



**Borzym Acoustics**

Consulting & Engineering

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14 September 2017

To: John Rehberg

**Re: Noise-Induced Annoyance from  
Proposed WOLF II Sanctuary, Red Feather Lakes, Colorado**

Hello John,

This memorandum gives comments and my opinions regarding the proposed WOLF II Sanctuary. My earlier report regarding the Noise Assessment (produced by EDI) stated my conclusion from the information presented in that document, specifically:

**In six of the fourteen residences studied (or 43%), noise of wolf/dog-hybrid barking and howling will be Clearly Audible outside residences during quiet background noise conditions.**

That EDI Assessment made reference to Chapter 23 of the reference textbook "Handbook of Acoustical Measurements and Noise Control" (Harris, C.M., ed. 1998.). That Chapter is titled "Noise-Induced Annoyance in Individuals and Communities."

However, there is no discussion of annoyance in the Assessment. Discussion of annoyance is missing from this Assessment. This Chapter 23 does have useful information about annoyance, and this is where I will begin this present memorandum.

Following this evaluation of the Harris Handbook, I will then further discuss the facts and importance of annoyance due to noise from the proposed wolf/dog-hybrid animal care facility, including the relevant requirements of the Larimer County Noise Ordinance.

You will read why I believe that noise from the proposed animal care facility would be found annoying and disturbing. And why I believe the proposed facility would violate the Larimer County Noise Ordinance.

## **PART ONE**

### **ANNOYANCE – Synopsis of Chapter 23 of the Harris Handbook**

“Noise-induced annoyance” is the full noun to express annoyance caused by noise.

The Authors Sanford Fidell and David M. Green produced Chapter 23 “Noise-Induced Annoyance of Individuals and Communities” in “The Handbook of Acoustical Measurements and Noise Control, Third Edition”; Cyril M. Harris, Editor; 1998. They cite over a dozen studies on noise-induced annoyance. They make clear that annoyance is based on acoustical and non-acoustical factors.

The first page of this chapter explains that annoyance is not strongly related to loudness. They state:

“Indeed, the annoyance engendered by low-level noise intrusions (dripping faucets, chalk squeaks, footfalls in apartments, distant motorized vehicles in outdoor recreational settings, etc.) is more closely associated with audibility (bandwidth-adjusted signal-to-noise ratio) than with absolute level.”<sup>1</sup>

We can restate this fact the following ways:

**Annoyance can be caused by the intrusion of low-level noise when it is audible.**

or

**Noise does not have to be loud for it to be annoying.**

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<sup>1</sup> The word “level” in acoustics means loudness. “Low-level noise” means a relatively quiet sound or noise.

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An interesting aspect common to the four examples of quiet yet audible and annoying sounds in this quotation is that they are sounds that can be identified. The cause is evident. There is information in the acoustical signal (the noise) that allows the listener to identify the source of the noise. The brain interprets the signal. The person makes some judgment – either consciously or unconsciously – about the acceptability or the annoyance of that noise.

These Authors go on to make statements that relate low-level sounds to annoyance.

Emotions such as fear can cause noise to be more annoying.

Noise which gives economic benefit to the listener may cause less annoyance, and the inverse. Noise which gives no economic benefit may be found more annoying.

The Authors go on to state:

“In communities in which the prevalence of annoyance is controlled by nonacoustic factors, there may be little or no reduction on annoyance associated with reductions in noise exposure. The intensity of community response to noise exposure may even in some cases be essentially independent of exposure.”

This fact means that noise mitigation measures to slightly reduce the loudness or frequentness of wolf/dog-hybrid animal noise is unlikely to result in less annoyance.

The majority of scientific study of noise-induced annoyance had been conducted on loud noises such as aircraft flyover, automotive noise from highways and so forth. This is due to two main reasons. Loud sound is easier to measure and quantify. Federal law in the United States requires study of loud sounds from new developments, due to the obvious negative effects of noise. This Chapter then goes on to summarize analysis of community response to noise that is of the loud variety.

## **EVALUATION – Harris Handbook**

My thoughts based upon this chapter about noise-induced annoyance due to low-level sound are these.

- Noise does not have to be loud to be annoying.
- The wolf/dog-hybrid animal care facility does not give any significant economic benefit to the Red Feather Lakes residents, and therefore is not likely to be accepted on the basis of utility.
- The sound of wolf/dog-hybrid animals barking, baying and chorusing have several fundamental acoustical characteristics that are likely to make many people find it annoying.
- The noise is made by a pack of large predatory animals that have for millennia been a mortal danger to humans and their livestock. This can logically cause fear. Fear causes an autonomous chemical response in the human body that is a form of stress. This is a negative impact.
- The noise is intermittent and its occurrence cannot be predicted.
- The noise will occur at times of day when people are sleeping or resting, and therefore can startle people.
- The noise cannot be controlled by the listeners.

