Intended for
Kimley-Horn and Associates, Inc.

Date
August 3, 2026

DUE DILIGENCE – SOUND AND VIBRATION REPORT SUMMARY

Kimley-Horn and Associates, Inc.
Project Bluestem
Leavenworth County, Kansas

Due Diligence – Sound and Vibration Report Summary

Project name	**Project Bluestem**
Project no.	**1940115134**
Recipient	**Kimley Horn and Associates**
Version	**1.0**
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Prepared by	**Dalima Kapten - Consultant**
Approved by	**Ryan J. Matheson, MSc. Applied Physics, P.Eng – Managing Consultant**
Description	**Due diligence desktop report summary for the referenced project site outlining findings related to sound and vibration emissions.**

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1. Project Site Review

1.1 Introduction

Cloverleaf is developing a data center facility, Project Bluestem, south of the City of Tonganoxie and in Leavenworth County, Kansas.

A review was completed to identify, at a high level, possible industrial site development and operational risks related to the proposed data center operations' environmental sound and vibration emissions.

1.2 Project Site and Vicinity Description

The project site is directly south of the City of Tonganoxie in unincorporated Leavenworth County, Kansas, west of U.S. Highway 40, as shown in Figure 1-1.

Figures 1-2 and 1-3 depict the current city and county zoning classifications, respectively, for the project site and surrounding properties. The project site is expected to be rezoned to Light Industrial (I-1) in Leavenworth County. Figure 1-4 depicts the future land use classifications for Leavenworth County.

The nearest noise-sensitive receptors are shown in Figure 1-5. These include two rural residences, both approximately 100 feet from respective site boundaries. All the nearby residences are in unincorporated Leavenworth County. Additionally, there is a church with a preschool approximately 2,000 feet from the project site boundary.

1.3 Proposed Facility

The facility is expected to include five (5) single-story data center buildings. Primary sound sources are likely to include ventilation equipment, rooftop exhaust fans, and emergency generators (when occasionally operating). It is understood the facility could operate 24 hours per day, 7 days per week. Additionally, maintenance and testing operations of the emergency generators are expected to be performed regularly.

