmental Effects of Dust from Surface Mineral Workings,* December 1995.

5.5 Review of Trends – Relating to past, current and future activities

5.5.1 Surface Coal Mine Overview

Since the early 1970s surface coal mining has been a significant employer in East Ayrshire and the coal recovered from the Local Authority area has been a major part of the overall Scottish output.

Productive Coal Measures are present across the Central Belt of Scotland, including large areas of East Ayrshire. The Ayrshire Coalfield was worked using underground methods for over a century however the closure of the last deep mine at Barony, near Auchinleck in 1989 brought an end to this, with a focus shift to shallow and surface mining.

The highest potential for deep mining, classified as that at depths greater than 200m, exists in the centre, north west and south west of East Ayrshire, within the Middle Coal Measures, Lower Coal Measures and Limestone Coal Formation. Extensive shallow mining potential covers much of East Ayrshire, with locally important areas in the centre[13] , however, areas of igneous intrusions, including the central western boundary, north east and south have no potential for shallow mining. The accurate spatial extent of mining can only be confirmed at local levels using plans from the Coal Authority and even in this instance mining records are not complete.

The following table summarises the East Ayrshire entries from the 2014 Directory for Mines and Quarries relating to coal mining[14.]

Table 3 - Coal Extraction East Ayrshire

Name	Location	Lithology Worked	End Use
Crowbandsgate Rail Facility	New Cumnock	Surface-derived coal	Generator coal
Garleffan Preparation Site	New Cumnock	Surface-derived coal	Generator coal
Killoch Colliery Disposal Point	Ochiltree	Surface-derived coal	Generator coal
Duncanziemere Surface Coal Mine	Lugar	Surface	Generator coal
Greenburn Surface Coal Mine, Braehead Extension	New Cumnock	Surface	Generator coal
Greenburn Surface Coal Mine, Dalgig Farm Extension	New Cumnock	Surface	Generator coal
Greenburn Surface Coal Mine, Wellhill Farm Extension	New Cumnock	Surface	Generator coal
House of Water Surface Coal Mine Burnston Extension	Douglas Water	Surface	Generator coal
Netherton Surface Coal Mine	Lugar	Surface	Generator coal

The extraction of coal using surface methods took over following the closure of the pits and East Ayrshire has provided at least 48% of Scotland's total coal production in the years 2003 to 2013. While the overall East Ayrshire share of Scottish production in 2015 was 43.5%, this does not reflect significant drops during the year. The drop in East Ayrshire production between Q1 and Q4 2015 was 91%, and in Q4 2015 East Ayrshire produced less than 20% of the Scottish total. This downward trend is expected to continue.

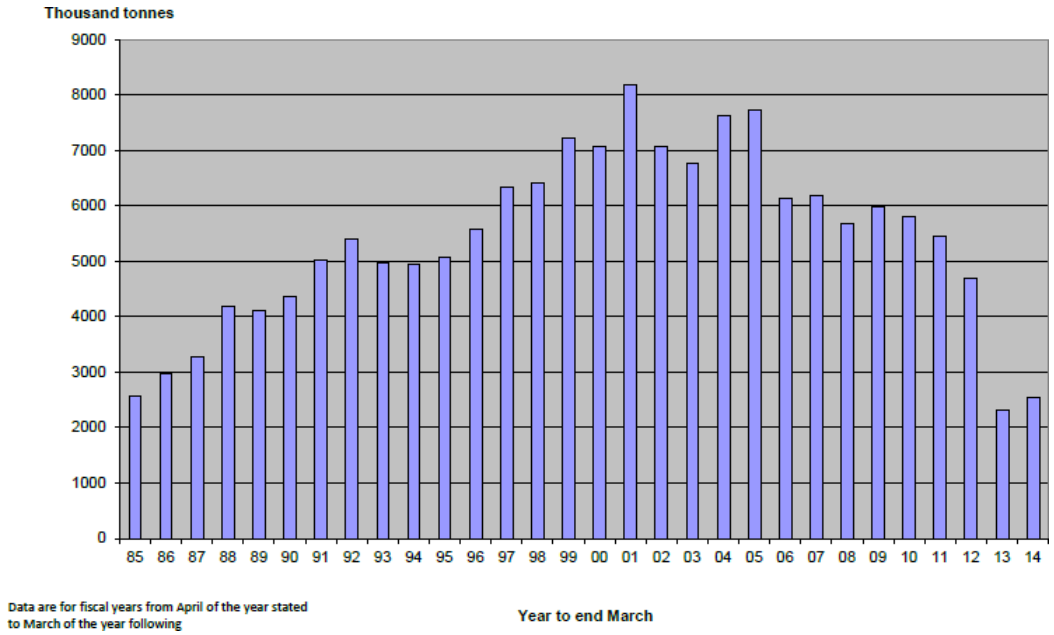
13 Macdonald AM, Browne, MAE, Smith NA, Colman T and Mcmillan AA. 2003. A GIS of the extent of historical mining activities in Scotland: explanatory notes. British Geological Survey Commissioned report, CR/03/331. 12pp.
14 Cameron, D G, Bide, T, Parry, S F, Parker, A S, and Mankelow, J M, 2014. Directory of Mines and Quarries 2014: 10th Edition (Keyworth, Nottingham, British Geological Survey).

