Noise and Vibration Management Plan

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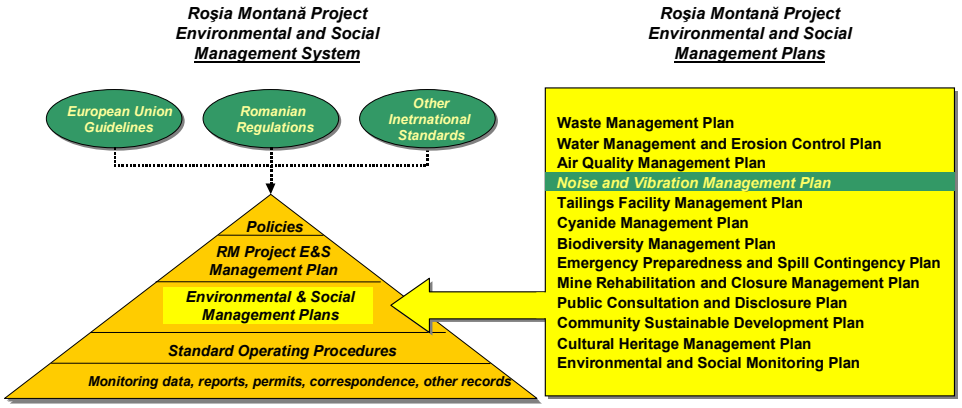
1 Introduction

This *Noise and Vibration Management Plan* describes the practices established by Roşia Montană Gold Corporation (RMGC) to manage the potential noise and vibration impacts on adjacent communities that are associated with mine construction, operation, decommissioning, and closure. The *Noise and Vibration Management Plan* applies only to Roşia Montană Project (Project) activities. It is a key component of the operational control section of the Project Environmental and Social Management System (ESMS), the minimum requirements of which are documented by the *Roşia Montană Project Environmental and Social Management Plan*.

2 Environmental and Social Management System Considerations

As noted in Figure 2.1, this plan is one of a suite of environmental and/or social management plans that have been developed to support the Environmental and Social Management System described in the current version of the *Roşia Montană Project Environmental and Social Management Plan*. Collectively, the *Noise and Vibration Management Plan* and its companion plans address key operational control needs that have been established for those areas for which the Environmental Impact Assessment (EIA) process (see the *Roşia Montană Project Environmental Impact Assessment*) indicates that potentially significant environmental or social impacts are either known to exist or may occur at some point in the mine life cycle.

Figure 2.1. Structural Relationship of Management Plans in Environmental and Social Management System



The implementation of this *Noise and Vibration Management Plan* is also supported by a number of detailed, lower-tier standard operating procedures. These procedures are contained in the *RMGC Standard Operating Procedures Manual*, the development, review, approval, distribution, and update of which is controlled by the *Roşia Montană Project Environmental and Social Management Plan*. Other specific document distribution, change control, personnel training, and records management needs associated with the implementation of this management plan are likewise addressed through the processes and procedures defined in the *Roşia Montană Project Environmental and Social Management Plan.*

3 Organisational Responsibilities

Primary responsibilities for the implementation of this Plan reside with the Manager, Environmental Management or designated Environmental Management staff, with the assistance of the Assistant Manager, Community Relations where stakeholder communications are concerned. Management of workplace-specific noise and vibration impacts is the primary responsibility of the Health and Safety Manager and assigned Health and Safety Coordinators, as noted in the RMGC *Occupational Health and Safety Plan.* Other procedural responsibilities shall be as defined in the RMGC standard operating procedures that govern specific tasks, as cited herein.

4 Project Setting and General Characteristics of Noise and Vibration

4.1 Noise

The word “noise” is generally used to describe sound that a listener finds disturbing, annoying, offensive, or, in the extreme case, physically painful. There are six characteristics of sound that generally describe noise as a listener perceives it: intensity, frequency, duration, loudness, annoyance, and offensiveness. Of these six characteristics, intensity, frequency, and duration can be physically measured. Loudness (i.e., perceived sound intensity), annoyance, and offensiveness are subjective and will vary widely with the perception of the listener.

Sound travels in waves; the higher the wave height or amplitude, the greater its power or intensity. The greater the number of sound waves reaching a point in a given time, the greater the frequency or pitch. The intensity of sound, or sound, is measured in decibels (dB). The frequency of sound is measured in Hertz (Hz; i.e., cycles per second); normal hearing ranges from 20 Hz to 20,000 Hz. Because human hearing is not equally sensitive to sound at all frequencies, an “A-weighting” filter system is used to adjust measured sound level to approximate this human frequency-dependent response. A-weighted sound level units are typically expressed as “dBA” or “dB(A).”

The decibel scale is logarithmic; therefore, a small increase in decibel rating represents a substantial increase in intensity. For example, while 10 decibels is 10 times more intense that one decibel, 20 decibels is 100 times more intense (10 x 10, rather than 10 + 10), 30 decibels is 1,000 times more intense (10 x 10 x 10), and so forth. The sound intensity multiplies by 10 with every 10-decibel increase.

Figure 5.1 provides a decibel scale that compares some common sounds and shows how they rank with regard to potential harm to hearing, as well as current Romanian regulatory limits.

4.2 Vibration

Vibration effects will be generated by the use of explosives in the excavation of quarried rock and ore, as well as by the use of heavy motorised vehicles and stationary equipment. In an open-pit mining operation, blasting is usually the more significant of the two sources with regard to its potential impacts. When an explosive detonates within a borehole, it causes the rock in the immediate vicinity to crack or distort. Outside the immediate vicinity of the blast site, permanent deformation does not occur; instead, rapidly decaying stress waves from the explosion cause the ground to exhibit elastic properties, whereby the rock particles are returned to their original position as the stress waves pass. This causes ground vibration to radiate away from the blast site, the effect being lessened as distance increases.

