

# Noise Modeling Report Wolf Creek Autobahn Northfield, MN

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# 1.0 Summary

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Wolf Creek Motorsports, LLC is proposing to construct a private road course near the City of Northfield, Rice County, Minnesota. The site is in Township 111N, Range 21W, Section 12 and 13, directly west of I-35. The proposed project is a private road course on a combined 466.4 acre site that encompasses the following existing PIDS: 0601350001, 0602475001, 0612225001, 0612325001, 0612300001, 0613250001, and 0613225001. The project consists of roughly 5.6 miles of private road course, 300 units of residential villas associated with the course, a clubhouse, open outdoor event space, a kart track, and 150 lot RV park. To support the development new sanitary sewer, storm sewer, multiple stormwater ponds and biofiltration basins, watermain, and water supply wells with a treatment system will be constructed.

During operation of the proposed project the primary noise sources at Wolf Creek Autobahn will be road course cars lapping on the track. Engine noise from the road course cars will be the primary source of noise. Go karts and other onsite vehicle traffic will also generate noise including vehicle traffic at the commercial properties. However, the road course cars will have louder engines and be traveling at higher speeds than other onsite traffic; therefore, contributing more noise to the area.

Due to the complexity of the project, noise modeling software was used to estimate the noise contribution by the site at nearby noise sensitive areas. Noise mitigation measures were included in the model that will need to be installed during construction of the site.

Sound level impacts associated with the project are predicted to comply with relevant Minnesota noise limits during track operation.

## 2.0 Noise Regulations

Minnesota Rule (Minn. Rule) 7030 regulates allowable noise in Minnesota. The rule classifies noise areas, and noise limits, based on the land use activity of the noise receiver. These limits are based on statistical calculations and are expressed as L10 and L50. These are sound levels in A-weighted decibels (dBA), which are exceeded 10 and 50 percent of the time for a one-hour survey, respectively.

Minnesota Statute 116.07.2a exempts motor vehicle race tracks built before July 1, 1996 from Minnesota noise standards. Since the proposed track would be constructed after July 1, 1996, Wolf Creek Autobahn will conform to the noise standards set forth in Minn. Rule 7030.0040. The surrounding area is zoned agricultural and transportation and are considered Noise Classification Area 3. Noise Classification Area 1 includes household units and includes farm houses; therefore, the residences on the zoned agricultural land that are considered Noise Classification Area 1 and are identified as noise sensitive areas (NSAs) on Figure 1.

Noise levels are split into daytime and nighttime levels, where more noise is allowed during daytime hours. The daytime period is from 7:00 am until 10:00 pm, and nighttime hours are from 10:00pm until 7:00 am. The noise classification area limits are summarized in Table 2-1 below.

**Table 2-1: Minnesota Noise Standards**

Area	Daytime		Nighttime	
	L50	L10	L50	L10
NCA 1	60	65	50	55
NCA 2	65	70	65	70
NCA 3	75	80	75	80

Wolf Creek Autobahn will only be operating during daytime hours and can be in constant operation; therefore, the NCA 1 daytime L50 limit of 60 dBA will be considered the noise limit for the project.

## 3.0 Noise Modeling

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Sound impacts associated with operations at Wolf Creek Autobahn were estimated using SoundPlan 8.1 noise modeling software. The software is able to account for local topography, atmospheric absorption of sound energy, ground and distance attenuation, barriers, and buildings from multiple noise sources using the ISO 9613-2 standard.

### 3.1 MODEL INPUTS

Georeferenced CAD files of the site grading, building locations, and track were loaded into the model along with 1-foot elevation data for the surrounding area. An aerial photo was also uploaded into the model and NSA locations were identified based on the aerial photo. 10 residences near the site are identified as NSAs 1 through 10 on Figure 1.

Default meteorological conditions are assumed for the model and are based on the ISO 9613 standard.

Ground hardness for all ground not otherwise occupied by buildings, track, or other paved areas is considered soft ground (hardness=1). For paved areas and the track hardness is considered hard ground (hardness=0).

