2024

ANNUAL NOISE REPORT

JACKSON HOLE AIRPORT BOARD

Jackson Hole Airport
1250 East Airport Road
Jackson, Wyoming 83001

PREPARED BY:

BridgeNet International | TETRA TECH

BRIDGENET INTERNATIONAL, A TETRA TECH COMPANY

2024 Annual Noise Report

Prepared:
March 2025

Prepared For:

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Executive Summary

This report summarizes the measured and modeled noise environment at Jackson Hole Airport for calendar year 2024. The measurements and modeling effort is used to determine if the Airport is in compliance with the Airport Use Agreement (Agreement) between the U.S. Department of the Interior and the Jackson Hole Airport Board (Sponsor). The 2024 results of the measurement and modeling survey show that the Airport is in compliance with the requirements of the Airport Use Agreement.

Aircraft noise levels within Grand Teton National Park (GTNP or Park) were measured and modeled below the levels specified within the Use Agreement. In addition to the Agreement specific to the Airport, the Federal Aviation Administration (FAA) has established a national guideline of 65 Day Night Average Sound Level (DNL) as the goal for compatibility with residential land use. The measured and modeled 65 DNL noise level does not extend into residential land uses and continues to be contained within Airport property.

1.0 Introduction

The purpose of this report is to present the results from the 2024 noise measurement and modeling survey at Jackson Hole Airport (Airport). Noise measurements are conducted year-round to determine the annual noise exposure levels from aircraft operations at the Airport. This year-end report summarizes the results from the calendar year annual measurements for 2024. The cumulative results are analyzed to determine if the Airport is in compliance with the Airport Use Agreement.

Historically from 1984 to 2003, noise monitoring was conducted for seasonal periods at three locations north and south of the Airport. Each site was monitored for one to three weeks during both the winter and summer peak seasons. The three sites that were monitored historically were Moulton Loop Road to the south of the Airport, Moose, and Barker Ranch to the north and west in Grand Teton National Park (GTNP or Park). In 2003, the Airport installed six noise monitors to continuously collect noise data. The existing sites at Moulton Loop, Moose, and Barker Ranch were upgraded with new noise monitors, and new sites were added at the Golf Course to the south and 4 Lazy F Ranch and Timber Ridge to the north in GTNP. These measurement locations are presented in **Table 1-1** and **Figure 1-1**. In the fall of 2021, a new site was installed in the Bar B Bar Ranch (Oatgrass) neighborhood and has continuously operated since; the results from 2024 for this monitor are also presented in this report. An eighth site, Zenith, was added in the summer of 2024 south of the Airport, with the full annual results for that site to be reported for calendar year 2024.

In 2008, a BI-6 radar data collection system was installed to allow the Airport's noise system to store flight track information, which provides correlation of flight tracks to recorded aircraft noise events. Prior to that, it was not possible to always correlate a noise event to the aircraft that caused the event; this was a manual process based on flight logs. Often, aircraft were not picked up on radar until they reached a thousand feet or higher above ground level. This system was upgraded again in 2014 that provided flight information associated with the radar tracks. Additionally, in 2020 the Federal Aviation Administration's (FAA) Automatic Dependent Surveillance-Broadcast (ADS-B) radar became fully operational, and the Airport installed a local ground station that now provides radar coverage at areas close to the Airport.

The historical annual reports provided information about the seasonal measurement results; with the installation of the system to record year-round, the reports still presented seasonal data to continue to show the peak period activities in summer and winter. The report format was updated in 2020 to show annual data for both cumulative DNL and single event Lmax. The report also switched to reporting calendar year results, eliminating the split-year reporting that was October to September.