It is necessary reduce both ground and airborne vibration from blast events to the minimum possible for any specific blast design. Such a reduction substantially increases the safety, efficiency, and therefore the economy of blasting operations. However, even the best-designed and executed blasts will generate a certain amount of unwanted energy in the form of ground vibration waves, which will radiate away from the blast location. An observer’s perception of ground vibration will depend upon the amplitude, frequency, and duration of

motion and the effect of vibration magnification caused by ground conditions or structural characteristics at the observer's location. Vibration amplitude is commonly measured in terms of velocity by measuring the ground motion in three orthogonal directions, and determining the maximum amplitude (vector sum), which is commonly referred to as the Peak Particle Velocity (PPV). Human sensitivity to vibration is most acute at frequencies from 8 Hz to 80 Hz. Table 4-1 below presents typical degrees of human perception to continuous vibration.

Table 4-1. Perceived Vibration Levels

Approximate Vibration Level	Degree of Perception
0.10 mm/s	Not felt
0.15 mm/s	Threshold of perception
0.35 mm/s	Barely noticeable
1.0 mm/s	Noticeable
2.2 mm/s	Easily noticeable
6.0 mm/s	Strongly noticeable
14.0 mm/s	Very strongly noticeable

Vibration is frequently merely an annoyance to the observer, but large magnitude low frequency vibrations may cause structural damage ranging from the development of hairline cracks in plaster and mortar joints through the collapse of structural elements.

4.3 Noise and Vibration Setting - Roşia Montană Project

4.3.1 Sources

The potential noise and vibration impacts associated with the Roşia Montană Project are typical for a large, modern, open-pit mining operation, and will generally include:

- operation of light and heavy vehicles for transportation of personnel, materials, and equipment to, from, and within the Project site;
- drilling and blasting operations within the Project's industrial protection zone boundary, to support excavations in two quarries and four open pits;
- operation of mobile and stationary motorised equipment within the Project's industrial protection area boundary, including haul trucks, excavators, bulldozers, loaders, drill rigs, aggregate crushers, conveyor systems, and temporary and emergency generators;

- operation of major items of ore beneficiation equipment (e.g., gyratory crushers, grinding mills, separators, conveyors) in the processing plant; and

- periodic operation of various auditory safety signals, alarms, or sirens (e.g., vehicle backup alarms, blast warning and all-clear sirens).

4.3.2 Receptors

Receptors for mining-related noise and vibration include:

- the mining workforce, consisting of RMGC and contractor personnel;

- mine site visitors;

- the human population living in villages, towns, hamlets, or rural residences outside of the Project boundaries, as well as specific habitation locations within the protected areas of the Project;

- culturally or historically valued buildings or structures, as identified in the *Cultural Heritage Management Plan,* which may potentially be sensitive to vibration damage and are located in protected areas, near the Project boundary, and/or on major access roads.

5 Regulatory Considerations

Current ambient noise and vibration regulations applicable to Project activities are described in the current issued version of the Roşia Montană Project *Regulatory Requirements Matrix* (see Section 3.2 of the *Roşia Montană Project Environmental and Social Management Plan)*. These requirements will serve as the primary performance targets against which Project-related noise and vibration will be monitored, and are summarised as follows:

- **Romanian Standard STAS 10009-88: Urban Acoustics: Permitted limits of noise levels**; this standard refers to the admissible limits of noise in urban areas, differentiated by zones and areas of specific use, and technical categories of streets; it conforms to other specific technical regulations regarding systematisation and environmental protection.

  Exterior admissible noise values (L_{eq}) for streets, measured at the edge of the sidewalk and the roadway, are established as a function of the technical category of street and the associated traffic intensity. Category III (collector) streets have a maximum admissible equivalent level of noise of **65 dB(A).** Category II (connector) streets have a maximum admissible noise equivalent of **70 dB(A).** The maximum admissible level of noise, L_{eq}, at the limit of industrial zones in urban areas is **65 dB(A)**. Dwellings can be built on streets of different technical categories, or at the limit of zones or areas of a certain use, as long as the maximum noise value is 50 dB(A), measured 2 metres away from the building face.

- **Order No. 536/July 1997 of the Ministry of Health** establishes the maximum limits for noise levels (L_{eq}) in dwellings. Daytime (between 0600 – 2200) limits are **50 dB(A),** measured , measured 2 metres away from the building face; nighttime (between 2200 – 0600) limits are set at **40 dB(A)** near dwellings, measured 2 metres away from the building face.