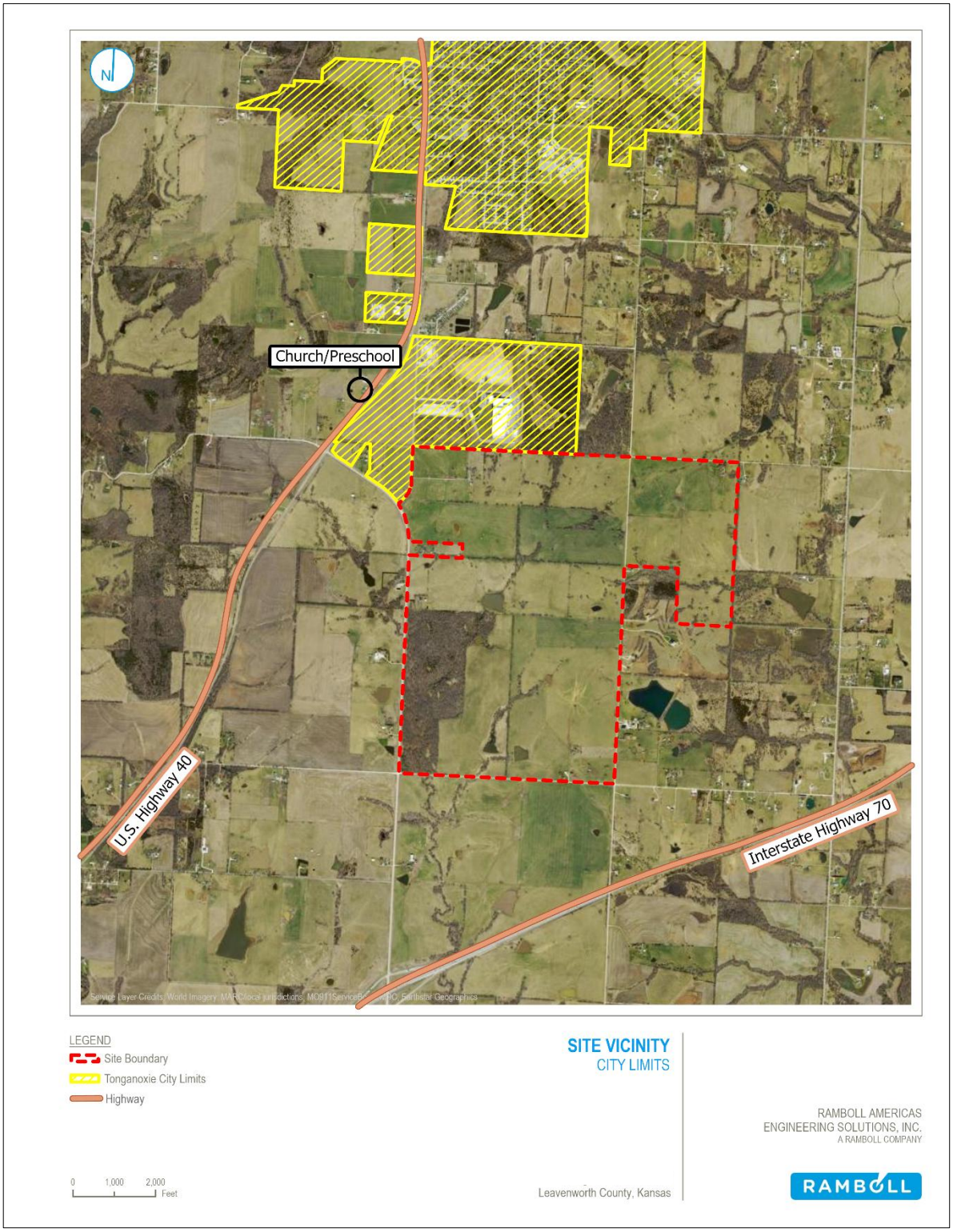


Figure 1-1. Project Bluestem- Site Vicinity.