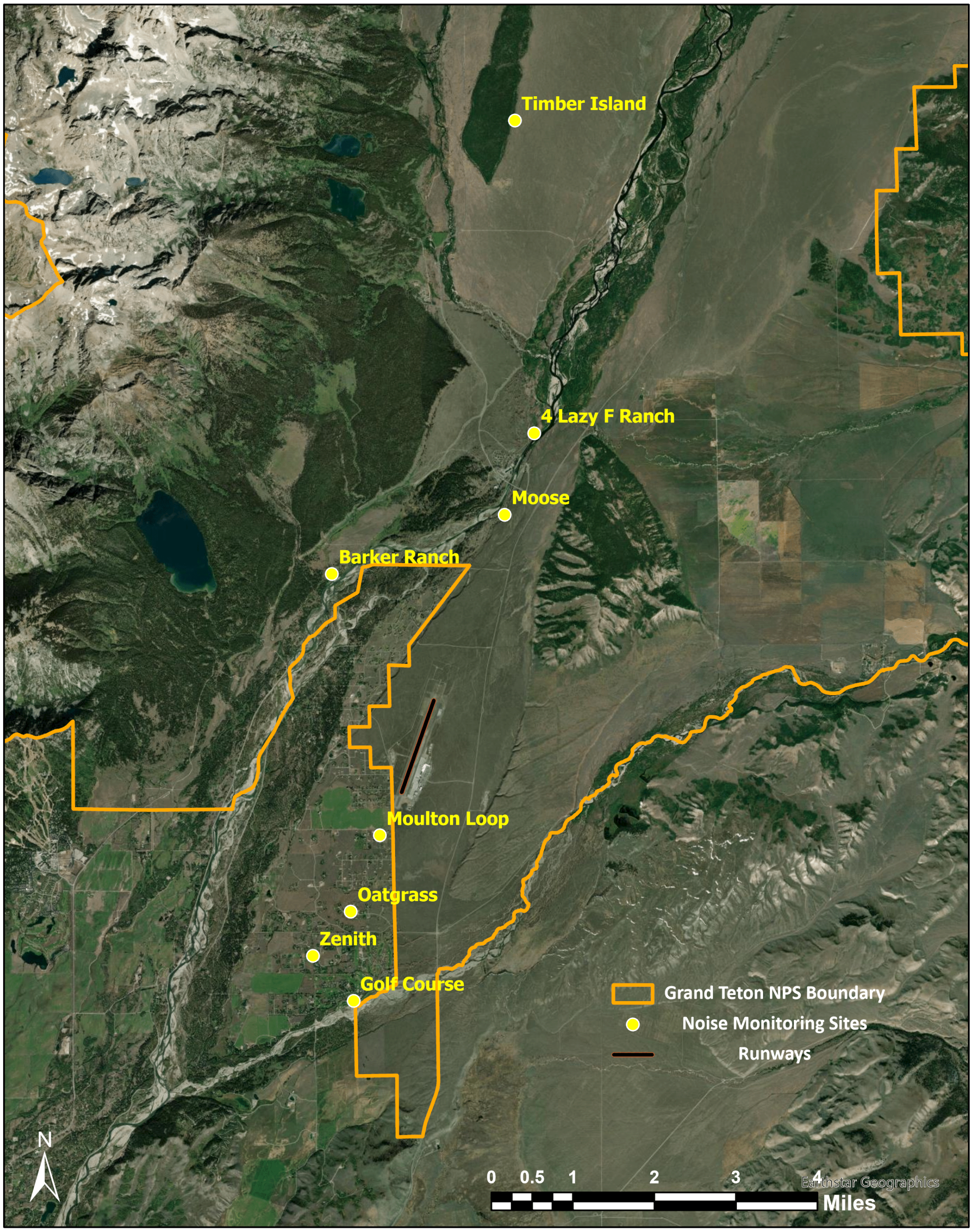
Table 1-1
Noise Measurement Site Locations

Site	Name	Location	Area	Latitude	Longitude
1	Moulton Loop	Zenith Drive and Spring Gulch Road	South Residential	43.592342	-110.744542
2	Golf Course	Jackson Hole Golf & Tennis Club	South Residential	43.562232	-110.753580
3	Barker Ranch	Circle H Ranch (Former Barker Residence)	GTNP	43.637980	-110.758610
4	Moose	Moose along Snake River	GTNP	43.648249	-110.716753
5	4 Lazy F Ranch	4 Lazy F Ranch	GTNP	43.662913	-110.708956
6	Timber Island	East of Timber Island	GTNP	43.714844	-110.713525
7	Oatgrass	445 E. Oatgrass (Bar B Bar Ranch)	South Residential	43.578046	-110.754271
8	Zenith	6200 E. Zenith Road – New Site	South Residential	43.570182	-110.76358

Source: BridgeNet International, 2024

One purpose of the measurements is to determine if the Airport is in compliance with the Airport Use Agreement (Agreement) between the U.S. Department of the Interior and the Jackson Hole Airport Board (Sponsor). The 2024 results of the measurement and modeling survey show that the Airport is in compliance with the requirements of the Agreement. Aircraft noise levels within the Park were measured and modeled below the levels specified within the Use Agreement. In addition to the Agreement specific to the Airport, the Federal Aviation Administration (FAA) has established a national guideline of 65 Day Night Average Sound Level (DNL) as the goal for compatibility with residential land use. The 65 DNL noise level does not extend into residential land uses and continues to be contained within Airport property.