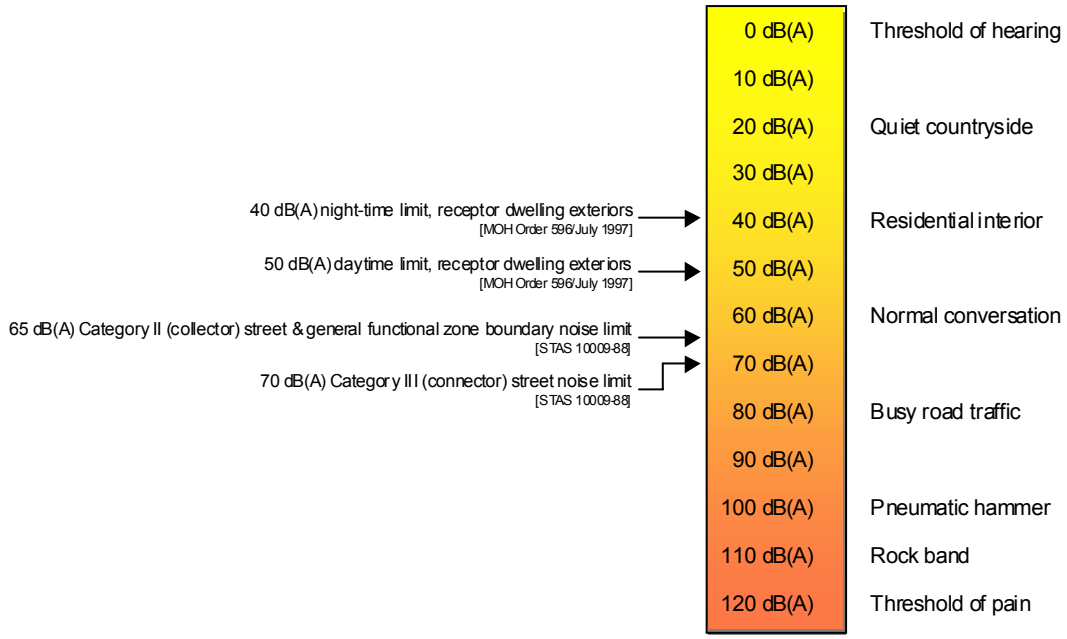
The db(A) limits associated with these regulations are shown on in relation to a typical decibel scale in Figure 5.1.

Vibration standards have also been developed that address the effects of traffic and machinery-induced vibration on dwellings, cultural buildings, and occupants, and are described as follows:

- Romanian Standard SR 12025/1-94: Vibration effects produced by road traffic on buildings or building parts (Measurement methods): Standard SR 12025/1-94 establishes methods of measurement for the parameters related to traffic vibration propagated through streets and affecting buildings or building components.

- Romanian Standard SR 12025/2-94: Building acoustics. Vibration effects on buildings or building parts (Permissible limits): Standard SR 12025-2/94 establishes the admissible limits for dwellings and cultural buildings as well as occupants who may be affected by vibration, either from internal/external machinery or from propagated vibration from street traffic.

Figure 5.1. Typical Decibel Scale, with Romanian Regulatory Levels Noted



As shown Tables 5-1 and 5-2 and Figures 5.2 and 5.3, admissible limits for both of these standards are expressed as the equivalent strength (*S*) of vibrations for a range of frequencies. These tables are based on information provided in SR 12025/2-94, and shall be used as the basis for assessing acceleration, velocity, and frequency data; see Sections 6.2.4 and 6.2.5. As noted in Section 1.3 of SR 12025/1, *S* values may be calculated using either velocity or acceleration data. It may be assumed that the higher the *S* value, the greater the potential for negative vibration-induced effects to occur.

No Romanian standards have been developed to date that apply specifically to vibration induced by blasting operations. However, frequency, velocity, and acceleration will be measured at sensitive structures adjacent to blasting areas during each blast as noted in Section 6.2.4. As noted in Section 6.2.5, these data will be evaluated in view of any observed structural damage or degradation and factored into refinements of the applicable blasting plan, in conjunction with the evaluation and resolution of any complaints or observations communicated by local stakeholders.

Table 5-1. Admissible Vibration Emissions – Structures

(following Table 1, SR 12025/2-94)

No.	Type of Building	Admissible Strength Levels (see Figure 4.3.2)
1	Rigid structures (with bearing walls, masonry walls, and/or cast-in-place or pre-cast concrete core walls) and:	
	Ground floor to 4-story, up to 15 m height	C1
	Ground floor plus 4 to 10 story, 15- 35 m height	C2
2	Multi-staged framed buildings, ground floor up to 10 stories and:	
	Single openings	C2
	Multiple openings	C3

Figure 5.2. Admissible Vibration Emissions – Acceptance Levels (Structures)

(following Figure 1, SR 12025/2-94)

