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**SAVC Facility Reg: FR15/13809**  
**Vat No. 4310259751 Reg. no. 2009/024829/07**

## Proposed Rietkol Mining Operation

# Impact Statement on Broiler Farms and Egg Packing Station

PREPARED FOR: Jacana Environmentals CC

DATE: 5 August 2021

Compiled by Dr Neil Duncan, BVSc (Hons), M Med Vet (Aves), Diplomate,  
American College of Veterinary Pathologists. SAVC: 95/78

Reviewed by Dr Christopher Henderson BVSc, SAVC: D83/1851

## **DECLARATION OF INDEPENDENCE**

I, Dr Neil M Duncan and Dr C C Henderson declare that:

We act as independent specialists in this application to Jacana Environmental.

We performed the work in an objective manner.

We declare that there were no circumstances that may compromise our objectivity in performing such work.

We have no vested financial, personal or any other interest in the application.

We have no, and will not engage in, conflicting interests in the undertaking of the activity.

All the particulars furnished by us in this form are true and correct.



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**Practice Registration number: FR15/13809**

5 August 2021

## **Study Team Qualifications and Background**

The study team comprises Dr Neil Duncan and Dr Chris Henderson of C4Africa Professional Consultants. C4 Africa and its predecessor Irene Poultry Consultancy have been providing a veterinary service to the poultry industry for over 30 years, covering the fields of broiler breeder, broiler, layer, pullet, and hatchery. Routine poultry consultancy is provided to clients in South Africa, Mozambique, Botswana, Swaziland, Namibia, Zimbabwe and Zambia with requests for assistance from as far afield as Egypt, the UAE, Burundi and the DRC.

### **Legal Requirements**

None

### **Background**

An existing poultry operation is concerned that the mining operation will have a negative impact on the performance of broiler farms within close proximity to the proposed mining area, Rustig and Geluk, as well as a layer operation, Wegle and an egg packing station, Highveld.

#### **Distance from the mine:**

##### **Broilers**

Rustig (Rietkol): 764m

Geluk: 1082m

##### **Layers**

Wegle: 2500m

##### **Packing station**

Highveld: 817m

#### **Methodology:**

To assist in this evaluation a site visit was carried out on the 7<sup>th</sup> of June 2021 and the Air Quality, Blast, Noise and Dust Fall Assessments were consulted, bearing in mind that the findings were “worst case scenarios” and that with the mitigation procedures recommended, they would be reduced to manageable levels or negated entirely. The available scientific literature was reviewed, and colleagues were approached for input: Dr S Wisdom, St David’s Poultry Team,

the largest veterinary poultry practice in the UK, Prof S Williams, Ass Dean, Poultry Diagnostic and Research Centre, University of Georgia, USA, Dr O Fletcher, Prof and Dean Emeritus, NC State University, USA.

The negative effects of noise (including vibration) and decreased air quality (including silica and dust fall) were the main concerns raised with the setting up and operating of the new mine.

The ambient noise, vibration and air quality levels in the area need to be determined. Then the effect of the construction and operation of the mine on these parameters will be identified and evaluated, and after taking the suggested mitigating effects into consideration, an executive summary will be formulated.

# Noise

The ambient noise levels recorded in the proposed mine area are those of an urban environment due to the presence of major roads and light industry with a 55dB – 45dB rating for day and night-time, respectively (Enviro Acoustic Research, 2021).

Also to be included as ambient noise is the noise associated with the thunderstorms that occur on the Highveld, especially in summer. The noise associated with such events varies from rumbling to thunderclaps, with thunderclaps producing sound levels of 120dB.

“Disturbing noise” is considered to be noise 7dB above ambient noise, which would be 62dB during the day and 52dB at night.

Ambient noise level measurements at Rustig, the broiler farm closest to the mine (764m) in February 2021, were 58dB during the day and 58dB at night (impulse-weighted sound level) and 57dB during the day and 57dB at night (fast-weighted sound level). The constant noise level is most likely due to the noise generated by the fans of the broiler houses (Enviro Acoustic Research, 2021) and is above the recommended nighttime level of 45dB.

In evaluating the effect of air blast levels (converted to dB) on “areas of concern”, either for structural damage or from human perception, specific indicators are used:

Viz.

“Problematic” where there is real concern for possible damage – at levels greater than 134 dB.

“Complaint” where people will be complaining due to the experienced effect on structures at levels of 120 dB and higher (not necessarily damaging).

“Acceptable” if levels are less than 120 dB.