Table 4 – East Ayrshire Share of UK Coal Production (Source: Extracted from Coal Authority[15])

Period	*EAC share of Scottish opencast production*	*EAC share of UK opencast production*	*EAC share of UK total coal production*
2012	53.6%	25.4%	15.8%
Q3 2015	21.3%	3.5%	2.4%
Q4 2015	19.9%	2.8%	1.9%
Whole of 2015	43.5%	9.5%	6.4%

Overall saleable coal across Scotland has dropped as shown on Figure 8.

Figure 3 – Coal production in Scotland 1985 – 2014 which shows the decline (source British Geological Survey[16])



5.5.2 Environmental Control

Since at least 1994, with the publication of NPPG 4[17] the potential impact of surface coal mining operations on residential amenity has been recognised as has been the need for appropriate environmental controls. More detailed guidance, specifically for surface coal, was published in 1999[18] and this again highlighted, amongst other aspects, that noise and blasting/vibration were matters that required to be controlled. NPPG 16 highlighted the requirement, in most cases, that noise and blast vibration from surface mining operations would be considered through the preparation of an Environmental Statement.

In March 2003, East Ayrshire Council published its Opencast Coal Subject Plan[19]. Aim 3 of that plan was to reduce the impact of surface coaling on the environment and to protect the

[15] https://www.gov.uk/government/statistics/solid-fuels-and-derived-gases-section-2-energy-trends

[16] https://www.bgs.ac.uk/mineralsuk/mines/coal/occ/home.html

[17] The Scottish Office Development Department, *National Planning Policy Guideline 4, Land for Mineral Working,* April 1994

[18] The Scottish Office Development Department, *National Planning Policy Guideline 16, Opencast Coal and Related Minerals,* March 1999

[19] East Ayrshire Council, *East Ayrshire Opencast Coal Subject Plan,* March 2003.

amenity of local residents and communities from the adverse effects of surface coaling operations. Clearly two of the effects that residents and communities were to be protected from would be noise and vibration. A further aim of the Subject Plan was to promote a high level of planning control over the management of surface coal mining operations, which was to be achieved by requiring operators to provide regular, comprehensive monitoring information.

PAN 50[20] was published in October 1996 and identified that whilst it provided general guidance on noise and blasting issues more specific details on these aspects would be presented in a series of Annexes.

PAN 50 Annex A[21], published in October 1996, set out the main procedures to be followed when undertaking a noise assessment for a mineral development; background survey, estimation of future noise levels, the calculation procedure and how method for setting noise limits. The guidance defined the daytime and night-time periods and gave noise levels for these periods that would generally be found to be tolerable.

In February 2000, the guidance specifically dealing with blasting and associated vibration effects was published as Annex D to PAN 50.[22] Following the guidance given for noise, this document described how vibration effects could be predicted and suggested suitable conditions for the control of both ground vibration and for air overpressure.

The guidance given in PAN 50 is equally applicable to the extraction of minerals; hard rock and sand and gravels, as it is to surface coal mining. Much of the guidance for mineral workings can also be applied to landfill sites, as the plant and equipment used in many cases is similar.

The assessment and setting of noise limits from the operation of wind turbines is most commonly undertaken following the guidance given in ETSU-R-97, as described previously, as amended by the IoA Guidelines[8].

5.5.3 Planning Conditions

Appendix 1 details the conditions from several of the surface coal mine planning conditions. Daytime noise limits have been set most often at 55 dB $L_{Aeq,1h}$ the normally justified criterion given in PAN 50 Annex A. There have been occasions where the limit for the period 0700 – 1900 hours has been set at 45 dB $L_{Aeq,1h}$, the lowest level given in PAN 50 Annex A and described as being appropriate for exceptionally quiet rural areas.