Once the track layout was finalized, a lap simulation was conducted to estimate the lap time and speed of a car over the course. Based on that simulation the track was broken up into segments in 10 mph increments. The model is set to distribute the noise along the track segment based on the speed of the segment to represent a car moving at the given speed over the segment. This was presented as sound power per meter within the model. This means a slower segment will have more effect on local noise because the modeled 'car' is in the area longer, whereas a faster segment will have less effect on local noise because the modeled 'car' passes through the area more quickly. This is a more representative way of modeling the traffic on the track and the resulting noise. It was assumed that the car experience maximum engine noise along the entirety of each segment. Areas that would realistically experience lower engine noise due to braking or constant speed (turning) were not considered as a measure of conservatism in order to examine a worst-case day of operation.

The track layout was designed to have course and operational flexibility so 4 scenarios were modeled. These scenarios are referred to as Track 1, Track 2, Track 3, and Tracks 2 and 3. Track 1 is the full course layout, Track 2 is a smaller loop on the north end of the course, and Track 3 is a smaller loop on the south end of the course. Tracks 2 and 3 do not share any of the course and could be used at the same time. Please refer to Figures 2 through 4.

Speeds and lap times for Tracks 2 and 3 are estimated based on the lap simulation for Track 1 and estimating speeds and times for turns that were not in the simulation based on similar turns that were simulated.

The proposed noise limit to road course cars set by the management company for the Wolf Creek Autobahn would be 103 dBA measured at 50 feet. This limit is consistent with noise limits at similar tracks. The proposed sound power limit equates to a sound power level of

138 dBA which was used in the model. Decreases in noise limit result in a linear decrease in modeled results, so only the 103 dBA at 50 feet limit was modeled.

Additional noise mitigation features like 8-foot-tall noise mitigating fencing along the property perimeter, berms, and villa siting, and additional 15-foot-tall noise mitigation fencing on the property where also included in the model. Please refer to Figure 5 for model inputs.

### 3.2 MODEL EXCLUSIONS

The proposed kart track was not included in the noise model. The course configuration is highly variable which would affect the number of karts on track and the speed they would travel. Wolf Creek Autobahn is anticipating using electric karts which are far less noisy than gasoline powered karts due to the lack of exhaust noise.

The loudest karts with gasoline powered engines are racing karts that are normally limited by FIA noise limits of 105 dBA measured 10 feet above the track. If Wolf Creek Autobahn intends to allow gasoline powered karts, additional noise mitigation like noise mitigating fencing and developing a site specific noise limit for the karts based on field measured data is recommended.

Additional site features like the outdoor event space and RV park are not included in the model. These activities should be incorporated into the site's Noise Mitigation Plan.

### 3.3 MODELING SCENARIOS

The remaining variable for the noise from the site is the number of laps per hour that can competed during operation. These data are based on anticipated run group sizes for each track. For scenarios for Tracks 2 and 3, it is assumed the track will be operating at the same time with the same number of laps per hour for each track (hourly lap count of 100 means 100 laps on Track 2 and 100 laps on Track 3 during the same hour). The number of laps modeled for each track layout are summarized in Table 3.3-1 below:

**Table 3.3-1: Modeled Lap Count**

Configuration	Hourly Lap Count
Track 1	100
Track 1	50
Track 2	100
Track 2	50
Track 3	200
Track 3	100
Tracks 2 and 3	100
Tracks 2 and 3	50

## 4.0 Results and Discussion

### 4.1 MODELED RESULTS

Based on inputs noted in Section 3.0, the results for various track configurations and lap counts with a 103 dBA at 50 feet limit are summarized in Table 4.1-1. **Bold** data indicates operating scenarios modeling exceedance of the assumed 60 dBA limit at the NSAs. An example of the model output demonstrating compliance with the 60 dBA limit for all noise receptors under Scenario 1 (Course 1, 103 dBA, 50 cars per hour) is displayed in Figure 6.