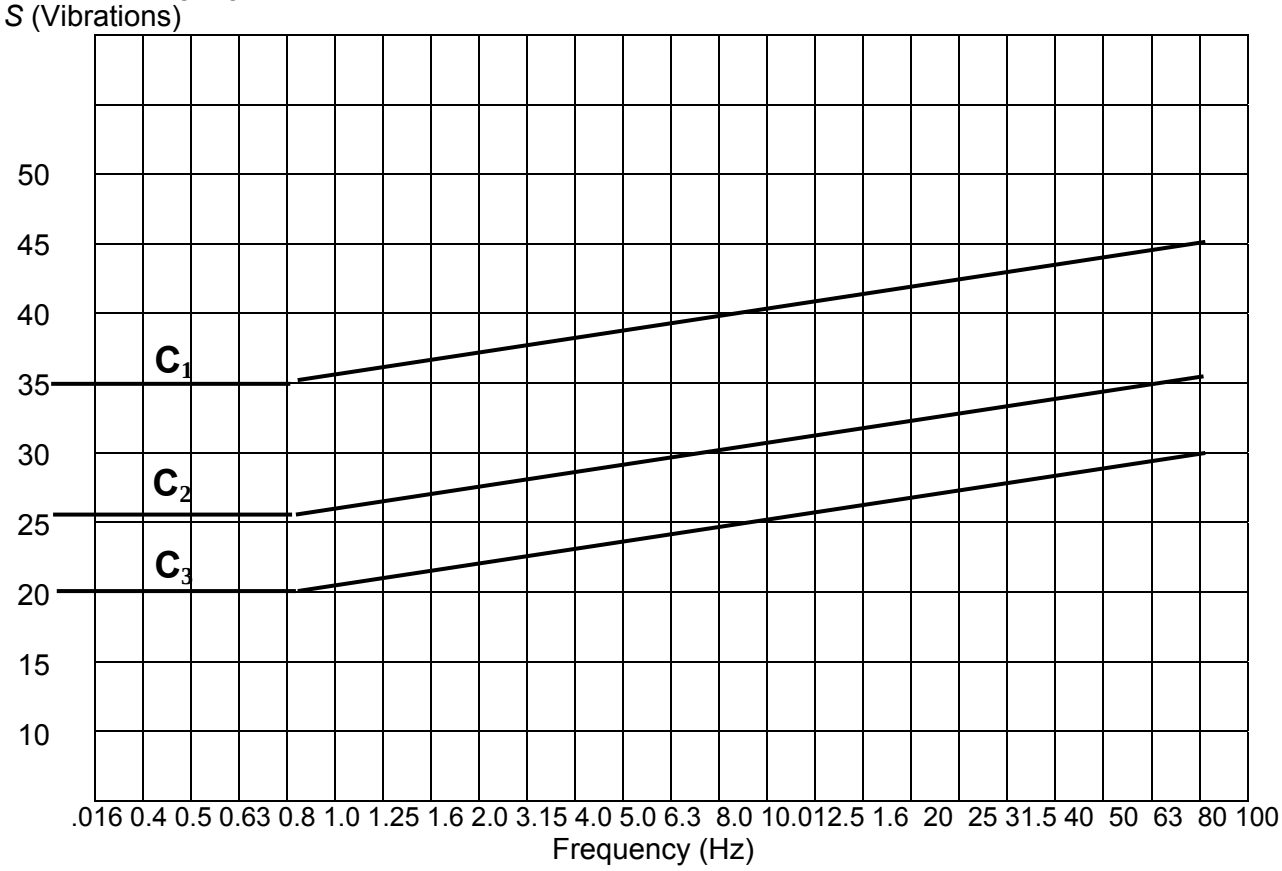
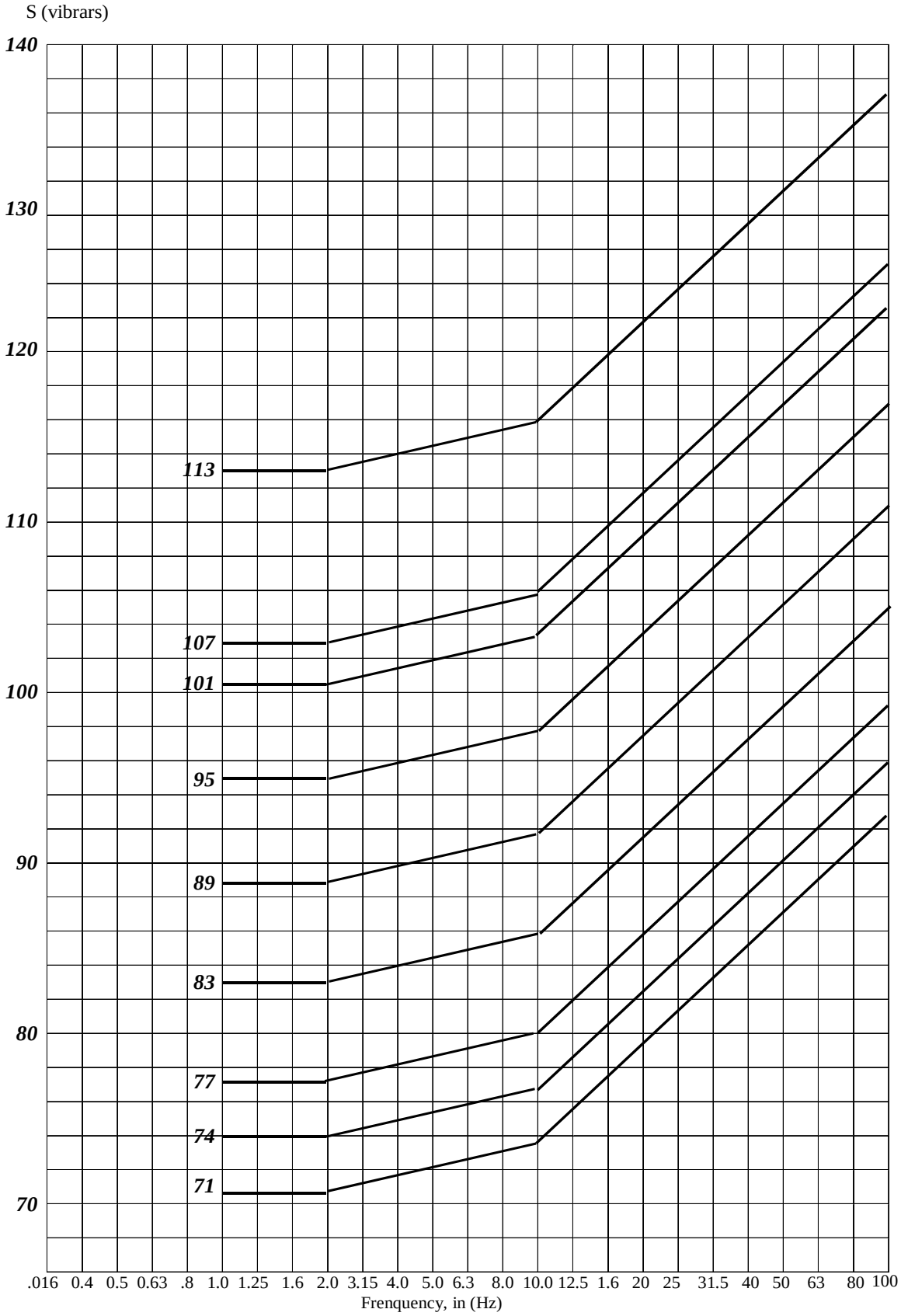


