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RATING OF MINERAL EXTRACTION NOISE

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INTRODUCTION

First, a review of noise rating policies affecting planning control of minerals is given, and some policies on noise are reported, with emphasis on rating methods and criteria. The impact of large quarries can be assessed relatively quickly once the database of reference source levels and the detailed working operational methods are known and agreed. The implications of new concepts of background noise are considered in conjunction with guidelines for planning and noise [1]. "Noise Rating" is taken here to refer to "the need for rating various noises of industrial origin affecting persons living in the vicinity" as used in BS 4142 [2,3] "Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas". "Minerals" is defined in the Town and Country Planning Act as, "all minerals and substances in or under land of a kind ordinarily worked for removal by underground or surface working," thus "mining operation" includes both quarrying and underground mining.

GUIDANCE ON MINERALS NOISE

Government guidance dates back to 1951. Later guidance on minerals planning was issued as Department of the Environment's series of Minerals Planning Guidance Notes. The first note (MPG 1) covered the general principles and national policy considerations of minerals planning with specific advice on the development plan system. The second note (MPG 2: 1988, Applications, Permissions and Conditions) covered planning applications for minerals development, planning permissions and the imposition of planning conditions, and gives relevant guidance in Paragraphs 89-92, (b) Noise [4]:

89. Some mineral working processes can give rise to considerable noise and this will be a major consideration where mineral working is proposed close to dwellings or other noise-sensitive premises. Factors to consider when examining ways to reduce noise disturbance include the siting of plant in relation to dwellings, prevailing wind direction and existing screens, all of which have a bearing on noise levels."
90. DOE Circular 10/73 (WO 16/73) 'Planning and Noise'[1] advises on the principles and specific criteria by which the Secretaries of State will be guided in taking planning decisions and on which local planning authorities should base their own policies. While local authorities (and individuals through magistrates' courts) can use the provisions of Part III of the Control of Pollution Act 1974 [5] to control noise where it amounts to a nuisance, it is preferable for such control to be exercised from the outset through the use of the appropriate conditions attached to the planning permission."
91. It is recommended that in the majority of cases a condition should be imposed stipulating the noise levels (in dB(A) terms) which should not be exceeded at the boundaries of the site or outside key nearby buildings. Exceptionally noisy short term operations, such as the construction and removal of earth banks and blasting, may need to be excluded or provided for separately. Advice on the prediction of noise levels from plant associated with (among other things) mineral extraction and guidance on how to reduce noise disturbance, has been published by the British Standards Institution in BS

5228: 1984 - 'Noise Control in Construction and Open Sites': Part 3 (which should be read in conjunction with Part 1) is specifically about noise control applicable to surface coal extraction by opencast methods" [6].

92. Other conditions which it may be necessary to impose include a requirement for efficient silencers to be fitted to all plant used in the site, the provision of acoustic screens or baffle banks and a restriction of hours during which plant may be operated. Moreover, a general restriction on the hours of working might serve to meet objections to traffic noise which is often a concern of residents."

THE SERPLAN STUDY

A sample of criteria for minerals is given in the SERPLAN (The London and South East Regional Planning Conference) publication "Sand and Gravel in South East England" [7]. It states that:

"One means of protecting human habitats is to impose appropriate planning conditions on permissions granted for extracting minerals. In 1985, the greater London Council researched the practices then being followed by Mineral Planning Authorities (MPA) in this respect. From this it will be seen that factors taken into account include the breadth of operating margins adjacent to housing, and measures to minimise the adverse impact of noise and/or pollution (including screens, mounding, planting, fencing and hours of operation). None of these standards finds expression in a statutory plan, other than the operating margin adopted by East Sussex and those included in the adopted Buckinghamshire Minerals Subject Plan. The Hertfordshire operating margin is included in a set of Minerals Criteria approved in 1986."

The findings of the survey are summarised in Tables 1-4.

HERTFORDSHIRE MINERALS CRITERIA

The Minerals Criteria [8] sets out "the various criteria against which Hertfordshire County Council will determine all planning applications for the surface extraction of minerals and associated processing activities. The criteria seek to balance community needs for aggregates for new building and maintenance of existing facilities with the need to protect the environment from the intrusive impact of mineral workings, while maintaining adherence to regional and national extraction guidelines."