Night-time noise limits, where 24-hour working has been requested and/or permitted the typical noise criterion is 42 dB $L_{Aeq,1h}$, although at Powharnal and Garleffan II this was lowered to 40 dB $L_{Aeq,1h}$. We understand that East Ayrshire Council are considering setting a night-time limit for Duncanziemere at 39 dB $L_{Aeq,1h}$. Levels lower than 42 dB $L_{Aeq,1h}$ are at odds with the guidance given in PAN 50 Annex A however are necessary due to site constraints.

Appendix 2 details the limits attached to surface coal mines.

Where limits were set, up to around 2005, these appear to have been an absolute level of 6 mms^{-1}. Following this, again where limits have been set, the most stringent criterion from PAN 50 Annex D has been used; 6 mms^{-1} at a 95% confidence level. There are projects

[20] The Scottish Office Development Department, *Planning Advice Note 50, Controlling the Environmental Effects of Surface Mineral Workings,* October 1996.
[21] The Scottish Office Development Department, PAN 50 Annex A, *The Control of Noise at Surface Mineral Workings,* October 1996
[22] The Scottish Office Development Department, PAN 50 Annex D, *The Control of Blasting at Surface Mineral Workings,* February 2000.

which include conditions to control air overpressure in accordance with PAN 50 Annex D, published in 2000.

In the cases of both noise and blast vibration most surface mine sites have been required to agree schemes of monitoring with the Planning Authority and to make the results available. Referring to the comments made in the minutes of the Liaison Committees this seems to have been carried out.

In accordance with policy MIN 40 of the Opencast Coal Subject Plan, the operators of surface coal sites have been submitting annual environmental audits where noise and blast monitoring results are included.

TincornHill Quarry was granted planning consent in September 2007. The normal working noise limit is 55 dB $L_{Aeq,1h}$, although the condition doesn't clearly state where this criterion has to apply. During soil handling the noise limit increases to 70 dB $L_{Aeq,1h}$ at noise sensitive properties, the work only permitted during daylight hours. No time limit on how long the soil activities could take place is given. The operator had to agree a noise monitoring scheme with the Planning Authority, making the results available on a monthly basis. The blast vibration was set at 6 mms^{-1} at a 95% confidence limit. A blast monitoring scheme had to be agreed with the Planning Authority, the results being made available on a monthly basis.

A sand and gravel site within East Ayrshire Council, Garpel has been granted following an appeal and includes a range of conditions. Condition 35 details the noise levels that are not to be exceeded at the farm known as Garpel. These limits are, for a maximum of 8 weeks per year during temporary operations, 70 dB $L_{Aeq,1h}$ and for normal operations, 55 dB $L_{Aeq,1h}$. The background levels at this property are, according to the information contained in the Environmental Statement, around 30 dB L_{A90} during the daytime.

Mineral extraction at North Drumboy Quarry has been approved by East Ayrshire Council but the Section 75 agreement has not been concluded at the time of writing – it is assumed that noise conditions will form part of the consent.

Noise conditions were also set for an extension to the large Whitelee Windfarm with respect to borrow pits. The requirement was that during Night Hours the noise at dwellings did not exceed the greater of $L_{A90,10min}$ + 5dB(A) or 43 dB $L_{A90,10min}$ at wind speeds not exceeding 12 ms^{-1} and at all other times the greater of Quiet Waking Hours $L_{A90,10min}$ + 5 dB(A) or 40 dB $L_{A90,10min}$ at wind speeds not exceeding 12 ms^{-1}.

5.5.4 Future Control of Operations

Since the well documented problems experienced by two of the previous main surface mine operators in the East Ayrshire Council area, a series of quarterly reports has been prepared in accordance with the recommendations made by The Independent Review of Regulation of Opencast Coal Operations in East Ayrshire.[23] The Council has also appointed an Independent Mining Engineer, as well as other consultants including some specifically appointed to review noise issues.[24]

Although initially the reports and work of the independent consultants was limited to surface coal mine developments this has now been expanded to include quarries, landfills, onshore wind farms and a major electrical interconnector.

Compliance monitoring, as detailed in a report by the East Ayrshire Chief Executive[25], is required for noise and vibration for operational surface mine sites. Where this is not made

[23] Jim Mackinnon et al, *Report of Independent Review of Regulation of Opencast Coal Operations in East Ayrshire,* 20 January 2014.
[24] East Ayrshire Council, Planning Committee, *Compliance Monitoring Update of Major Developments in East Ayrshire,* 24th October 2014.
[25] East Ayrshire Council, *Opencast Mining in East Ayrshire – Steps to Recovery,* 19 September 2013

available to the Independent Mining Engineer already, as we note some operators are now doing this, we would recommend that it does commence. As the remit for independent consultants has been extended to include quarries, landfill sites and onshore windfarms, it seems sensible that monitoring reports from these developments are also made available to the consultants.