Table 5-2. Admissible Vibration Emissions – Occupants

(following Table 3, SR 12025/2-94)

No.	Building type	Admissible combined curve Avc (see Figure 4.3.3)
1	Dwellings (permanent habitations)	77
2	Dormitories, hotels, guest houses (temporary habitations)	77
3	Hospitals, clinics	71
4	Schools	77
5	Pre-schools	71
6	Technical/administrative buildings and their attachments (e.g. machine-shops, warehouses, storage areas)	83
7	Commercial buildings	89
Notes: See Section 2.5, SR 12025/2-94. Avc refers to a combined curve in the 1-2 Hz domain for transverse vibration curves, and in the 8-80 Hz for the longitudinal vibration curves. For the 2-8 Hz domain a linear interpolation between the two curves is estimated (see Figure 4.3.4). Numbers in the Avc column represent the acceleration level for a 2 Hz frequency, in decibels, reference value 10-6 m/s2.		

Figure 5.3. Admissible Vibration Emissions – Acceptance Levels (Occupants)
(after Table 7, SR 12025/2-94)



Several other European Union directives have been issued on management of noise and vibration in the open and working environment, applicable elements of which are considered in the RMGC *Occupational Health and Safety Plan* and preventive maintenance plans for major equipment.

As noted in Section 3.2 of the *Roşia Montană Project Environmental and Social Management Plan*, any changes or modifications to the aforementioned regulations will be reflected in updates to the *Regulatory Requirements Matrix*, which will in turn prompt an update to this *Noise and Vibration Management Plan.*

6 Management Approach

6.1 Management of Workforce Noise/Vibration Impacts

Noise and vibration impacts to the Project workforce will be managed separately via the hearing protection programme and other features of the RMGC *Occupational Safety and Health Plan*. Contractors will be required to implement the minimum applicable requirements of the RMGC hearing protection programme or to implement their own equivalent programme.

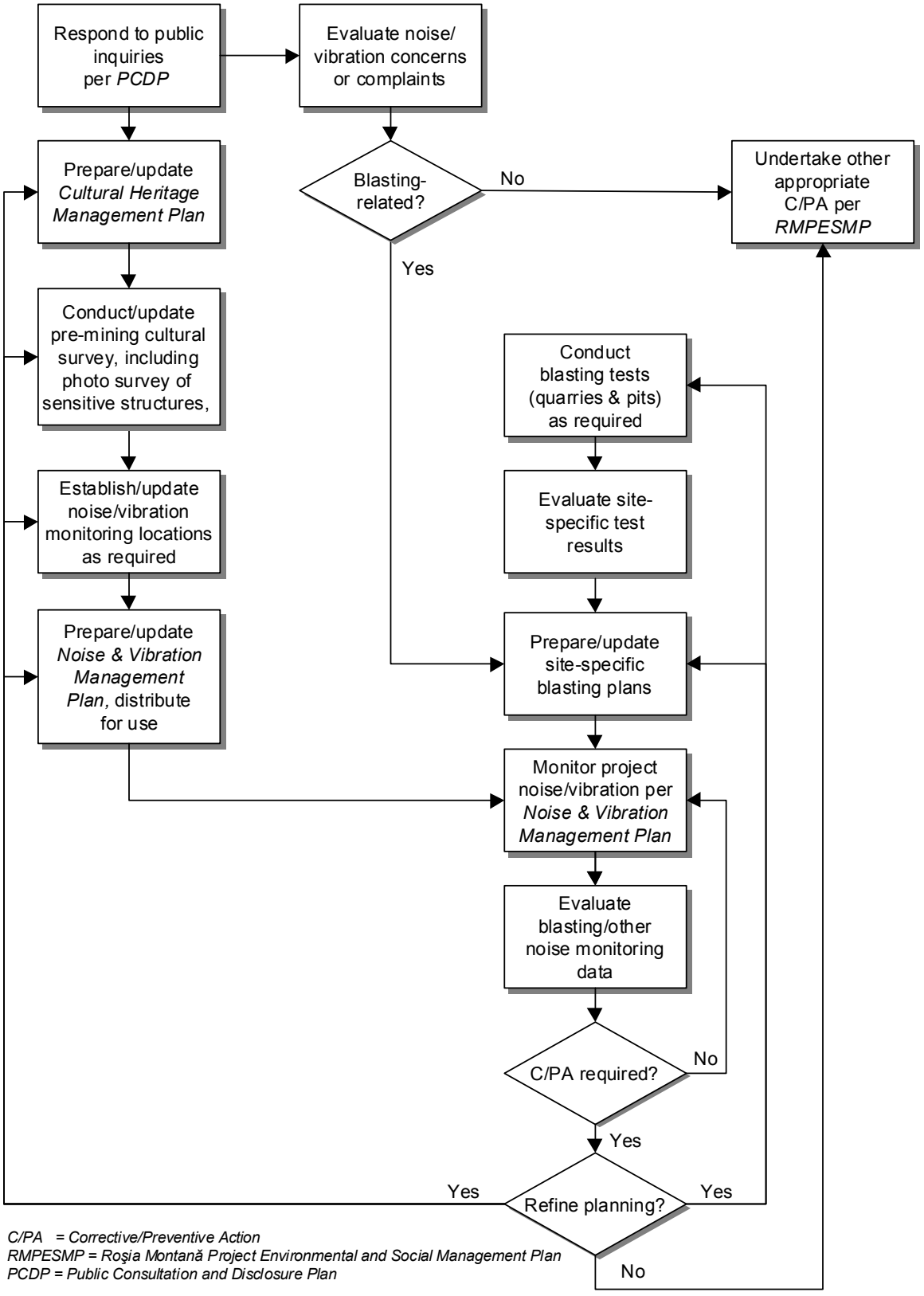
6.2 Management of Ambient Noise/Vibration Impacts