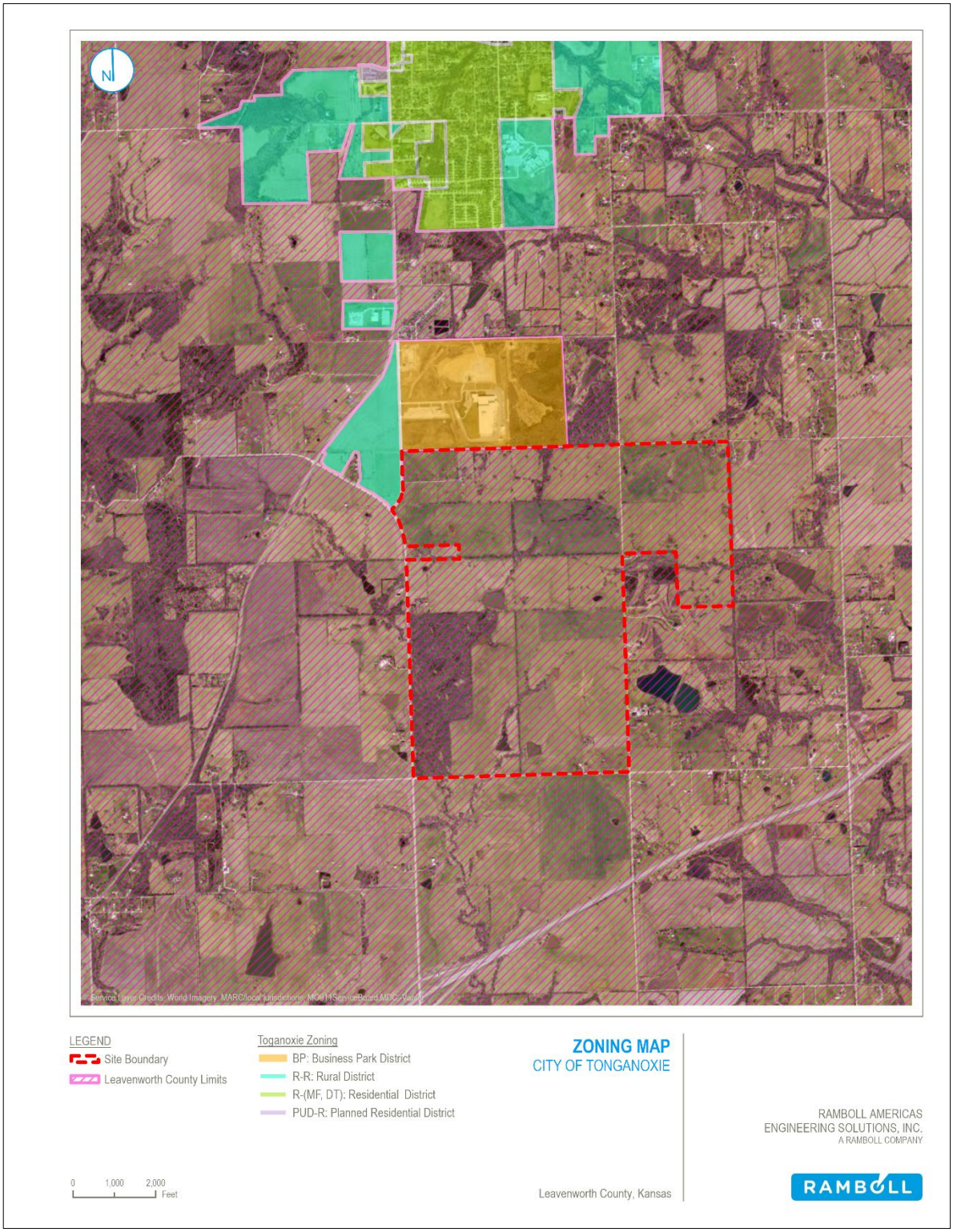


Figure 1-2. Project Bluestem - City of Tonganoxie Zoning Map

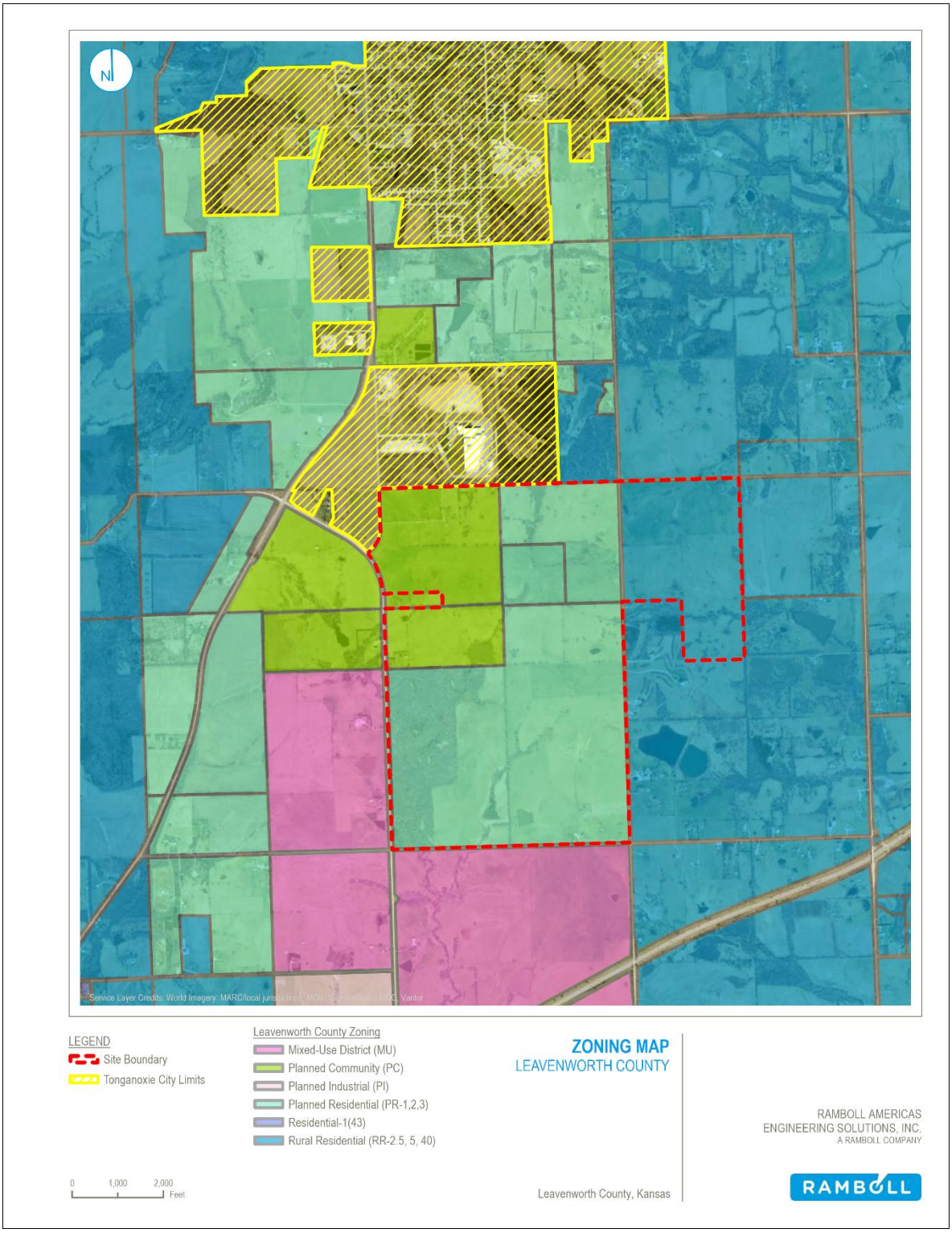


Figure 1-3. Project Bluestem- Leavenworth County Zoning Map

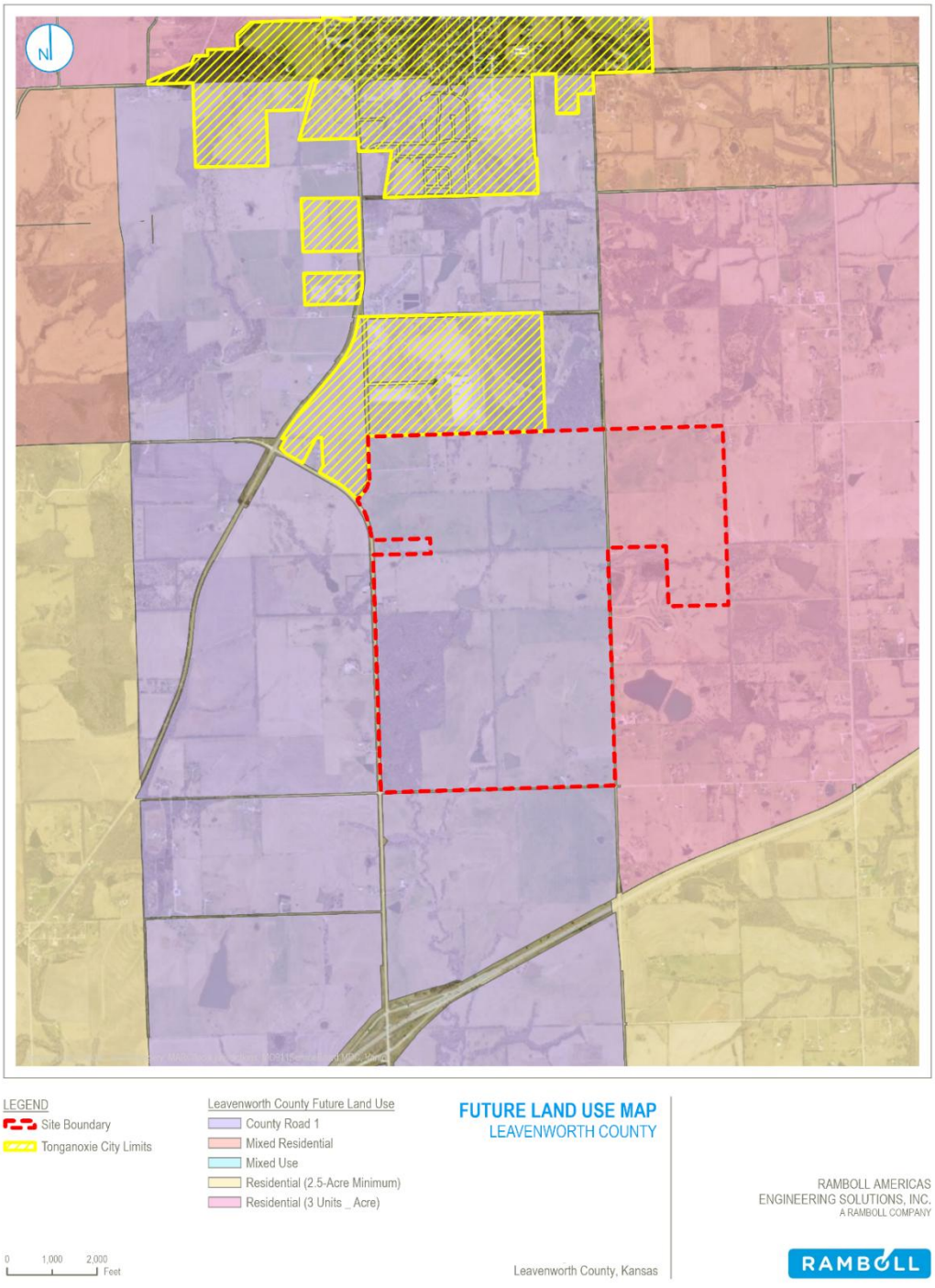


Figure 1-4. Project Bluestem - Leavenworth County Future Land Use

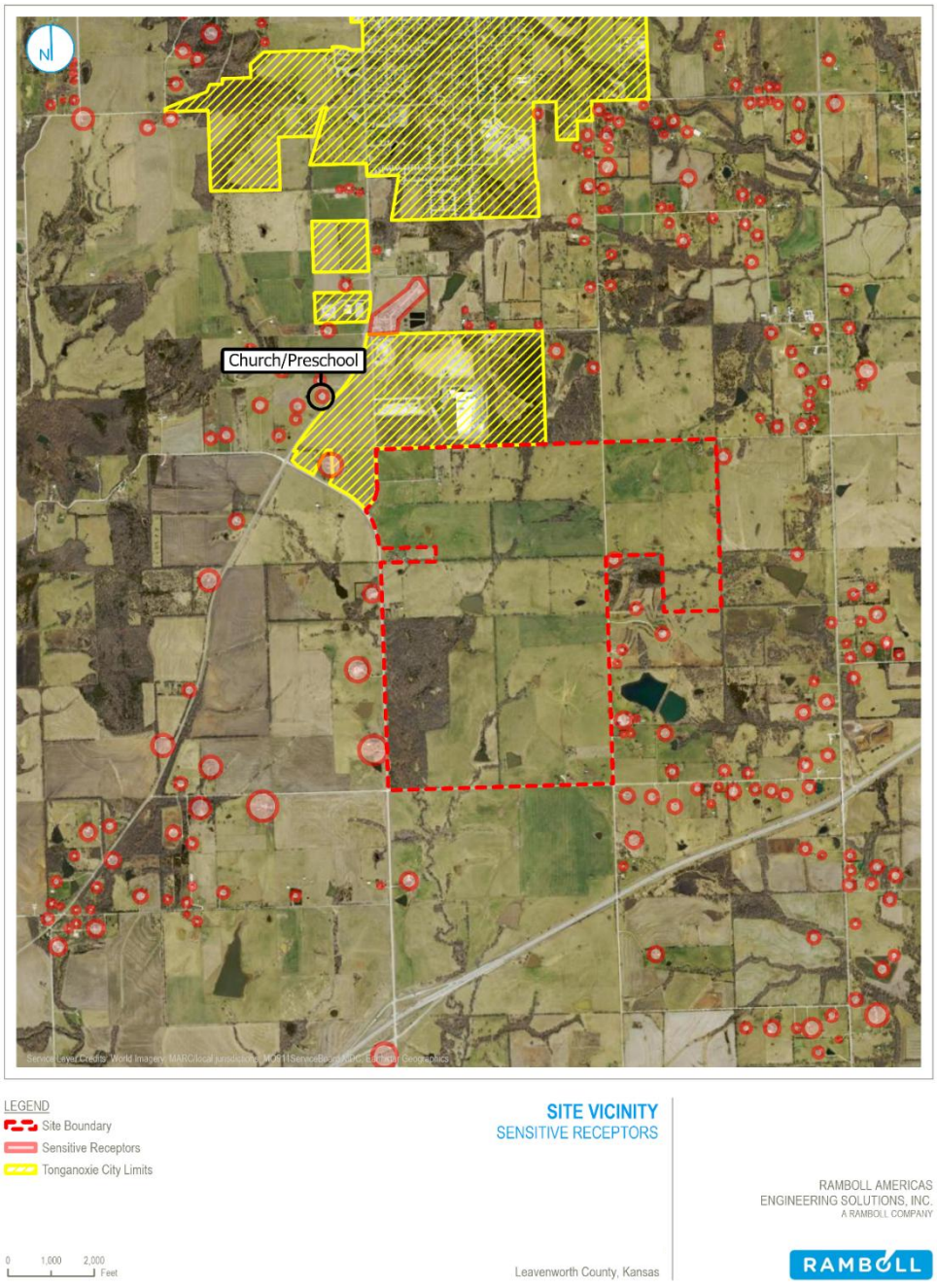


Figure 1-5. Project Bluestem – Nearby Sensitive Receptors

2. Project Acoustical Criteria

The following subsections present a summary of the acoustical criteria applicable to sound and vibration emissions from the proposed project.

2.1 Regulatory Framework

An overview of the legislative/regulatory framework for the applicable jurisdictions as related to environmentally sound emissions is presented herein.

- State of Kansas
- City of Tonganoxie
- Leavenworth County

2.1.1 State of Kansas

No state requirements pertaining to environmental sound and vibration have been identified.

2.1.2 City of Tonganoxie

The northern boundary of the site is directly adjacent to the City of Tonganoxie, Kansas. The City of Tonganoxie has established noise regulations in its Zoning and City Code to prevent loud and unnatural noises that could disturb public comfort. According to Chapter XI, Article 2(f) of the Tonganoxie City Code[1], construction activities are limited to the hours between 7:00 AM and 9:00 PM. Additionally, Section 16 of the Tonganoxie Zoning Code prohibits sound levels no louder than the average traffic in