## **CONCLUSION – Harris Handbook**

My conclusion is that the audible sound caused by wolf/dog-hybrid animals at the proposed animal care facility will be found annoying or highly annoying by nearby residents when outdoors during quiet times.

## **PART TWO**

### **Larimer County Noise Ordinance 97-03**

The Larimer County Noise Ordinance has two components that qualify, or judge, whether a noise is or is not disturbing, and thus permitted or not permitted.

Section 6a uses a measurable sound level as a pass/fail criterion. I will not delve into that part 6a of the Noise Ordinance. It is not relevant to the noise impacts of the proposed wolf/dog-hybrid animal care facility. Loudness is not the issue here. Disturbance, or annoyance of noise is the issue at hand.

Section 6d is a different, and independent criterion for acceptability of noise. This section is clearly independent of section 6a. It seems evident that if section 6d is not satisfied, section 6a is irrelevant and does not supersede section 6d.

Stated more directly, if section 6d of the Noise Ordinance is not satisfied, the noise should be disallowed.

### **Definition of “Disturbance”**

The Merriam Webster Dictionary defines “disturbance” this way:

“Disturbance”

: something that stops you from working, sleeping, etc.: the act of disturbing someone or something

: a change in the position, arrangement, or order of something

: violent or noisy behavior especially in public”

To the second line above, I would add, ‘a change in the quality of something’.

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I posit that noise from baying and howling of wolf/dog-hybrid animals at the animal care facility will be disturbing to nearby residential neighbors. The noise will be audible, as clearly shown in the EDI Noise Assessment. The noise will be disturbing. The noise will disturb people, and perhaps livestock also. This noisy behavior of the wolf/dog-hybrid animals will disturb neighbors outside of their homes, on their properties, and perhaps inside of their homes also.

**Annoyance**

The EDI Assessment contains a valid and important statement in the first part of Section 2.0 pertaining to “Applicable Noise Ordinance / Laws”. This Author states:

**“Section 6d (of the Larimer County Noise Ordinance) uses the phrase  
“unreasonable interference” which can be interpreted to mean “annoyance” ... ”**

Indeed “annoyance” is the term of art that is customarily used in the science and engineering of acoustical phenomena to characterize the human negative response to noise in the occupied environment.

To annoy, per the several definitions within Merriam-Webster is:

**“to disturb or irritate, especially by repeated acts”**

**“to harass especially by quick brief attacks”**

**Annoyance is:**

**“a source of vexation or irritation”**

It is clearly evident that annoyance is a negative human experience.

I posit that noise from baying and barking of wolf/dog-hybrid animals will indeed be found disturbing, annoying, irritating, and vexing. The nature of these sounds will be brief, and repeated, as noted in the definition above.

## **Acoustical Environment at Red Feather Lakes**

This question of annoyance must be considered in the context of the environment at Red Feather Lakes, in vicinity of the proposed animal care facility.

This is an environment characterized acoustically by frequent periods of very low ambient or background sound. Absence of sound is frequent. Silence is a distinct and notable quality of this environment. The calm of silence is a value in this environment. This is a relatively rare characteristic, and no doubt one of the characteristics valued highly by residents of Red Feather Lakes. A person who does not live in such a quiet natural environment might be unable to appreciate this distinct character of this environment, unless urged to think clearly about this environmental value. A judgment on sound and noise in the Red Feather Lakes area cannot be made using the norms and values of someone residing in an urban environment.

Many residents in the Red Feather Lakes area spend considerable time out of doors. They work outdoors, relax outdoors, and perhaps even sleep in essentially outdoor conditions (i.e. with windows open). It would not be correct to consider disturbing noise conditions only within structures. Disturbance by noise must be considered in the out-of-doors.

## **Audibility of Noise**

When the ambient noise is very low, persons with normal hearing can attune to noise that is of very low level, especially if the noise is unusual, or has some other characteristic that causes the ear/brain system to pay attention. It is very easy to hear and comprehend the source of noises in quiet environments.

## **Character of Noise**

Sound – or noise – has many characteristics. Sound is not just loud or quiet. Sound has qualities. Sound can be shrill, throbbing, piercing, impulsive and so forth.

Disturbing noise has qualities that may or may not be well matched to the rest of the sonic environment.

In this case, the nature of the source sound (wolf/dog-hybrids baying, barking and howling) is not associated with the normal activities of the residents. The residents do not control this sound. They do not benefit from this sound. Noise is sometimes tolerated if there is benefit to the persons who are subject to it. The noise of wolf/dog-hybrid animals will not pose benefit to the residents of the Red Feather Lakes area.