The overall process for managing the ambient impacts from Project-related traffic, mobile and stationary equipment operation in the processing plant and other Project area, and blasting operations in the quarries and open pits is summarised in Figure 6.1 and discussed further in the following paragraphs.

6.2.1 Consideration of Stakeholder Issues / Elaboration of the Pre-Mining Survey of Sensitive Structures

A community consultation, information and education programme will also be implemented as outlined in the Project *Public Consultation and Disclosure Plan,* in order to describe to the external community what sort of noise and vibration impacts are anticipated, why limiting impacts on the community is in the interest of RMGC and the public, and how the mitigation of impacts will be achieved though the implementation of best management practices (BMPs) that have been successfully applied on other international mining projects. Based on the information developed through this discourse and on the lists of historically or culturally significant structures identified in the *Cultural Heritage Management Plan,* the RMGC Environmental Management staff will direct or conduct photographic/physical mapping surveys of the sensitive structures or habitations so identified. Such surveys will be conducted by trained personnel in accordance with NM-01, “Surveys of Sensitive Structures”, well in advance of significant construction or blasting activities, in order to document existing structural conditions or damage, and to finalise the establishment of estimated vibration damage thresholds (in terms of PPV) and air-blast impact thresholds (in terms of overpressure), for separate consideration in the development of the blasting programme. An initial list of critical structures will be generated, with cross-references to their general location and applicable survey sketches and photographs. The locations of structures specifically selected for installation of permanent vibration sensors or periodic noise monitoring events will ultimately be indicated on updates to the monitoring location maps for the initial (construction) phase of the Project that are included in Figure 6.2. Figure 6.2 identifies areas of the Project that are potentially sensitive to noise and vibration; the isopleths so depicted are based on preliminary modelling-based estimates conducted as part of the Project EIA.

Figure 6.1. Noise and Vibration Management Process



C/PA = Corrective/Preventive Action
RMPESMP = Roşia Montană Project Environmental and Social Management Plan
PCDP = Public Consultation and Disclosure Plan

The *Noise and Vibration Management Plan* will be reviewed and updated on at least an annual basis in order to ensure that noise and vibration monitoring locations identified in Figure 6.2 and the required monitoring and evaluation activities remain appropriate for the current developmental phase of the Project. See Sections 4.6.2 and 6 of the *Roşia Montană Project Environmental and Social Management Plan*; MP-13, “Management Reviews”; and MP-16, “Environmental and Social Performance Improvement Process.”

6.2.2 Conduct Blasting Tests/Prepare Quarry or Pit-Specific Blasting Plans

All blasting work (including obtaining, transporting, storing, handling, loading, detonating, and disposing of blasting material) shall be carried out under the direction of a competent, experienced person who understands the hazards involved in blasting, and who has completed a blaster training certification program administered on behalf of RMGC by a recognised agency. These individuals will be designated as a Certified Blaster or Certified Blasting Engineer. Trained and properly certified RMGC mining operations staff and/or speciality contractors will conduct blasting tests to establish delays, charge weights, stemming lengths, blast size, explosives type, and other elements of the controlled blasting programme, in accordance with NM-02, “Test Blasting and Development and Implementation of Quarry or Pit-Specific Blasting Plans” and HS-18, “Blasting Safety.” Blasting tests will be required for each quarry and pit, in order to optimise blasting designs relative to the hardness and other characteristics of the rock or ore body, proximity to sensitive structures or human receptors, Project economics, and other factors. Efforts will be made to avoid unfavourable atmospheric conditions or blast orientations that could exacerbate noise (overpressure) effects, generate unproductive or excessive ground vibration, generate flyrock, or other undesirable conditions. No blasting is permitted at night. Blasting plans will be developed for each pit or quarry location that incorporate the evaluated results of blasting tests; all such plans shall be reviewed and approved by a Certified Blasting Engineer before any release for operational use.

The blasting plans so produced will be actively refined and updated in response to blast monitoring feedback, as discussed in Section 6.2.4.

6.2.3 Establishment/Updating of Noise and Vibration Monitoring Locations

RMGC staff will install an array of several permanent, semi-automatic monitoring stations near representative structures identified during the pre-mining survey in accordance with NM-03, “Ambient Noise and Vibration Monitoring.” Selection of the structures to be monitored will initially be based on professional judgement, the results of the baseline survey described in Section 6.2.1, the noise impact modelling performed in support of the Project EIA (reflected in the isopleths displayed in the current version of Figure 6.2), and specific stakeholder concerns or requests as relayed to RMGC via the communication processes defined by the Public Consultation and Disclosure Plan. As noted in NM-03, monitoring stations will be instrumented with noise and vibration recording equipment that will generally be triggered by ground vibrations at half the general maximum PPV (threshold - 2.5 mm/s). The instrumentation will also be capable of continuous monitoring; data will be routinely collected for every blast. Initially, the instrumentation will be downloaded on a weekly basis. Remote telemetry of the instrumentation output to the mine office may be activated during the operational phase of the Project.