Table 1. Operating Margins Adjacent to Housing

Minerals Planning Authority (MPA)	Distance to Location (m)		
	Curtilage	Dwelling	Village/ Settlement
Former GLC	60		
Berkshire	15	30 (min.)	
Essex			45
Surrey			60
Hertfordshire			60
Oxfordshire		100	350
Buckinghamshire		100 (bund) 200 (open)	
East Sussex		400	

Table 2. Noise-Barriers and Bunds

Minerals Planning Authority (MPA)	Screen Source	Bund Height (m)	Close-board Fence (m)
Surrey	Yes		
Kent	Yes		
Essex		3 (max.)	
Former GLC		3 - 5	
Berkshire		3 - 5	
Hertfordshire		5 - 6	3

Table 3. Examples of Hours of Working Used in Planning Conditions

Minerals Planning Authority (MPA)	Monday /Friday	Saturday	Bank Holiday /Sunday
Essex	7.00-18.00	7.00-12.30	
Berkshire	7.00-18.00	7.00-13.00	
Oxfordshire	7.00-18.00	7.00-13.00	
Kent	7.00-18.00	7.00-13.00	
Hertfordshire	7.30-18.00	7.30-13.00	No work
Former GLC	7.30-17.30	7.30-13.00	No work
Surrey	7.30-17.30	7.30-13.00	No work
Buckinghamshire	8.00-17.00	8.00-12.30	
East Sussex	8.00-18.00	8.00-13.00	

Table 4. Environmental Impact (Including Noise) Policies

Minerals Planning Authority (MPA)	Relevant Policy Document
Bedfordshire	Structure Plan 1980, Altn 1984
Berkshire	Draft S.P., Minerals Plan 1984
Buckinghamshire	S.P. 1986, Minerals Plan 1982
East Sussex	Structure Plan 1985
Essex	Structure Plan 1982, Review 1986
Former GLC	Greater London Development Plan 1976
Hampshire	Mid Hants S.P., NE Hants S.P., S Hants S.P., Minerals Plan 1987
Hertfordshire	Structure Plan 1984, Review 1986 Minerals Criteria 1987
Isle of Wight	Structure Plan 1979, Review 1986
Kent	S.P. 1983, Minerals Plan 1982
Oxfordshire	Minerals Amendment 1982
Surrey	Structure Plan 1980, Altn 1986 NW Surrey Minerals Plan 1985
West Sussex	Structure Plan 1980, Altn 1985

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"7 - Access and Lorry Movements
"(a) Quarry to processing plant - To reduce the adverse effect of vehicular movements, the County Council will ensure that wherever possible the haulage of material from excavation to processing plant is kept off public highways. Use of conveyor belts will be encouraged wherever possible.
"(b) Delivery to Customers - There will be a general presumption against granting planning permission where the transport of material would require the use of local roads to gain access to the site from the major road network.
"8 - Proximity of Other Land Uses - Proposed mineral workings (including all site operations) will not normally be permitted when they approach within 60 metres of any existing development. In addition the County Council will take into account the direction of the prevailing wind, dust, the level of vibration emanating from the site, the number of people who would be affected, any barrier or significant intrusion between the proposed excavation and other land users (e.g. a major road or a railway embankment), and the adverse effects of any ameliorative works themselves, such as earth mounds. The distance may be extended if necessary."
"9 - Noise - The noise generated by excavators and fixed plant can be one of the most intrusive aspects of mineral workings. Estimates are needed of the general noise level prevailing in the area, the duration of noise at different intensities and the cumulative intrusion that extra noise might produce in an area. Such estimates may be required from the applicant. The direction and strength of the prevailing wind may be significant too. The noise adjacent to a mineral working or a plant site, can be considerably ameliorated by works like screen banks, so there may be a trade-off between a lower noise level and a more intrusive noise barrier. The noise from processing plant is a particularly important consideration because of its level and duration. Whilst the worst impact of excavators occurs for a relatively short time as one part of the site is worked, the noise from plant lasts continuously, often over the lifetime of more than one planning permission for excavation. However, as it is noise rather than its source that matters, the County Council will adopt the same standards when taking decisions on the use of all plant. The following criteria will be adopted:

a) There will be a presumption that planning permission will not be granted for mineral extraction or processing plant if the noise from day-to-day operations relating to extraction of material, tipping of waste material or operating processing plant exceeds a peak noise level of 70 dB(A) at the boundaries of the site. Noise levels during the period of removal, storage and replacement of topsoil and subsoil and the formation of bunds may exceed this peak but should not exceed 75 dB(A). In addition, the 12 hour equivalent continuous noise level (12 hr Leq) should not exceed 65 dB(A). In such cases where this is likely to happen the Minerals Planning Authority will require the working day to be reduced, either by a later start to the working day, or by an earlier finish, or both, in order that the target value of 65 dB(A) will not be exceeded.
b) An application will not normally be refused on grounds of noise, if after the introduction of all ameliorative measures and the consideration of the corrections detailed in BS 4142/1967, the ambient noise level (i.e. L90) measured over a representative period in the vicinity of the nearest noise-sensitive use, is at no time raised by more than 5 dB(A). (Measurements shall be made at a height of 1.2 metres and at least 3.6 metres away from any walls or other reflective surfaces of an occupied building which face the site).
c) The County Council may be guided on the aspects of noise assessment by its consultants or Technical Departments. The County Council will need to be

satisfied that should noise levels exceed these criteria, immediate measures can be taken to reduce them. All noise measurements shall be made using a sound level meter to BS 5969:1981 (IEC 651 1979) Type 1 or Type 2 or equivalent set on "slow" response."

"13 - Schemes of Working -The County Council will expect a comprehensive scheme of working to be submitted with any application to meet the minerals criteria and to deal with the matters outlined. The scheme will normally need to be agreed with the County Council before any planning permission is implemented.

EXTRACT FROM THE SURREY GUIDELINES

The Surrey Guidelines stresses that straightforward application of the criteria may not always be appropriate. Instead they are intended to provide guidance and are not intended as obligatory standards. Each case is assessed on its particular circumstances involving special site factors or policy considerations, and may involve specialist advice from the County Engineer's Control Section.

The guidelines contain a section specifically on mineral working and waste disposal sites together with some general principles and comments. In this respect minerals are considered as a separate matter distinct from: construction/ demolition sites; and industrial premises and other fixed installations.

"(b) Mineral Working and Waste Disposal

While some disturbance from noise is inevitable in that working will bring some additional noise to an area, every effort should be made to reduce its impact, particularly upon neighbouring residents."

"The L90 noise index is considered to be the most appropriate measure of this type of noise. Noise from any plant or machinery used in the operation of the site should not normally exceed the existing L90 plus 5 dB(A) at the facade of any residential building (1.5m receiver) during the working day; Leq should be limited to existing L90 + 10 dB(A) and Lmax to existing L90 + 15 dB(A)."

For short periods of extraction where it is necessary for a machine to be temporarily in the vicinity of residential properties the noise (L90) should be limited to existing L90 + 10 dB(A). Such noise levels would only be acceptable for short periods.

Working hours should be limited, especially the start of noisy activities in the morning. Any pumps or other equipment that have to run all night must be very effectively silenced and should be inaudible at night at any bedroom window. No activity will normally be permitted which generates noise with strong or obvious tonal qualities." These levels are summarised in Table 5:

Table 5. Extract from Surrey Guidelines

	L90	Leq	Lmax
Plant and machinery	L90 + 5	L90 + 10	L90 + 15
Daytime Short-term	L90 + 10	L90 + 15	L90 + 20
Nightime	L90(night)-5		

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CHESHIRE GUIDELINES

Cheshire has published guidelines [10] in 1980. The guidance on new noisy development stems from the basic concept that the variety of factors involved is such that no fixed standard level of acceptability can be applied. Therefore each case requires individual consideration on its merits and according to its particular location.

The basis for assessment is based on the principles of BS 4142, in that new noise levels are compared with existing noise levels. The acceptability of the new noise source depends upon the amount by which the level, together with adjustments for character and duration, exceeds the existing ambient.

The development site is generally categorised as one of three categories, for extent of development noise, with levels expressed in terms of a dB(A) Leq(1 hour) derived from the ambient dB(A) L90:

(a) No increase of noise:	Residential areas. Mixed residential/industrial with unacceptable levels. New noise level = Ambient L90 - 10 dB(A).
(b) Marginal increase of noise:	Rural settlements with low ambient. Mixed area/ urban area. New noise level = Ambient L90 + 5 dB(A).
(c) Significant increase of noise:	No noise-sensitive properties.

Conditions are generally expressed as Leq levels at site boundaries for noise-producing developments. Noise-sensitive developments criteria (for dwellings) are:

Internal: 45 dB(A) Leq 1 hour daytime.
40 dB(A) Leq 1 hour evening.
35 dB(A) Leq 1 hour night-time.
External: 65 dB(A) Leq 1 hour.