Figure 1-1
Noise Measurement Location Map



Source: BridgeNet International, 2024

2.0 Background and Information about Noise

2.1 Background

Jackson Hole Airport is the only commercial service airport in the country that is located entirely within a national park. Accordingly, it has had a long history of addressing noise. The Airport Board has also developed several special noise measures to minimize intrusions from aircraft noise. A review of noise metrics, local noise abatement measures and a brief history of their development are presented in this section.

2.2 Noise Metrics

The description, analysis, and reporting of community sound levels from aircraft are difficult given the complexity of human response to sound. This analysis utilized the two primary noise metrics for analysis of aircraft noise impacts: Day Night Average Sound Level (DNL) and the Maximum A-Weighted Noise Level (Lmax). Both metrics are based on the A-weighted decibel (dBA), which most closely replicates how the human ear hears sound.

Day Night Average Sound Level. DNL, the primary metric for analysis, is a cumulative noise metric because it represents a measure of the total noise over a 24-hour period. Cumulative noise metrics are useful because these scales attempt to combine the loudness of each event, the duration of these events, the total number of events, and the time of day these events occur into a single number rating scale. The DNL also considers the loudness of the events and how often and when they occur. Aircraft events occurring between 10 p.m. and 7 a.m. are penalized 10 dBA to account for lower ambient noise levels at night. The FAA, the Environmental Protection Agency (EPA), and other government agencies use DNL in assessing noise and land use compatibility.

Maximum Sound Level. Lmax is a measure of single-event noise that describes the loudness of a single flyover regardless of the time of day or the number of such events. Lmax is the peak or loudest sound reached during an aircraft flyover. There are no noise or land use compatibility standards in terms of Lmax. In general, it is the metric that is more easily related to by the public because it is what the public hears on a per-event basis.

Sound Exposure Level. SEL is calculated by summing the dB level at each second during a noise event and compressing that noise into one second. It is the level the noise would be if it all occurred in one second and allows different noise events to be compared in a uniform manner. The SEL value is the integration of all the acoustic energy contained within an event and considers the maximum noise level and duration of the event.

2.3 Federal and Local Noise Assessment Guidelines

Noise/Land use guidelines have been developed by several agencies, including the FAA. As a means of implementing the Aviation Safety and Noise Abatement Act, the FAA adopted regulations on airport noise compatibility planning programs. The guidelines specify a maximum amount of noise exposure (in terms of the cumulative DNL noise metric) that will be considered acceptable to or compatible with people in both living and working areas. Residential land use is deemed compatible for noise exposures up to 65 DNL.

2.3.1 Access Plan

As part of the Agreement with the U.S. Department of the Interior, Jackson Hole Airport is required to comply with certain noise limits within GTNP. The primary restrictions are that the Airport cannot exceed specific DNL cumulative noise levels at critical locations within the Park boundary. The annual cumulative level from aircraft noise at the Moose measurement location, in the southeastern corner of the noise sensitive areas of the Park, cannot exceed 55 DNL. In addition, there is a Critical Area Boundary within the Park where annual aircraft noise levels cannot exceed 45 DNL. These areas are shown in **Figure 2-1**.

In 1983, the Airport Board and the U.S. Department of the Interior entered into a new agreement for the continued operation of the Airport in GTNP. To facilitate meeting the cumulative noise limits of the Agreement, the Airport Board developed an Access Plan. This Access Plan places a limit on the number of commercial jet aircraft operations necessary to meet the cumulative standards associated with the "base class" aircraft at the time. Operations of the Boeing 737-200 D-17 base class aircraft were limited to 6.85 Average Daily Departures (ADD). Increases in the number of operations may only be accomplished by substituting quieter, new generations of aircraft, which at that time were just entering into service.