The frequency of routine noise monitoring and reporting for developments other than surface mines at monthly intervals is considered to be excessive, as these developments, in general, are much slower moving or are indeed static sources. If, however, complaints over noise are received it would be expected that some investigative monitoring be carried out by the developer and if substantiated mitigation works undertaken to address the problem.

Blasting is only likely at hard rock quarries or at borrow pits associated with windfarm developments. Monthly reporting of vibration results is considered appropriate, albeit some small quarries may only blast once every 2 – 3 months.

In terms of acceptable noise levels and although PAN 50 Annex A is now some 18 years old, the suggested levels remain relevant. For example, in England more recent guidance has been made available for noise from mineral developments.[26] The on-line planning policy guidance associated with the above document suggests that the maximum allowable noise at sensitive properties during the period 0700 – 1900 hours, should be 55 dB $L_{Aeq,1h}$. Where a lower level would not impose an unreasonable burden on the operator a criterion of background level, dB L_{A90}, + 10 dB(A) could be suitable. For night-time, 2300 – 0700 hours, the maximum noise level at sensitive properties is 42 dB $L_{Aeq,1h}$.

As reported in the October 2014 Compliance Monitoring Update presented to East Ayrshire Planning Committee, noise monitoring at a wind farm development has concluded that the development is meeting its noise criteria but yet complaints are being received. It will frequently be the case for many large developments that residents living close to them will complain over noise, irrespective of the actual level, simply because of the subjective nature of the impact. Inaudibility is not a noise criterion that can reasonably be applied to major developments.

The British Standards Institution in December 2008 issued guidance for the control of vibration.[27] Having reviewed available literature they confirmed earlier guidance contained in BS 7385-2: 1993 over acceptable transient vibration levels at residential and industrial receptor locations, as shown below.

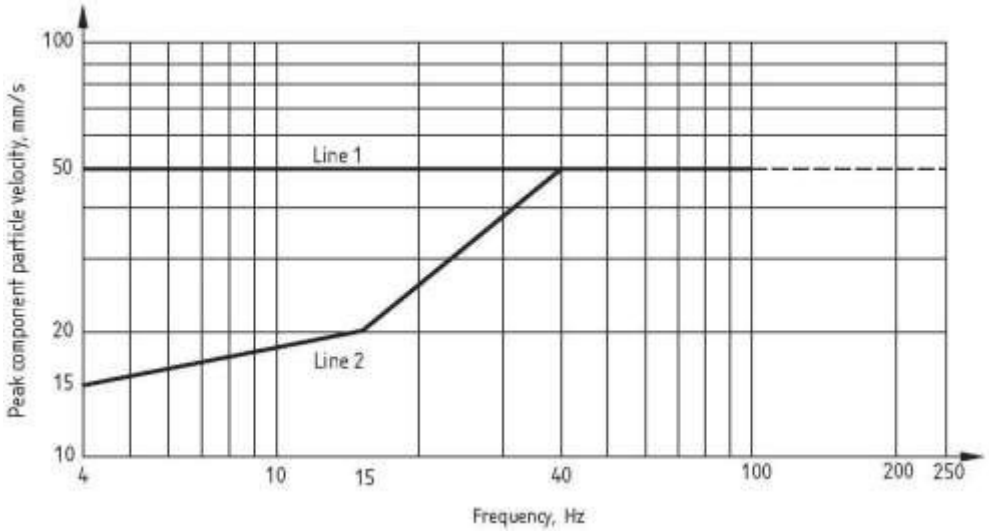
Table 5- British Standards Institution Guidance for the Control of Vibration

Line	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mms^{-1} at 4 Hz and above	50 mms^{-1} at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mms^{-1} at 4 Hz increasing to 20 mms^{-1} at 15 Hz	20 mms^{-1} at 15 Hz increasing to 50 mms^{-1} at 40 Hz and above
Note 1 – values referred to are at the base of the building Note 2 – for line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded			

[26] Department for Communities and Local Government, *National Planning Policy Framework,* March 2012.

[27] British Standards Institution, *BS 5228-2: 2009; Code of Practice for noise and vibration control on construction and open sites – Part 2: Vibration,* December 2008.