**Table 4.1-1: Modeled Results for 103 dBA at 50-foot Limit**

Configuration	Hourly Lap Count	NSA 1	NSA 2	NSA 3	NSA 4	NSA 5	NSA 6	NSA 7	NSA 8	NSA 9	NSA 10
Track 1	100	<b>63.0</b>	<b>61.6</b>	59.3	<b>61.7</b>	<b>60.6</b>	<b>60.3</b>	54.0	<b>60.6</b>	<b>61.7</b>	59.5
Track 1	50	60.0	58.6	56.3	58.7	57.6	57.3	51.0	57.6	58.7	56.5
Track 2	100	<b>62.3</b>	<b>60.7</b>	58.2	57.7	49.5	48.9	48.1	51.3	59.3	58.4
Track 2	50	59.3	57.6	55.2	54.7	46.5	45.9	45.1	48.3	56.3	55.4
Track 3	200	51.9	54.6	53.3	58.1	<b>62.8</b>	<b>62.5</b>	54.1	<b>62.6</b>	<b>60.4</b>	55.6
Track 3	100	48.9	51.6	50.3	55.1	59.8	59.5	51.0	59.6	57.4	52.6
Tracks 2 and 3	100	<b>62.5</b>	<b>61.2</b>	58.8	59.6	<b>60.2</b>	59.9	52.8	<b>60.2</b>	<b>61.5</b>	59.4
Tracks 2 and 3	50	59.5	58.2	55.8	56.6	57.2	56.9	49.8	57.2	58.5	56.4

## 4.2 CALCULATED RESULTS

As previously discussed, any decreases in noise limit result in a linear decrease in modeled results, so only the 103 dBA at 50 feet limit was modeled. A 3-dB reduction as applied to the modeled results from Table 4.1-1 to represent a 100 dBA at 50 feet limit. These results are summarized in Table 4.2-1. **Bold** data indicates operating scenarios modeling exceedance of the assumed 60 dBA limit at the NSAs.

**Table 4.2-1: Calculated Results for 100 dBA at 50-foot Limit**

Configuration	Hourly Lap Count	NSA 1	NSA 2	NSA 3	NSA 4	NSA 5	NSA 6	NSA 7	NSA 8	NSA 9	NSA 10
Track 1	100	60.0	58.6	56.3	58.7	57.6	57.3	51.0	57.6	58.7	56.5
Track 1	50	57.0	55.6	53.3	55.7	54.6	54.3	48.0	54.6	55.7	53.5
Track 2	100	59.3	57.7	55.2	54.7	46.5	45.9	45.1	48.3	56.3	55.4
Track 2	50	56.3	54.6	52.2	51.7	43.5	42.9	42.1	45.3	53.3	52.4
Track 3	200	48.9	51.6	50.3	55.1	59.8	59.5	51.1	59.6	57.4	52.6
Track 3	100	45.9	48.6	47.3	52.1	56.8	56.5	48.0	56.6	54.4	49.6
Tracks 2 and 3	100	59.5	58.2	55.8	56.6	57.2	56.9	49.8	57.2	58.5	56.4
Tracks 2 and 3	50	56.5	55.2	52.8	53.6	54.2	53.9	46.8	54.2	55.5	53.4

## 4.3 INITIAL OPERATING SCENARIOS

Based on the modeled site layout and track configuration, there are multiple operating scenarios that will be compliant with the 60 dBA limit at the NSAs. Table 4.3-1 summarizes the initial operating scenarios with car noise limits and the corresponding hourly lap count limit.

The model is based on conservative assumptions and actual noise from the site is expected to be lower than modeled during operation. These operating scenarios should be incorporated into the site's Noise Mitigation Plan and be treated as operating restrictions until such time as Wolf Creek Autobahn can demonstrate compliance with the 60 dBA limit at the NSAs with field measured data.

**Table 4.3-1: Initial Operating Scenarios**

Configuration	Noise Limit at 50'	Hourly Lap Count	Maximum Modeled Noise	NSA Location
Track 1	103 dBA	50	60.0	NSA 1
Track 1	100 dBA	100	60.0	NSA 1
Track 2	103 dBA	50	59.3	NSA 1
Track 2	100 dBA	100	59.3	NSA 1
Track 3	103 dBA	100	59.8	NSA 5
Track 3	100 dBA	200	59.8	NSA 5
Tracks 2 and 3	103 dBA	50	59.5	NSA 1
Tracks 2 and 3	100 dBA	100	59.5	NSA 1



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## 5.0 Conclusion

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Based on the data in Section 4.0, there are multiple operating scenarios that will be compliant with the 60 dBA limit at the NSAs. These operating scenarios should represent the initial operational limits for lap counts and car noise limits until such time as Wolf Creek Autobahn can demonstrate compliance with the 60 dBA limit at the NSAs with field measured data.

1. Noise Sensitive Areas
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