“Low” where there is very limited possibility that the levels will give rise to any influence on people or structures. Levels below 115 dB could be considered to have low or negligible possibility of influence.

## **Different sources of noise associated with mining:**

- A). Short duration - blasting
- B). Longer duration, repetitive - Construction phase: machinery and equipment
- C). Long duration, repetitive - Operation phase: machinery and equipment

## **Short duration**

While a blasting level of 134dB is the limit in SA, levels below 120dB should be the target. Looking at the effect of blasting, an area 500 m to 1500 m around the pit area can be considered as being a medium sensitive area with Rustig

(764m), Geluk (1082m) and the Highveld packing station (817m) falling within this zone (Blast Impact Assessment, 2021).

Beyond 1500m, this is considered a low sensitive zone with minimal effect on buildings and people, is the zone in which the feed mill and egg layer unit can be found (Blast Impact Assessment, 2021).

The air blast (converted to dB) levels were acceptable at Geluk (117.8dB) but fell within the range of “complaint” at Rustig (120.7dB) and at Highveld (120.2dB) with a 56kg charge and with the maximum charge (226kg), levels were in the “complaint” range at all sites viz. 121.7dB, 124.7dB and 124.1dB respectively (Blast Impact Assessment, 2021).

### **Increased noise of longer duration, which may be repetitive.**

Considering the noise generated by the various types of equipment used in the construction of a mine as set out in Table 4.1 of the Environmental Noise Impact Assessment (Enviro Acoustic Research, 2021), of the 41 pieces of machinery, it is only the use of an impact pile driver, impact hammer and vibratory pile driver that will produce sound over that of the day time ambient noise level of 55dB, viz 61.2dB, 56.2dB and 61.2dB respectively at 750m from the mine, which is just short of the distance of the mine from Rustig (764m). All 3 levels fall below the daytime disturbing noise level of 62dB. All other construction activities will produce noise below 55dB at 750m.

Considering Geluk (1082m from the mine) and Highveld (817m from the mine), it is only the impact hammer that will produce noise above the ambient level, viz. 58.7dB but well below the “disturbing noise” level.

With respect to the nighttime “disturbance level” of 52dB, it is also only the use of the impact pile driver, impact hammer and vibratory pile driver that will produce noise above this, at 750m from the mine.

Regarding possible operational noise, of the extra 19 sources of noise documented in Table 4.2 of the same report, no equipment use resulted in noise above 48dB.

With regard to the projected change in ambient noise due to the mine construction and operation, it is only Rustig that will experience an increase in ambient noise and that will only be during nighttime operations and will be between 3dB and 5dB (Enviro Acoustic Research, 2021).

Regarding the effect of such noise levels on poultry and poultry production:

Thunderstorms on the Highveld, accompanied by claps of thunder, have not been known to cause deaths in poultry, even though they produce noise at a level of 120dB (personal observations).

Mechanical equipment within the chicken house can generate noise, with ventilation fans producing 73dB and chain feeders 92dB (J. Brouček, 2014; Oh et al., 2011).

Repeated longer periods of noise of 80db – 118dB had no effect on the growth of young chickens (Stadelman, 1958b).

Noise up to 90 dB did not affect productivity and egg quality of laying hens (Oh et al., 2011).

Continual noise levels that pass the 85 dB level have been reported to cause a decreased feed intake of between 15-25%, stunting the growth of the chicken (Poultry World, Oct. 2016).

The proximity to a busy road (75dB – 80dB) had no effect on the production of a broiler breeder farm (Personal communication, Dr S Wisdom, St David's poultry team).

### **Conclusion:**

Loud noise of short duration, to a level of 120dB, does not negatively effect broilers. Louder noise, such as that associated with the 56kg charge at Rustig and the 224kg charge all three sites, will result in complaints. With the proposed new blast design, as recommended by the blasting specialist, no impact is envisaged.

If one looks at common examples of a continuous loud noise level of 73db – 80db (ventilation fans, a busy road) or repetitive loud noise of longer duration (chain feeders in the chicken house at 92dB) – there also does not appear to be any negative effects on broiler and layer chicken performance. Considering the possible noise associated with the construction and operation of the mine as well as the distance of the poultry units from the mine, “disturbance levels will not be reached during the day and only reached at night with the use of an impact pile driver or hammer (and that is without any attempts at mitigation).