A typical attenuation of 15 dB(A) is assumed for a slightly open window, for new development only. Three categories of interpretation are given, in relation to external noise:

(1) Over 70 dB(A) Leq: Unacceptable.
(2) Over the 15 dB attenuation limit to achieve criteria for time of day: Acceptable but with conditions to achieve internal criteria.
(3) Internal levels - within criteria: acceptable.

ENVIRONMENTAL ASSESSMENT

For large projects EA may be relevant. In the case of minerals [11]:

(c) Extraction of minerals other than metalliferous and energy-producing minerals, such as marble, sand, gravel, shale, salt, phosphates and potash.
(e) Extraction of coal and lignite by open-cast mining.
(j) Extraction of minerals other than metalliferous and energy-producing minerals by open-cast mining.

Such projects would be subject to assessment if they are likely to have significant effects on the environment by virtue of factors such as its nature, size, and working methods. It is envisaged, in the government circular [11], that only a small number of such projects would occur each year, the key issue being the likelihood of "significant" environmental effects.

For opencast coal mines and sand and gravel workings, sites of more than 50 ha could be regarded as requiring an EA. Significantly smaller sites could require an EA if they are in a sensitive area or if subjected to particularly obtrusive

operations. A recent application for sand and gravel extraction was of order 350 ha, which could be regarded as requiring an EA. Such assessments may involve:
(1) A description of the project, including an estimate of noise and vibration.
(4) A description of the likely significant effects of the proposed project on the environment.
(5) A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

PLANNING CONDITIONS

Conditions must not be wholly unreasonable. Conditions may be quashed on the grounds of unreasonableness. There are cases where a permission failed with the condition, when successfully challenged in the courts. It is therefore important that any condition should be reasonable in practical terms.
Circular 1/85 [12] sets out guidance on how planning conditions can be imposed which are clearly seen to be fair, reasonable and practicable. A test for whether a condition is necessary is that "planning permission would have to be refused if the requirements of that condition were not imposed", otherwise the condition requires "special and precise justification". The Circular warns that the use of conditions in an unreasonable way, so that it proves impracticable or inexpedient to enforce them, should be avoided. In cases of appeal, the circular recommends "reasoned suggestions from either of the parties as to conditions which they would find acceptable if permission were granted".
Suggested model conditions for noise are given in Appendix A of the circular. Two examples refer to noise limits and working hours:
(7) "Noise emitted from the site shall not exceed (... noise level) dB expressed as a (... period) minute/hour LAeq between (... times) hours Monday to Friday and (... noise level) dB expressed as a (... period) minute/hour LAeq at any other time, as measured on the (...) boundaries of the site/at points (...)." The setting of such limits infers that the limits are agreeable to both sides and reasonably practicable, within the context of any agreed noise control scheme.
(8) "[No (... specified machinery) shall be operated on the premises] before (...) am on weekdays and (...) am on Saturdays nor after (...) pm on weekdays and (...) pm on Saturdays [nor at any time on Sundays or Bank holidays]." Again, such condition would be both reasonable and practicable.

GUIDANCE ON NOISE RATING

For planning and noise, the relevant guidance is given in Circular 10/73 [1]. That circular makes explicit reference to minerals in Paragraph 26:
"There will however be times when it is appropriate - or even desirable in order to meet other planning objectives - to allow some form of industrial or similar development near houses etc. Minerals have sometimes to be worked although there are houses nearby. And some service installations are sometimes welcomed in a local shopping centre serving a residential area. The need then is to take every precaution to ensure that noise emitted by the development in question does not on the whole make the area a less pleasant place in which to live."
The Circular also endorses the methodology of British Standard BS 4142 [2]. The Standard is presently being revised [3] to incorporate the now widely-used Leq index for industrial noise. Briefly, BS 4142 states (or will state) that the noise level plus corrections (the rating level in terms of Leq) defines whether complaints are likely or not likely:

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Rating Level >= L90 + 10 dB(A) complaints likely.
Rating Level <= L90 - 10 dB(A) complaints not likely.

The corrections used in the BS 4142 Rating Level are similar to the corrections used in the CIBS Guide [13] to correct Noise Rating (NR) Curves for subjective effects of non-steady or tonal sounds. Three changes are discussed here: First, the reference to a difference of 5 dB(A) being of marginal significance has been dropped. Second, the concept of a notional background level and its calculation procedure has been dropped. Instead the principle will be that the L90 level is measured rather than estimated. It is made explicit in the draft that, "for a modified noise source, or a new source in existing premises, it is permissible to include in the background level any noise from the existing premises if these are operating without causing complaints". Third, the concept of a threshold for background noise has been introduced in the draft BS 4142. It states that "the assessment procedure may also be insufficient when the A-weighted background noise level is less than 30 dB" (Note to Paragraph 9.2.2).