The Agreement also included a single-event noise limit that restricted the operation of any aircraft that generated sound levels above 92 dBA, as defined by the approach dBA level from 14 CFR FAR Part 36 regulations (*Note: This numeric value is based on the effective perceived noise level (EPNdB), which is a different metric than the annual noise levels shown in this report. Therefore, this single-event noise limit and the annual average noise levels shall be analyzed separately.)* This essentially eliminated aircraft from operating at the Airport that generated higher noise levels than the Boeing 737-200 D-17 aircraft.

The following points summarize the noise abatement measures outlined in the Airport's Noise Abatement Plan, which was a requirement of the Access Plan:

- Operations by commercial turbojet aircraft should be between the hours of 7:00 am – 9:30 pm. In 2022, the voluntary curfew for general aviation operations was expanded to these hours.

- A preferential runway program that requests that all aircraft depart to the south and arrive from the south when wind/weather conditions permit.

- Aircraft are encouraged to maintain a course east of Highway 26/89 north of Moose.

- Aircraft with a single event noise level higher than 92 dBA are not allowed to operate at the Airport.

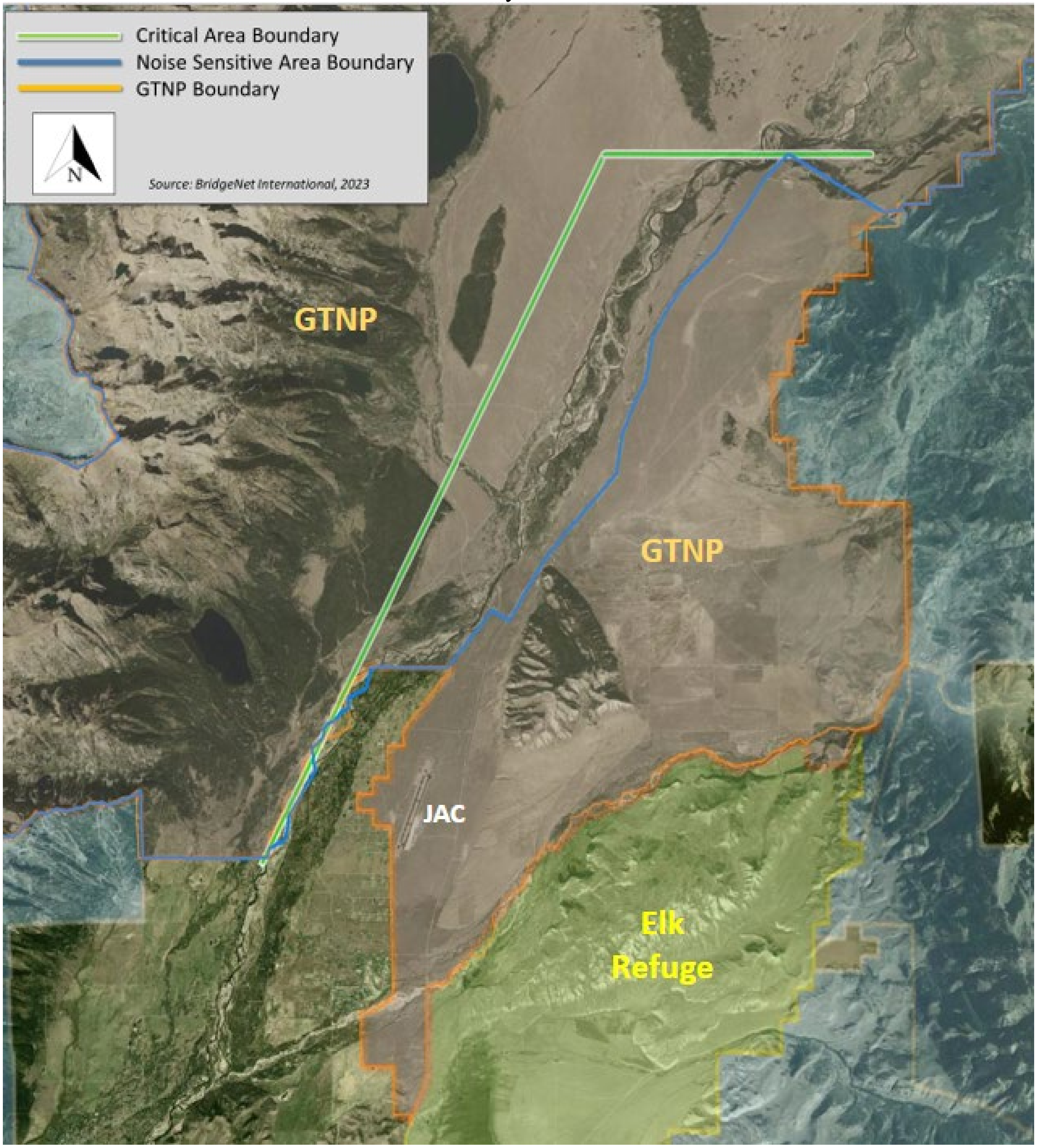
- A request to not operate training, charter, or scenic flights over noise sensitive areas of the Park.