the area at the property boundaries of Light Industrial districts. While this technically would not apply to the project site, which is in Leavenworth County, the limit is generally consistent with county requirements discussed below. No exemptions are noted for testing of emergency generators, or operation of emergency generators during a power outage.

2.1.3 Leavenworth County

The site is in the unincorporated area of Leavenworth County. According to Article 27(b) of the Leavenworth County Zoning and Subdivision Regulations[2], a sound level limit of 60 dBA[3], or the normal daily level of traffic noise, is imposed on all districts at property boundaries. Additionally, the Leavenworth County Code of Ordinances prohibits the use of construction equipment outside the hours of 7:00 AM to 10:00 PM. No exemptions are noted for testing of emergency generators, or operation of emergency generators during a power outage.

2.1.4 Vibration Emissions Criteria

According to the County Code, the creation of perceptible vibrations without the use of special equipment to measure is prohibited. However, this type of industrial development is not typically a significant source of vibrational energy.

[1] City of Tonganoxie Zoning Code / City Code, last accessed on June 23, 2025.
[2] Leavenworth County Code of Ordinances, last accessed on June 23, 2025.
[3] Weighting is not indicated in the code; The applicable metric is the 1-hour A-weighted Equivalent Sound Pressure Level in decibels are assumed in accordance with industry standards.

3. Ambient Sound Survey

The results of the continuous monitoring provide an indication of the daily trends in the ambient sound levels over this period. The continuous sound level monitoring results are summarized in the following tables and figures.

3.1 Acoustical Conditions

Sound levels were continuously monitored at each location to capture typical ambient daytime and nighttime sound levels. The survey took place over two (2) 48 hour periods. The first phase was 11:00 a.m. on Wednesday May 13, 2026, to approximately 11:00 a.m. on Friday May 15, 2026 while the second phase was 2:00 p.m. on Monday July 6, 2026 to approximately 2:00 p.m. Wednesday July, 2026. During phase one (1) of the survey, the weather was generally calm with occasional wind gusts, and temperatures ranging from 47°F at night to 87°F during the day. During phase (2) of the survey, the weather was also generally calm, with temperatures ranging from 63°F at night to 91°F during the day.

3.2 Survey Locations

The survey consisted of continuous 48-hour sound level monitoring at five (5) locations. Phase one (1) of the survey consisting of sound level monitors (SLM) 1-3, and phase two (2) consisting of SLM 4 and 5. These locations were used as representations of the most critical noise-sensitive receptors. These locations were deemed adequate for assessing existing sound conditions and are detailed in Table 3-1 and shown in Figure 3-1.