RANGE OF CRITERIA

A wide range of criteria have been adopted for assessing minerals, even though there may be consistency within individual Minerals Planning Authorities (see for example, the Guidelines published by Cheshire, Hertfordshire and Surrey). Most of the criteria can be described as deriving from considerations of BS 4142 or from some other consideration such as propagation of sound over distance.

INITIAL SITE CLEARANCE & BUND CONSTRUCTION

Where specific noise guidelines are published it is usual to treat the preliminary work as an initial construction phase. Thus the removal and storage of top-soil and overburden to form bunds is seen as a necessary preliminary operation to the main long-term quarry activity. In this way it is treated in a a similar manner to construction noise, and being considered temporary and of longer term benefit to the acoustic environment at dwellings, higher levels can be tolerated.

MAIN QUARRY ACTIVITY

Briefly, the British Standard BS 5228 [6], "Noise Control on Construction and Open Sites" now covers both construction noise and mineral workings. It gives guidance on noise prediction and control, and uses the Leq index for assessment and monitoring. No guidance is given on absolute limits for acceptable noise levels. It was originally intended that the revision should include additional parts specifically relevant to minerals - sand and gravel; and hard rock quarrying, but it would appear that the interests of these industries were felt to be adequately covered by the published parts, and there are no current plans to introduce them [14,15].

IMPACT ASSESSMENT UNDER EA

It is probable, that for mineral proposals requiring EA, the basic techniques discussed above would be appropriate, with rating of noise using the latest revisions of BS 4142, Circular 10/73, and BS 5228. Briefly, there would be a baseline survey and comparison of predicted noise levels with some agreed acceptability criteria. Quantitative procedures would be used, eg. showing the residential properties subject to noise contours in 5 or 10 dB(A) bands.

GROWTH IN BACKGROUND NOISE

As Rupert Taylor [16,17] has pointed out, in planning the future noise environments of large developments extending over many years it is not appropriate to consider the L90 level before development began in assessing the likelihood of nuisance under BS 4142. Instead, what is more relevant is the future L90, resulting from the introduction of specified noise sources which have been introduced without complaint. This higher L90 would then provide the basis for comparing the introduction of further noise sources, since the new background would be established at the time when further noise sources are to be introduced. The process continues for subsequent detailed approvals for production plant and installations, with the overall objective of preventing creeping ambient exceeding "ultimately acceptable levels". This concept of a mega-background which changes with time, and creeps steadily upwards would be permitted within the framework of BS 4142, which only seeks to indicate nuisance in terms of an excess over ambient at the relevant time. In planning terms, the concept of mega-background is also correct, but in addition circular 10/73 provides scope for planning conditions to avoid the dangers of creeping nuisance but only where reasonable and practicable. This is when the definition of an absolute acceptable noise level becomes of concern.

The CIRIA manual [18] recommends criteria for absolute external noise limits for industrial noise in rural environments, of 45 LAeq (night) and 55 LAeq (day). These levels were quoted recently by Rupert Taylor [17] in his Proof of Evidence at a "Super-Pit" coal mine inquiry as support for the development of noise criteria for assessing environmental impact:

Table 6. Noise Impact Rating

Noise Impact Rating	Noise Level at Dwelling (LAeq) For Source and Time of Day		
	Road HGV	Bund Construction	Mine Site
Major Impact	65	70	65 day 60 evening 55 night
Moderate Impact	60	65	60 day 55 evening 50 night
Minor Impact	55	60	55 day 50 evening 45 night

Notes: (1) Above levels do not include reflections.
(2) Times of day: Day (7.00-18.00); Evening (18.00-22.00)
Night 22.00- 7.00
(3) Road noise is Leq 24-hour (free field), ie. 5 dB less than L10 18-hour levels, so 60 Leq is equivalent to 65 L10.

REFERENCES

[1] Department of the Environment/ Welsh Office, Planning and Noise, Circular 10/73 (16/73), HMSO, 1973.

[2] British Standards Institution, Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, BS 4142:1967

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[5] Control of Pollution Act, 1974.

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[18] Construction Industry Research and Information Association, Sound Control for Homes - A Design Manual, CIRIA Report 114, London, 1986, p. 18.