- A request that all aircraft departing to the south make a left turn, as weather conditions permit. This procedure is seldom utilized today because the majority of aircraft fly an instrument flight rules (IFR) procedure.

- A request that aircraft entering the area from the south, but landing from the north, perform a left downwind turn near Blacktail Butte, as weather conditions permit. Right downwind turns over the Park are discouraged.

- A comprehensive operational and noise monitoring program that documents the level of compliance with these noise abatement procedures.

Figure 2-1
Critical Area and Noise Sensitive Area Boundary



Source: BridgeNet International, 2024

2.4 Methodology in Determining the Noise Environment

The noise environment at Jackson Hole Airport was determined through the employment of comprehensive noise measurements from the Airport's monitoring system and noise modeling effort. This system records ambient and aircraft noise sources. The noise measurement surveys determine DNL, Lmax levels from each aircraft flyover, SEL, and background or non-aircraft ambient noise environment.

The measurements are annualized by correlating measured noise events with flight radar. The results of the measurements, in conjunction with annual airport operational data, are incorporated into the FAA's Aviation Environmental Design Tool (AEDT) software program through which annual average noise levels at any location around the Airport can be predicted. The noise environment is commonly depicted in terms of lines of equal noise levels, or noise contours. Compliance with the Use Agreement requirements are determined from the noise modeling results.

As discussed in Section 1.0, noise measurements are conducted at eight locations around the Airport, shown in **Figure 1-1**. The Moulton Loop measurement site is indicative of the residential area directly south of the Airport, which is directly under the extended runway centerline, approximately 2,200 feet south of the runway's end and is one of the areas exposed to the highest noise levels just north of where the residential development starts. In 2003, the Moulton Loop site was moved approximately 200 feet closer to the runway's end than the old site. This results in slightly higher noise-level readings. The Oatgrass site is centrally located in the residential area south of the Airport within the Bar B Bar subdivision.

The Moose measurement site is in GTNP, south of Teton Park Road and directly under the extended runway centerline. The Agreement requires that the aircraft noise levels at this location not exceed 55 DNL. The Barker Ranch measurement site is also within GTNP, along Moose-Wilson Road northwest of the Airport. This site is on the restriction line that requires that aircraft noise levels not exceed 45 DNL.

3.0 Operational and Flight Data

3.1 Aircraft Operations

The total 2024 aircraft operations were derived directly from the FAA's Operations Network (OPSNET) data Airport summary of daily logs and the Airport's noise monitoring system radar data. The breakdown in the category and type of operation is based on the FAA's Traffic Flow Management System Counts (TFMSC) data, Airport summary of daily logs, and the Airport's noise monitoring system radar data. The 2024 annual operations along with data from 2001 are presented in **Table 3-1**. The total number of operations during the 12-month period was 32,788 – an operation is one departure or one arrival. The total operations showed an increase in operations over 2023 but still below the 2021 peak and it should be noted the Airport was closed for 78 days in 2022 for runway construction. The 2024 operations are made up of 8,882 commercial jet operations, 2,284 regional jet operations, 16,868 corporate jet operations, and 4,754 operations classified as other (piston general aviation aircraft, helicopters, and other small local aircraft).

The operations have seasonal differences with more activity during the summer and winter months. **Figure 3-1** presents the monthly activity broken down by total operations, commercial/regional, and corporate general aviation (GA) activity. As shown in this figure, August had the highest number of operations. The data from **Figure 3-1** is derived from the Airport's noise monitoring system data and will not exactly match the FAA counts.