6.2.4 Project Noise and Vibration Monitoring

The monitoring stations discussed in Section 6.2.3 will be operated continuously in accordance with NM-03, “Ambient Noise and Vibration Monitoring." Periodic follow-up inspections of selected structures or habitations will be carried out to detect whether or not

blasting has caused (or exacerbated existing) damage. In addition, noise-monitoring surveys will be conducted at specified locations in the adjacent communities on at least a monthly basis, using a sound level meter connected to a chart recorder. At least three 15-minute samples will be recorded per day for each monitoring site, along with wind speed and direction and other factors (e.g., traffic, animal, or insect noise) that could bear on the monitoring results.

6.2.5 Evaluation of Noise/Vibration Monitoring Data and Corrective/Preventive Action

The inspection data sheets specified in NM-03 will be completed and systematically forwarded to the RMGC Environmental Management office for evaluation and further action. Monitoring data summaries will be routinely made available to the public and other external stakeholders via the communications mechanisms defined by the *Public Consultation and Disclosure Plan*.

Any noted exceedances of the regulatory limits discussed in Section 5, blast vibration damage, or other noise/vibration-related complaints received from external stakeholders shall be documented as nonconformances and investigated and resolved through the corrective and preventive action process described in MP-10, “Corrective and Preventive Action for Environmental and Social Management System Non-conformances” and Section 5.2 of the *Roşia Montană Project Environmental and Social Management Plan*. The most likely physical source of any such complaint [e.g., blasting events, shipment of super heavy lift and over dimensional (SHLO) equipment, or construction activities] will be identified. Where appropriate, physical examinations of affected structures may be made and compared to pre-mining survey documentation to determine if damage is actually attributable to the source event. At a minimum, all such determinations shall be compared to the parameters of the associated event, and considered in adjustments to the design of future blasting activities, or to the mitigation of impacts associated with deliveries of materials and equipment, workforce transportation, or other potential sources.

All participants in the corrective and preventive action process described in MP-10, shall, at a minimum, (where noise and vibration nonconformances are concerned) specifically consider making appropriate adjustments to the affected blasting plan, or, where other noise and vibration sources may be involved, and implement one or more of the potential mitigative measures listed in Table 6-1 or other appropriate BMPs.

Table 6-1. Potential Mitigation Measures for Observed Noise Exceedances

Potential Mitigation Measures	Minimisation Potential	BAT Sources
Adjust frequency of deliveries by heavy vehicles to prevent concentrated impacts to adjacent communities	Variable	1
Adjust construction schedules to minimise night-time activities requiring the use of high acoustical-energy equipment (e.g., dozers, excavators) at night	Variable	1
Install solid, modular concrete noise control barriers as close proximity sound walls (e.g., “Jersey” barriers) along haul routes and sensitive access roads	5 to 10 dB	1
Place solid, portable, modular wood/metal or concrete noise control barriers as close proximity sound walls around operating rock drills or excavators	5 to 10 dB	1
Create noise control barriers via earthen/slag berms ("bunds"), which can be as long as required and from 10 to 20m high depending on the topography and geometry of the source(s) and receiver(s)	5 to 20 dB	7, 2, 3, 4
Acoustic treatment of dwellings in special situations, as necessary to improve habitable spaces	10 to 20 dB	10, 5
Fit heavy haul trucks with noise control systems as necessary to achieve desired reductions; options include: engine combustion management systems enclosing engine bays aerodynamic radiator fan design noise-control louvers or baffles on radiator grille noise-control louvers or baffles on hydraulic system cooling fans high-performance silencers variable backup warning systems, adjusted for ambient conditions chain mesh mudflaps low-noise tyre tread design	 2 to 5 dB to 10 dB 2 to 3 dB 2 to 3 dB 2 to 3 dB 5 to 10 dB variable benefits` <3 dB 1 to 3 dB	7, 10, 11, 6, 7, 8, 9, 10
Fit excavators with noise control systems as necessary to achieve desired reductions; options include: engine combustion management systems sound-absorbing panels within engine bays, under the deck area, and inside the counterweight sound absorbing panels around the powerpacks and hydraulic cooler house use multiple hydrostatically-controlled units for engine cooling (vs. single belt-driven fan) variable backup warning systems, adjusted for ambient conditions primary/secondary silencers, tuned to engine exhaust characteristics	 2 to 5 dB 3 to 5 dB 5 to 10 dB 2 to 4 dB 1 to 3 dB variable benefits 5 to 10 dB	7, 10, 11, 13, 15

[1] Professional experience, Advanced Acoustical Consultants, Inc. (AAC)
[2] *Mine Planning for Environment Protection*, Commonwealth of Australia, Environmental Protection Agency, Best Practice Environmental Management in Mining, June, 1995
[3] *Noise Management at Martha Mine, Newmont Mining; www.marthamine.co.nz/sound.html*
[4] *Noise, Vibration, and Airblast Control*, Environment Australia, 1998; www.ea.gov.au/industry/sustainable/mining/booklets/noise/noise3.html#3
[5] Australian Government, Department of the Environment and Heritage, *Checklists for Sustainable Minerals*, Checklist for Noise, Vibration, and Airblast Control, 2003
[6] *Pollution Prevention and Abatement Guidelines for the Mining Industry*, World Bank/UNIDO/UNEP draft guidelines, July 1993
[7] Caterpillar web site; www.cat.com
[8] *Essentials – Noise Management in the Construction Industry: A Practical Approach*, Government of Western Australia, 3/99
[9] *Noise Control Resource Guide – Surface Mining*, U. S. Department of Labor, Mine Safety and Health Administration (MSHA)
[10] *Environment and Community – Opportunities and Challenges for Mine Planning and Operations, Mt. Arthur Coal (BHP Billiton), May 2005*