Figure 4 – PAN 50 Annex D (Extract)



The allowable levels given are in general agreement with those contained in PAN 50 Annex D. In recent planning permissions for surface coal mine and hard rock quarry sites the typical planning condition has been to set a limit of 6 mms^{-1} at a 95% confidence limit. We would recommend that the use of this limit continues but that there are further requirements limiting the peak particle velocity from any individual blast to 12 mms^{-1} and that the operators agree a scheme to minimise air overpressure with the Planning Authority before any blasting takes place.

Similar to noise, when blasting is undertaken there is the potential that perceptible effects will result but if these comply with the suggested guidance there should be no damage caused.

The requirement to agree a vibration monitoring scheme with the Planning Authority should continue to be a requirement in planning conditions.

The results from such monitoring, if operators follow best practice, should be used to continually update the regression analysis and thus provide valuable input to the design of future blasts.

In addition to the above monitoring undertaken by the operator of developments, monitoring should continue to be carried out by East Ayrshire Council. This will allow confirmation of the results presented by the operators and, in the case of complaints, assure residents that their concerns are being fully investigated. If the levels recorded by the operator and East Ayrshire Council do not agree, some further investigation into the reason for the differences will be required and possibly some joint monitoring.

The standard agendas for Technical Working Groups and Community Liaison meetings at the surface mine sites have noise and blasting/vibration listed as topics for discussion and will ensure that monitoring doesn't lapse and keep the operators focused on minimising impacts through site planning.

5.6 Conclusion

Noise from mineral workings can impact on people living and working in the vicinity of such sites. The extraction and processing operations are typically confined to daytime activities through planning conditions restricting hours of working and therefore should not interfere with sleep processes during the night, but can cause issues if unmitigated during the day.

Noise can also arise as a result of the vehicle movements both within a site and on the road network affected by the site heavy goods vehicles. The Quarries Regulations 1999 controls noise from blasting but monitoring is important to ensure compliance.

In the cases of both noise and blast vibration most surface mine sites in East Ayrshire have been required to agree schemes of monitoring with the Planning Authority and to make the results available. Referring to the comments made in the minutes of the Liaison Committees (Appendix 1) these schemes have been implemented.

In accordance with policy MIN 40 of the Opencast Coal Subject Plan, the operators of surface coal sites in East Ayrshire have been submitting annual environmental audits where noise and blast monitoring results are included.

REFERENCES

References and sources of further information and guidance

Reference	Available From:	Date Accessed / Frequency of Updates
Jim Mackinnon et al, *Report of Independent Review of Regulation of Opencast Coal Operations in East Ayrshire,* 20 January 2014.	http://www.east-ayrshire.gov.uk/Resources/PDF/C/Coal-Independent-Review-of-the-Regulation-of-Opencast-Coal-Operations-in-East-Ayrshire---Redacted-report-by-the-Independent-Review-Team.pdf	March 2019
East Ayrshire Council, Planning Committee, *Compliance Monitoring Update of Major Developments in East Ayrshire,* 24th October 2014. Further updates	http://docs.east-ayrshire.gov.uk/crpadmmin/2012%20agendas/planning%20committee/24%20october%202014/Compliance%20Monitoring%20Update.pdf https://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/Minerals,%20Waste%20and%20Onshore%20Wind%20Site%20Monitoring%20Reports/Quarterly-Compliance-Monitoring.aspx	March 2019
East Ayrshire Council, *Opencast Mining in East Ayrshire – Steps to Recovery,* 19 September 2013	http://www.east-ayrshire.gov.uk/CouncilAndGovernment/About-the-Council/MinutesAgendasAndReports/OpencastCoalUpdate.aspx	May 2016
Department for Communities and Local Government, National Planning Policy Framework, March 2012.	https://www.gov.uk/government/publications/national-planning-policy-framework--2	March 2019
Berglund B, Lindvall T, & Schwela D (Eds) (1999) *Guidelines for Community Noise*. World Health Organisation.	https://apps.who.int/iris/handle/10665/66217	March 2019
Considerate Constructors Scheme	http://www.ccscheme.org.uk/	May 2016
Charlotte Hurtley (Ed) (2009) *Night Noise Guidelines for Europe.* World Health Organisation	http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf	March 2019
Transportation Noise Working Group, *Draft Transportation Noise Action Plan,* The Scottish Government, October 2013.	http://www.gov.scot/Publications/2013/10/8366/5	March 2019