Table 3-1. Sound Level Monitoring Locations

Location	Description	Measurement Type
SLM 1	Located near the west area of the site. Representative of rural residential locations west of the site boundary along 222nd street.	Continuous Monitoring (~48 Hours)
SLM 2	Located near the site's midsection along 214th Street. Representative of rural residences south of the site.	Continuous Monitoring (~48 Hours)
SLM 3	Located near Honey Creek Road, near the northeast corner of the site. Representative of residences near the site, the northwest corners of the site.	Continuous Monitoring (~48 Hours)
SLM 4	Located on the east site boundary along 214th Street. Representative of rural residences east of the site boundary.	Continuous Monitoring (~48 Hours)
SLM 5	Located near the northwest site boundary corner, near the intersection of 222nd Street and Honey Creek Road. Representative of rural residences west of the site boundary.	Continuous Monitoring (~48 Hours)

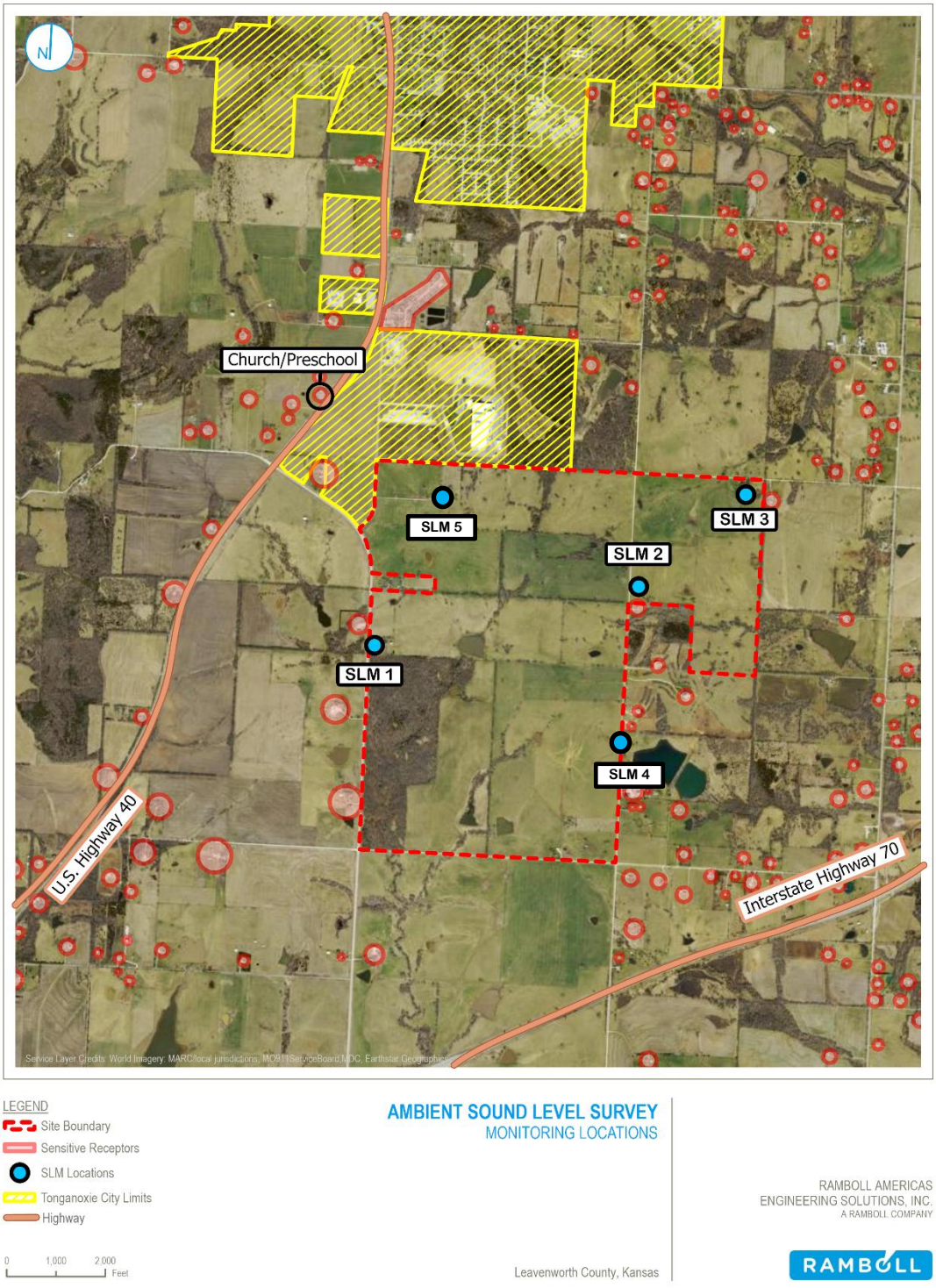


Figure 3-1. Site overview and sound monitoring locations.

3.3 Result Summary and Comparison of Overall Measured Sound Levels

Table 3-2 shows the average background sound levels (L_{AEQ}) for each of the monitoring locations. The background sound levels (L_{AEQ}) for this site ranged between 40 and 69 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and between 31 and 69 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.). Overall, the measured acoustical conditions are typical of rural environments. Slightly higher levels are noted near SLM 1 as it was most influenced by heavier traffic along 222nd Street and distant traffic on U.S. Highway 40.