Potential Mitigation Measures	Minimisation Potential	BAT Sources
Fit dozers with noise control systems as necessary to achieve desired reductions; options include: engine combustion management systems high-performance silencers engine shrouding variable backup warning systems, adjusted for ambient conditions optional tread control devices to reduce “track slap” characteristics	 2 to 5 dB 5 to 10 dB 5 to 10 dB variable benefits variable benefits	7, 10, 11, 12, 11

[11] *Bulldozer Noise Control, U. S. Department of Labor, Mine Safety and Health Administration (MSHA).*

7 Health and Safety Considerations

All RMGC and contractor activities addressed by this plan and its supporting procedures are subject to the requirements of the RMGC *Occupational and Health and Safety Plan,* as applicable to the hazards associated with specific Project assignments. Any personnel observing unsafe conditions shall notify their supervisors or RMGC Health and Safety staff for initiation of appropriate corrective and preventive action, as noted therein.

8 Records Management

Records of noise and vibration monitoring activities and associated management action are important documents that are critical to the continued safe and economical management of blasting and other noise-generating activities. All such records shall be retained in accordance with MP-11, “Management of Environmental and Social Management System Records” and Section 5.3 of the *Roşia Montană Project Environmental and Social Management Plan*. At a minimum, records shall include:

- complete list of sensitive structures and their locations; baseline structural survey reports, reference photographs, sketches, measurements, and other observations from sensitive structures;
- post-blast inspection notes, reference photographs, sketches and observations;
- blast records for each event, including:
    - date and time of blast;
    - name and signature of Certified Blaster or Certified Blasting Engineer supervising the event;
    - environmental conditions (e.g., temperature, cloud conditions, wind speed and direction, snow cover.) that may affect the noise/vibration characteristics of the blast;
    - location of blast (mine co-ordinates, elevation, and description);
    - sketch of blast pattern, including depth and diameter of holes, number of holes in blast and holes per delay, spacing of holes, burden on rows and direction of throw, and the type and dimensions of decking and stemming in blastholes;
    - type, product name, package dimensions, and density of explosives;
    - distribution and weight of explosive per hole;
    - maximum weight of explosive per delay;
    - delay type, sequence, pattern, and timing;
    - initiation system description; and
    - mats, padding, or other mitigation measures employed.
- vibration records for each blast event at all required monitoring locations, including:

- date and time of blast;
- name and signature of person recording monitoring data;
- type of instrument, sensitivity and calibration details;
- exact location of instrument and distance from blast;
- maximum vibration level (PPV reading);
- maximum noise level (Overpressure reading); and
- plots of vibration trace for each blast.

- personnel training records; and
- any noise complaint correspondence and associated corrective/preventive action records.

9 References

9.1 External References

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Commonwealth of Australia, 1995; *Mine Planning for Environment Protection*, Environmental Protection Agency, Best Practice Environmental Management in Mining

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Government of Western Australia, 1999; Essentials – *Noise Management in the Construction Industry: A Practical Approach*

Newmont Mining, 2005; *Noise Management at Martha Mine,* www.marthamine.co.nz/sound.html

Romanian Standard 12025/1-94; *Vibration effects produced by road traffic on buildings or building parts (Measurement methods)*

Romanian Standard 12025/2-94; *Building acoustics. Vibration effects on buildings or building parts (Permissible limits)*

U. S. Department of Labor, Mine Safety and Health Administration (MSHA); *Bulldozer Noise Control*

U. S. Department of Labor, Mine Safety and Health Administration (MSHA); *Noise Control Resource Guide – Surface Mining*

World Bank/UNIDO/UNEP, July 1993; *Pollution Prevention and Abatement Guidelines for the Mining Industry* (draft guidelines)

9.2 Rmgc Environmental and Social Management System References[12]

Roşia Montană Project Environmental Impact Assessment
Environmental and Social Monitoring Plan
Public Consultation and Disclosure Plan
Cultural Heritage Management Plan
Biodiversity Conservation Plan

RMGC Occupational Health and Safety Plan
RMGC Standard Operating Procedures Manual

- HS-18, “Blasting Safety.”
- MP-02, “Identification of Legal and Regulatory Requirements”;
- MP-03, “Environmental and Social Management System Training”;
- MP-10, “Corrective and Preventive Action for Environmental and Social Action Program Non-conformances”
- MP-11, “Management of Environmental and Social Management System Records”
- MP-13, “Management reviews”
- MP-16, “Environmental and Social Performance Improvement Process”
- NM-01, “Surveys of Sensitive Structures”
- NM-02, “Test Blasting and Development and Implementation of Quarry or Pit-Specific Blasting Plans”
- NM-03, “Ambient Noise and Vibration Monitoring”

[12] Note: all documents listed are controlled documents per Section 4.5 of the *Roşia Montană Project Environmental and Social Management Plan*; current approved versions shall be assumed to apply in all cases.

Appendix 1. Figure 6.2