Monitoring of Renewables, Infrastructure and Minerals – East Ayrshire Council	https://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/Minerals,%20Waste%20and%20Onshore%20Wind%20Site%20Monitoring%20Reports/Quarterly-Compliance-Monitoring.aspx	March 2019
Scottish Noise Mapping	http://www.scottishnoisemapping.org/	March 2019
EIA Regulations	http://www.legislation.gov.uk/ssi/2011/139/schedule/4/made	March 2019
DETR commissioned research by Vibrock Limited 'The Environmental Effects of Production Blasting from Surface Mineral Workings' and Environmental effects of surface mineral workings: report to Department of the Environment Great Britain. Department of the Environment; Roy Waller Associates	Referenced in PAN 50 but not available online	May 2016
Digest of United Kingdom Energy Statistics – Chapter 2 Coal, 2014 (published December 2015)	https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes	March 2019
DECC, UK Energy Statistics, Q3 2015	https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes	March 2019

GLOSSARY

Decibel (dB) - The decibel (dB) is used to measure sound level. The dB is a logarithmic way of dscribing a ratio

dBA - A-weighted decibels, abbreviated dBA, dBa, or dB(a), are an expression of the relative loudness of sounds in air as perceived by the human ear

dB LAeq,1h – equivalent continuous noise level over period of 1hr

dB L_{WA} - sound power level in decibels

EHO – Environmental Health Officer within a local authority

Lden – day-evening-night level

Lmax – maximum level recorded during the period of measurement.

$L_{10,T}$ - The level of sound exceeded for no more than 10% of the measurement period (T).

$L_{90,T}$ - The level of sound exceeded for 90% of the measurement period (T). This level of sound can be used to define the background sound level, and is influenced by constant sources such as industrial equipment and constant background city sounds, eg from air handling equipment.

$L_{eq,T}$ - The 'equivalent continuous noise level', which is a parameter that calculates a constant level of noise with the same energy content as the varying acoustic noise signal being measured.

mms^{-1} – millimetres per second

ms^{-1} – metres per second

Maximum instantaneous explosive charge weights (MIC) - parameter used in the calculation of scaled distance from which vibration predictions can be made, vary from around 30 kg on surface mines to 200 kg on hard rock quarries

MPA – Mineral Planning Authority

Appendix 1 - Review of Liaison Committee Minutes

Surface Mine Complex	Community Liaison Group Minutes	Comments relating to Noise or Vibration
Powharnal	6 meetings, 4/08 – 11/12	4/08, No complaints received by site or EAC. 9/09, EAC advised committee that quarterly returns were being received and were available for public inspection. 11/12, EAC advised noise complaint received from Cronberry re noise from nearby Laigh Glenmuir site. Monitoring had shown levels complied with limits
House of Water	12 meetings, 11/08 – 5/14	3/09, reported that 1 week trial night-time had passed without comment over noise. 11/12, EAC advised of wider noise issue but that monitoring had confirmed compliance and that there was no cumulative issue. 11/13, EAC advised they had agreed noise monitoring protocol with surface mine operators. 2/14, EAC advised that Barn-Owl system, a directional noise monitor, was operating. No breaches of noise in previous 3 months. 5/14, EAC advised of their intention to hold a noise forum and to issue a noise questionnaire.
Spireslack	5 meetings, 3/02 – 6/09	No complaints or issues over noise or vibration recorded.
Greenburn	19 meetings,	8/05, problem over identifying where construction type nose originated. 11/08, EAC reported they had no issues with the site. 3/09, It was reported that site was audible but generally complied with planning conditions. 9/09, One member reported she could hear site and feel blasting. Operator advised that site was working to limits. 3/10, Some discussion on white-noise reverse alarms. 3/11, EAC no concerns with site. Noise complaint being investigated, not thought to be this site. 3/12, Noise complaints started since work commenced on Netherton - monitoring indicates compliance. Complaint received about blasting but found out to be noise. 9/12, Noise working group with surface mine operators established. Mention of several complaints but EAC had not received any blasting complaints. 3/13, Operator confirmed that EAC had been receiving noise complaints and that Barn-Owl system had been installed but not yet working. Residents in Bank Glen and Burnside complaining over noise levels. Operator advised they had met with several residents following a spate of blasting complaints – far fewer complaints since. 9/13, Discussion on Barn-Owl system but no results available yet. Acknowledgement that environmental monitoring had been correctly carried out. EAC expressed opinion that PAN 50 required updating. Glen Park residents complain over blasting. In response, operator considered issue to be air overpressure. EAC advised they were assessing whether blast related conditions shoud be modified. 3/14, EAC to follow up status of Burnside blasting complaint. Issue of blasting from Wellhill site raised; installation of permanent monitor reported and adoption of good neighbour policy. 9/14, EAC to follow up status of blasting complaint from Burnside, adding that guidance from Scottish Government set