It would appear that birds, after showing signs of stress, habituate to the noise and return to their normal behavior (Chloupek et al., 2009). The anatomy of the chicken lung also influences the possible negative effects air blast may have. The avian lung does not have alveoli, i.e., the airways do not end in a blind ending sack where oxygen transfer to the blood occurs. Birds draw air through the lungs and into large thin-walled cavities called air sacks. When they exhale, the air is pushed through the lung tissue again and oxygen transfer then occurs. Looking at the negative effect of air blast, that of lung injury with rupture of the alveoli accompanied by hemorrhage – without blind ending alveoli the lung tissue will not be damaged.

## Vibration

While most of the research done on vibration in broilers is in relation to transportation stress on the way to slaughter and its effect on meat quality (Brouček J., 2014), its effect on broiler production has not been researched.

In the case of layers, vibration greater than  $10\text{mm s}^{-1}$  did have a negative effect on egg production (Oh et al., 2011).

With a 56kg charge, the vibrations at Rustig (764m), Highveld (817m) and Geluk (1082m) were too low to be perceived,  $0.6\text{mm s}^{-1}$ ,  $0.5\text{mm s}^{-1}$  and  $0.3\text{mm s}^{-1}$  respectively, while with a maximum charge (226kg), vibrations were perceptible and acceptable ( $1.7\text{mm s}^{-1}$ ,  $1.6\text{mm s}^{-1}$  and  $1\text{mm s}^{-1}$  respectively) (Blast Impact Assessment, 2021, Table 13).

### **Conclusion:**

Vibrations produced by the normal (56kg) as well as the maximum (226kg) charge, are well below the level of  $10\text{mm s}^{-1}$ , reported in the literature, above which production issues in layers were observed. While there is no data on the effect on broilers, with the levels well below  $10\text{mm s}^{-1}$ , a negative effect is unlikely.

## Air quality

While the air quality for chickens is no different to that for people, the short length of the production cycle, viz the time the broiler will be in that specific environment, will negate any possible long-term effects. Broilers are normally slaughtered between 32 and 35 days of age so each bird will only be exposed to the ambient air for 5 weeks.

The possible pollutants of concern from the mine are Dust fall, Particulate Matter ( $\text{PM}_{10}$ ,  $\text{PM}_{2.5}$ ) and Silica.

The daily dust fall measured in June was below the residential standard of  $600\text{mg/m}^2/\text{day}$  being  $57.27\text{mg/m}^2/\text{day}$  (Rayten Engineering Solutions, 2021).

When particulate matter was measured in June 2021, the South African National Standard daily level of  $75\text{ug/m}^3$  for  $\text{PM}_{10}$  was not exceeded although the South African National Standard daily level for  $\text{PM}_{2.5}$  of  $40\text{ug/m}^3$  was exceeded 10 times during the test period, with a maximum recorded level of  $55.94\text{ug/m}^3$  (Rayten Engineering Solutions, 2021).

Background silica, measured as Alpha quartz, was at a level below the limit of reporting i.e.,  $0.013\text{mg}$  (Rayten Engineering Solutions, 2021).



## **Conclusion:**

From the Ambient Monitoring Report (Rayten Engineering Solutions 2021), the level of PM<sub>2.5</sub> in the ambient air often exceeded the South African National Standard daily level but is below the 75ug permissible level of PM<sub>10</sub>. Regarding the projected effects of the mine's impact on the air quality, in areas beyond the MRA boundary, all parameters were still below the health criteria standards for ambient air quality (PM<sub>10</sub>, NO, SO<sub>2</sub>) (EBS Advisory, 2021)

When combined with the current background concentrations the results are still below the health criteria standards for ambient air quality.

Regarding silica exposure, the risk identified for ambient environmental exposure, was below the US exposure limit of 100ug/m<sup>3</sup> viz.13ug (Rayten Engineering Solutions, 2021).

## **Mitigation**

Mitigation interventions have been proposed in all 3 areas viz. blast, vibration, and air quality. They are set out in detail in the respective assessment documents and bring all values into the acceptable range.

## **Executive Summary**

The areas of concern are noise, blast, and ground vibration but with the recommended mitigation measures put into place, they will be reduced to manageable levels or negated entirely. Good communication lines between the mine and the farm managers of both farms will be beneficial. Monitoring of air quality, noise and blasting should be conducted at the facilities of concern i.e. the broiler farms Rustig and Geluk and the Highveld egg packing station to determine any impacts associated with the proposed mining.

Due to the paucity and sometimes conflicting research results from projects carried out on poultry, we cannot say for certain that the mitigation recommendations will negate all the possible negative effects on poultry. Should there be negative effects on performance, then pre-performance data must be used to establish the financial losses on production due to the mining operation.

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