Noise is sometimes found acceptable for some personally-beneficent reason. Such as a person who buys an inexpensive house next to an existing highway.

Noise is sometimes found acceptable if it is typical. Such as a person who buys a house in an urban or suburban environment with lots of traffic noise because they commute to their workplace.

Noise is sometimes found acceptable if it is beneficially associated with one's own activities. Such as a person who installs a pump on their property.

Noise is sometimes found acceptable if it is harmonious. Such as a music-lover who buys a house next door to a concert pianist who practices at home.

None of these scenarios seem germane to the proposed animal care facility.



### **Noise from Wolf/Dog-Hybrid Animal Care Facility Will Be Annoying**

I think it is critical to stress several characteristics of the noise that will be “Clearly Audible”<sup>2</sup> at neighboring residential properties from the proposed animal care facility. The chorus howl of wolves is a rather specific type of noise; it is a noise that has rather unusual – indeed rare – qualities.

➤ **It is not continuous and unvarying.**

A fan is an example of a continuous, unvarying noise. Fan noise does not vary in quality over time. Continuous noise tends to be less offensive than noise of varying quality. Wolf howl is not continuous and is not unvarying.

➤ **It is not common.**

Examples of common sounds are wind, vehicular traffic, human voices, machinery, flowing water. Wolf howl is not common.

➤ **It is rare.**

Where else might you hear wolf howls today? Wolf howl is extremely rare in populated locations in the United States.

➤ **It is frequent.**

The howls will occur repeatedly. At any time of day.

➤ **It is brief, and intermittent.**

The howls will start then stop. (See definition of “annoyance” above.)

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<sup>2</sup> “Noise Impact Assessment”; EDI report dated 25 May 2017.

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➤ **It is identifiable.**

The character of the sound is dissonant and time-varying, characteristics that make this sound easy to identify. It will be immediately evident that the noise heard is a wolf howl.

➤ **It will occur at any time.**

➤ **It is likely to occur at daybreak.**

➤ **It carries important information.**

Almost all sounds convey information to the attentive listener. Examples include human voice, television/radio broadcast, music, auditory alarms, sirens, train whistles, birdcalls, a housecat purring, and many more.

Signal in noise causes the human ear/brain system to pay attention. The importance of the information determines the degree to which the brain pays attention.

➤ **It is a signal of the presence of danger.**

Wolf howls are unlike other animal sounds. Humans can distinguish this sound from others. Audible wolf howls indicate that wolves are in close proximity. Chorus of wolf howling indicates that there are several or many wolves nearby. Wolves are inherently dangerous to humans.

➤ **It is a signal of alarm.**

Wolf howl has been experienced by humans for millennia. Wolves have been a carnivorous predator on humans for millennia. Humans have incorporated into their neural response network over these millennia a rational response to this noise. This response is of alert to proximate mortal danger.

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➤ **It is a noise that causes greater auditory sensitivity and human reaction.**

Wolf howl, being a signal of mortal danger to humans, is distinguished to a greater degree by humans and their well-developed brains than other noises that do not contain signal of danger. The audibility of danger signals can be quite low, but the brain – the interpreter of information – distinguishes this danger signal noise from other low-level noises that are normal in the environment.

➤ **It is not consistent with other normal activities of residents.**

Residents cause unnatural noise in their residential area but these are consistent with residential norms. House dogs and barns dogs bark. Horses neigh. Autos and other vehicles operate. But these are normal noises produced by a majority of residents, and thus become part of the expected soundscape. The roar of a lion or the take-off of an airplane would not be considered normal nor consistent with typical residential activities in the Red Feather Lakes area.

➤ **It is not consistent with the landscape.**

A lone natural wolf, or a pack of natural wolves travelling through the area would be a cause for notice and speculation and some degree of alarm. But such event would be rare and very limited in time extent – perhaps one night or maybe a few times a year – but not daily, nightly, year-in and year-out. A wolf-saturated soundscape would make this area an anomaly, perhaps even unique in Colorado.

➤ **It does not convey value.**

Automobile noise is tolerated because it gives value to nearly everyone. A lone rooster (outside of Iowa) is not generally tolerated because it does not give value to the general community.

➤ **It impacts humans and livestock.**

Just as for humans, livestock has had millennia to develop instinctive reaction to wolf howling. There is undoubtedly stress in some animals due to the danger signal given by wolf howls.

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**Conclusion**

In my professional opinion, if developed as proposed, noise from the proposed animal care facility will be found annoying and disturbing. Therefore I believe the proposed facility would violate the Larimer County Noise Ordinance.

Please do not hesitate to contact me with questions or comments.

Thank you.

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