Surface Mine Complex	Community Liaison Group Minutes	Comments relating to Noise or Vibration
		acceptable criteria. Noise complaint received from Connel Park and had been dealt with. Usual complaints had been made relating to blasting. EAC reported on a noise questionnaire. Low response, with most concern over night-time levels. View expressed that factors influencing levels could be weather and temperature inversions. Cumulative noise had been considered, through the Barn-Owl system and EAC content with recorded levels. Blasting concern from Caerniven.
Garleffen complex	17 meetings, 7/07 – 10/13	11/08, Comment made relating to low frequency noise, operator to monitor. 5/09, EAC reported that the noise which had been creating a nuisance had greatly reduced. EAC advised that following mitigation at the railhead no further complaints had been received. 9/09, Noise monitoring at Crowbandsgate indicated compliance. EAC confirmed no further complaints had been received. 9/10, Noise from conveyor rollers heard on golf course.
Duncanziemere complex	12 meetings, 10/07 – 10/13	1/08, Conveyor noise at top of Lugar, further noise monitoring required. 7/08, The conveyor noise raised previously not proven to be site attributable. 4/09, Conveyor noise again dismissed 10/09, Running of conveyor belt at night-time not resulting in concerns. 12/11, High noise levels raised as a concern, plus cumulative impact with SRG Dalfad site. EAC report that they were taking noise seriously. 7/12, Action to be taken in the event of a noise problem. EAC reported they had no issues with the performance of the site 4/13, Night-time noise issues at Cronberry 7/13, Noise monitoring on-going. No compliance issues arising since Dalfad closed. Night-time complaint from Wallaceton but noise levels found to be compliant. 10/13, On-going noise monitoring continuing - no issues raised by Community representative. Night-time noise complaint from Wallaceton, addressed by changes to shift change over. Blast vibration levels well below limit.
Chalmerston complex	2 meetings, 9/1999 – 12/12	No concerns raised over noise or blasting
Skares / Netherton	31 meetings 4/1999 – 6/14	4/1999, Operator reported that noise monitoring indicated compliance. 11/01, 1 night-time noise complaint, no others noted. 5/06, Operator indicated that blasting would commence. Reverse alarms replaced by white noise type. 11/06, Only limited blasting going forward. 10/07, Resident expressed concern over night-time noise, thought to be overburden being loaded into dumptrucks. 10/08, Resident representative requested he be advised when blasting about to take place. 2/09, Anticipated there would only be 2 blasts per month. EAC advised there had been no complaints re noise or blasting. 11/09, Complaints received over noise associated with new car park, and of plant moving around outside permitted hours. 5/10, Committee requested that noise monitoring be updated. 9/10, Operator advised noise monitoring to be undertaken in October. No complaints re noise or blasting. 10/10(N), 1st Netherton meeting, operator advised preliminary works underway. 2/11(N), Resident expressed concern over night-time coal washing. Operator to arrange monitoring. 2/11(S), Noise monitoring indicated levels well below limits. EAC advised they had not received any noise complaints and

Surface Mine Complex	Community Liaison Group Minutes	Comments relating to Noise or Vibration
		that EHO would undertake monitoring. 5/11(N), Number of complaints over night-time noise, operator to remove one excavator to address problem. Sounding of horn to indicate full truck raised as an issue. Complaint that blast initiated after 1500 hours made, refuted by operator. 9/11(N), Noise remains an issue, monitoring at 8 locations twice weekly, results showing compliance with limits. EAC advised they are to install monitor at residential location for 2 week period. 2/12, Local residents group formed re noise, all 3 operators to be asked to attend their next meeting. Night-time noise complaint from Skares and comment horns continuing to be used instead of lights. Operator to undertake additional monitoring in this area. 4/12, EAC received complaint over noise. Monitoring confirmed levels were acceptable. 5/12, Noise remains an issue, additional bund to be created as mitigation. Also noise complaints from Skares over a 4 day period, including a Sunday. 9/12, Noise issues on-going. Frequency back to monthly. Results indicate compliance. 2/13, Recent noise complaints, thought to be as new area being opened up and plant operating close to surface. Operator to look at additional monitoring during this period of works. EAC advised they are to trial new equipment, that indicates source of noise "Barn-Owl" system. 7/13, Complaints over levels of vibration, but monitoring confirmed levels below limits. EAC confirmed Barn-Owl in use but problems had been reported with its use. 6/14, EAC confirmed noise forum had been set for August 2014. 1 complaint since last meeting re noise.