Since the primary source of sound in the area is traffic, any regulatory study should consider the average sound levels noted as representative of the average traffic sound, as implied in the Leavenworth County Zoning and Subdivision Regulations. Therefore, during project acoustical modeling, future project sound levels at receptors near SLM 2,3,4 and 5 should be assessed against the lower of 60 dBA or the sound levels noted in Table 3-2.

Table 3-2. Ambient Sound Level Survey Results Summary.

Time of Day	Overall Measured Equivalent Continuous Sound Levels (dBA)				
	SLM 1 (West Property Boundary)	SLM 2 (East Property Boundary)	SLM 3 (Northeast Property Boundary)	SLM 4 (Southeast Property Boundary)	SLM 5 (Northwest Property Boundary)
Daytime (7AM-10PM)	65	56	49	59	52
Nighttime (10PM-7AM)	61	49	45	51	54

3.4 Tonal Noise Evaluation

3.4.1 Assessment

Ramboll has evaluated the ambient level data for tonal noise. Evaluation was conducted using the ANSI/ASA S12.9 Annex C, Sound with Tonal Content assessment criteria for evidence of tonal noise. A prominent discrete tone is identified when the sound pressure level of a certain band exceeds the adjacent bands by the applicable threshold shown in Table 3-3.

Table 3-3. ASA/ANSI 12.9 Part 4 – Tonal Noise Content Analysis

ASA/ANSI Annex C. Sounds with Tonal Content Analysis Summary		
Frequency Range	1/3 Octave Bands	Required Difference Above Adjacent Bands
Low-frequency bands	25 Hz – 125 Hz	15 dB
Mid-frequency bands	160 Hz – 400 Hz	8 dB
High-frequency bands	500 Hz – 10,000 Hz	5 dB

Ramboll reviewed the measured one-third octave-band sound pressure levels during the ambient sound survey. Sound monitoring location one (SLM 1) was used as a reference point for the tonal analysis on Friday May 15, 2026 from 12:00 AM to 12:10 AM. The measured data did not identify any one-third octave band that exceeded both adjacent bands by the applicable ANSI/ASA tonal threshold depicted in Figure 3-2.