Appendix 2 Surface Mine Planning Conditions

Site Name	Planning Ref'n	Daytime Noise Limits, dB LAeq,1h	Night-time Noise Limits, dB LAeq,1h	Temporary Noise Limits, dB LAeq,1h	Other Noise Constraints	Vibration Limits	Other Vibration Constraints
Gasswater	96/0496FL	55	42	-	Temporary operations excluded from general noise limit, but no limit set. Monitoring programme to be agreed with PA, monthly reporting.	Not to exceed 6 mm/s	Monitoring programme to be agreed with PA, monthly reporting. 2, two hourly periods during Mondays to Fridays between 0900 - 1700 hours. 1, two hourly period on Saturday between 1000 - 1200 hours.
Chalmerston / Pennyvenie	97/0582/FL	55	42	70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours and not to exceed 8 weeks per year.	Not to exceed 6 mm/s	Monitoring programme to be agreed with PA, monthly reporting. 3 properties noted that when blasting within 500m blast details and predicted PPV to be agreed with PA prior to blasting.
Skares	97/0596/FL	55		70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours and not to exceed 8 weeks per year.	Not to exceed 6 mm/s	Monitoring programme to be agreed with PA, monthly reporting. 2, two hourly periods during Mondays to Fridays between 1000 - 1600 hours.
Powharnal	99/0761/FL	45	40	70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours.		Times set. Monitoring scheme to be agreed with PA, monthly reporting.

Site Name	Planning Ref'n	Daytime Noise Limits, dB LAeq,1h	Night-time Noise Limits, dB LAeq,1h	Temporary Noise Limits, dB LAeq,1h	Other Noise Constraints	Vibration Limits	Other Vibration Constraints
Garleffan II	00/0526/FL	45	40	70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours.		Monitoring scheme to be agreed with PA, monthly reporting.
Greenburn	00/0793/FL	55	42	70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours.		Times set and not within 500m of occupied properties outwith control of applicant. Monitoring scheme to be agreed with PA, monthly reporting.
Laigh Glenmuir	05/0232/FL	55	50	70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours.	6 mm/s at 95% confidence level	Times set and not within 500m of occupied properties outwith control of applicant unless legal agreement in place. Monitoring scheme to be agreed with PA, monthly reporting.
Chalmerston	06/0685/FL				Undertaken in accordance with original consent, 97/0582/FL		Undertaken in accordance with original consent, 97/0582/FL
Dunstonhill	08/0783/FL	55	42	70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours.	6 mm/s at 95% confidence level	Times set and not within 500m of occupied properties outwith control of applicant unless legal agreement in place. Monitoring scheme to be agreed with PA, monthly reporting.

Site Name	Planning Ref'n	Daytime Noise Limits, dB LAeq,1h	Night-time Noise Limits, dB LAeq,1h	Temporary Noise Limits, dB LAeq,1h	Other Noise Constraints	Vibration Limits	Other Vibration Constraints
Burston Fields	09/0371/FL				Existing House of Water site noise monitoring scheme to continue. Otherwise undertaken in accordance with original consent, as amended by variations.		Undertaken in accordance with original consent, as amended by variations.
Duncanz-iemere	09/0511/PP				Refers to previous Laigh Glenmuir consent		Refers to previous Laigh Glenmuir consent
Netherton	09/0891/PP	55	42	70	Monitoring programme to be agreed with PA, monthly reporting. Temporary operations only during daylight hours.	6 mm/s at 95% confidence level	Times set and not within 500m of occupied properties outwith control of applicant unless legal agreement in place. Monitoring scheme to be agreed with PA, monthly reporting.
Braehead	10/0491/PP				Refers to previous Greenburn conditions.		Refers to previous Greenburn conditions.
Dalfad	10/0842/PP				Refers to previous Gasswater & Powharnal consents		Refers to previous Gasswater & Powharnal consents
Wellhill	12/0066/PP	55	42	70	Temporary operations only during daylight hours. Undertaken in accordance with original consent, as amended by variations.		Not within 500m of occupied properties outwith control of applicant unless legal agreement in place. Undertaken in accordance with original consent, as amended by variations.

East Ayrshire Council
Comhairle Shiorrachd Inbhir Àir an Ear

Planning & Economic Development
The Johnnie Walker Bond, 15 Strand Street
Kilmarnock, East Ayrshire KA1 1HU

www.east-ayrshire.gov.uk