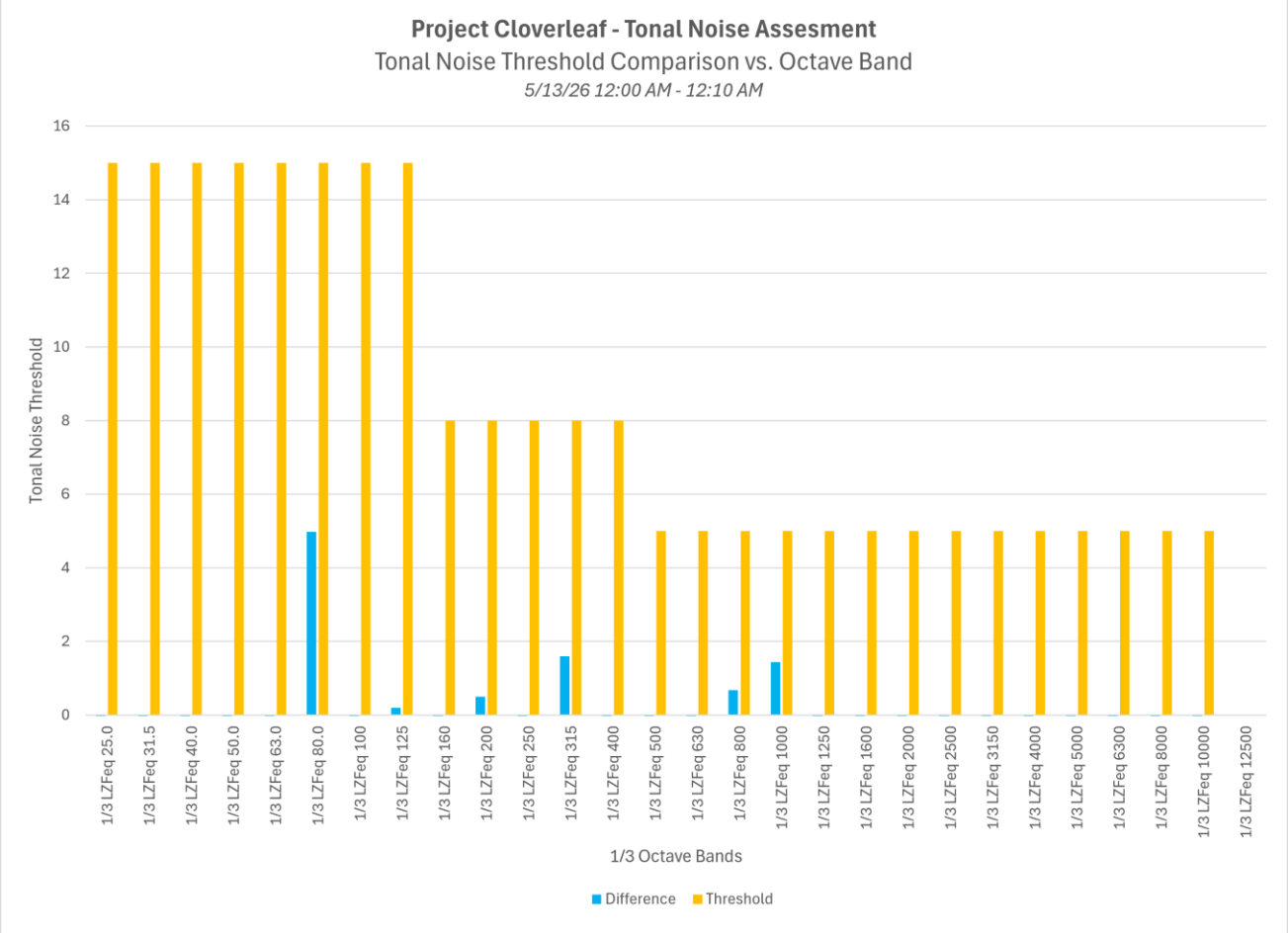


Figure 3-2. Tonal Noise Assessment

3.4.2 Tonal Noise Summary

Based on Ramboll's review of the measured ambient sound levels one-third octave band data, there is no indication of prominent tonal noise near the project site. The existing ambient noise measured is reflective of a generally rural environment influenced by road traffic as well as general wildlife.

3.5 Conceptual Design Assumptions

The full build-out of the site is expected to include five (5) one-story data center buildings. Based on Ramboll's data center experience, the primary continuous project sound sources will likely include cooling and ventilation equipment (e.g., air-cooled chillers (ACC), condenser units, and makeup air units). Noise mitigation strategies typically include a combination of measures such as low-noise equipment, acoustic enclosures, intake/exhaust silencers, acoustic louvers, and acoustic barrier walls or equivalent measures. Secondary or intermittent noise sources include emergency generators, which operate only occasionally when tested or when engaged to provide backup power during an unexpected power outage. Emergency generator maintenance and testing are required to occur during daytime hours. Emergency generators are housed within acoustical enclosures and equipped with exhaust mufflers designed to reduce sound emissions during operation.

4. Discussion and Conclusions

Ramboll has completed the sound and vibration technical due diligence for the proposed data center facility adjacent to the City of Tonganoxie and in Leavenworth County, Kansas. The assessment identified applicable noise and vibration requirements and evaluated the potential impact from project-related noise sources.

The project site is in unincorporated Leavenworth County, Kansas, and is zoned by Leavenworth County as a combination of residential and community land uses. The project site is expected to be rezoned to Light Industrial within Leavenworth County. There are rural residences within approximately 100 feet of the site boundary.

There are no applicable noise regulations pertaining to the State of Kansas. Regulations for Leavenworth County prohibit sound levels at the property boundary exceeding 60 dBA or the average local traffic noise. This requirement is generally consistent with the City of Tonganoxie regulations. However, the County does not define parameters for "average traffic noise," and based on this, a sound level survey was conducted to establish baseline conditions, including contributions from local traffic at the site boundaries. Ramboll used the measured ambient sound levels (LA_{EQ}) to determine the basis for the average traffic noise levels. The sound level limit for the site boundary will be 60 dBA, or the level of traffic noise, presumably whichever is lower, although Ramboll recommends clarifying with Leavenworth County. Whether the limit would apply to the emergency operation of generators during a site-wide power outage should also be clarified. Sound level limits near specified property boundary locations and adjusted per measured average traffic noise are summarized below:

Table 4-1. Maximum Sound Pressure Levels (dBA)

Time of Day	Maximum Sound Pressure Levels (dBA)				
	West Property Boundary	East Property Boundary	Northeast Property Boundary	Southeast Property Boundary	Northwest Property Boundary
Daytime (7AM-10PM)	60	56	49	59	52
Nighttime (10PM-7AM)	60	49	45	51	54

Leavenworth County does set restrictions on perceptible vibrations, though Ramboll's experience with data centers suggests that perceptible vibration levels at off-site locations are not typical.

Ramboll completed an ambient sound level survey to assess the existing ambient conditions of the site and the surrounding area. Over two 48-hour ambient survey periods, the ambient sound levels (L_{AEQ}) in the areas surrounding the site ranged from 40 to 70 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and from 31 to 69 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.).

Alongside the ambient sound level survey, a tonal assessment was conducted by reviewing the 1-3 octave band data, concluding that there were no indications of prominent tonal noise near the site.

The survey data were reflective of a generally rural environment influenced by road traffic. The primary sources of noise in the area included local traffic on 222nd Street and U.S. Highway 40 to the west of the site boundary, road traffic on 214th Street bisecting the site, Honey Creek Road

along the north site boundary, and U.S. Highway 70 to the south of the site boundary. Additionally, sound from wildlife also contributed to the overall ambient sound levels.

Since the predominant sound source in the area is traffic, the average sound levels or measured LA_{EQ} should be used as a basis for preliminary acoustical modeling per the Leavenworth County Zoning and Subdivision Regulations.

Acoustical modeling is recommended to determine the mitigation measures, if any, that would be required to conform to regulatory requirements.