3.2 Enplaned Passengers

The total number of enplaned passengers is also presented in **Table 3-1**. For 2024, there were 527,292 enplaned passengers.

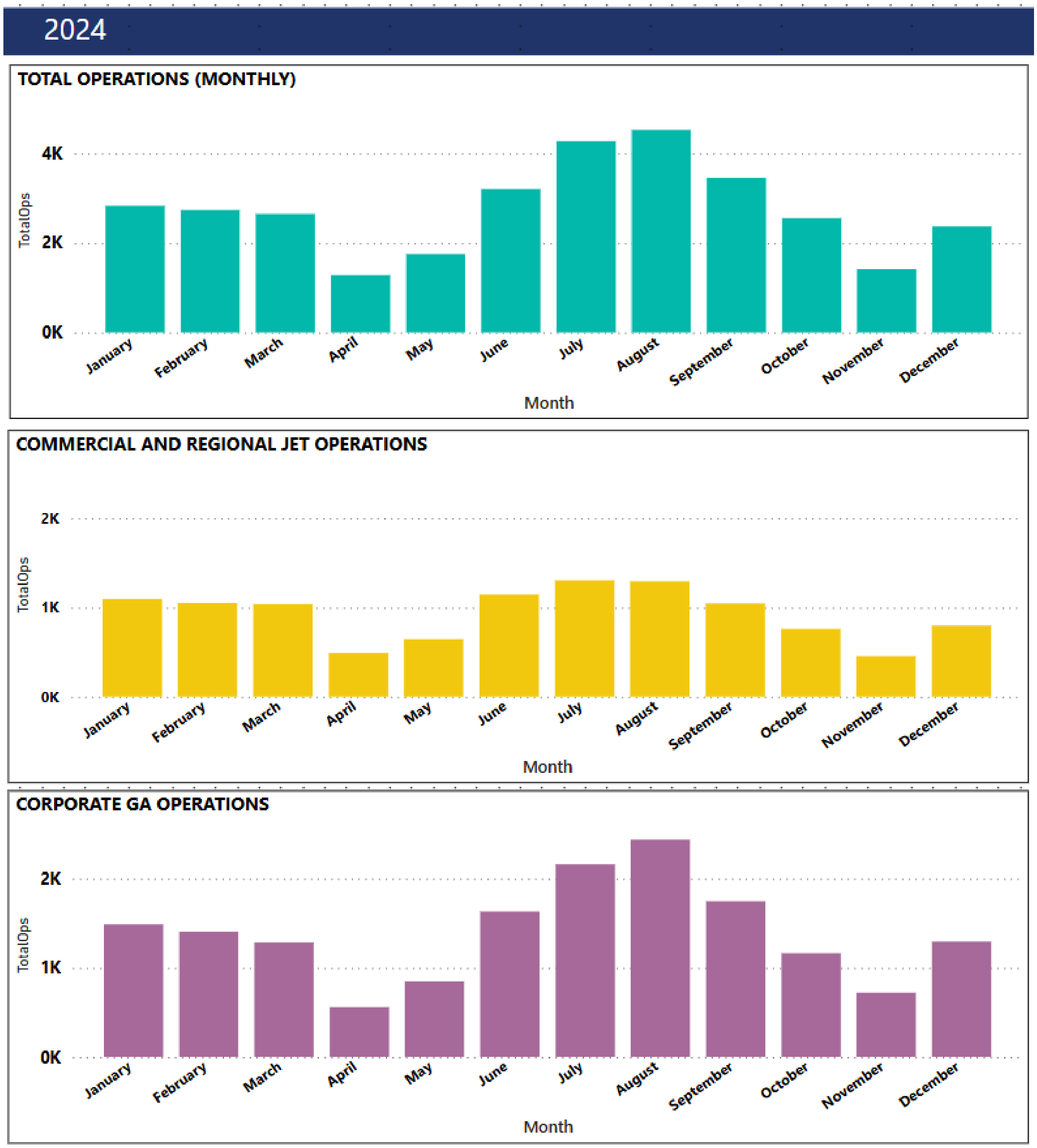
Table 3-1
Annual Operations and Enplaned Passengers, 2001–2024

YEAR	AIRCRAFT ANNUAL OPERATIONS					ENPLANED PASSENGERS
	COMMERCIAL JET	REGIONAL JET	CORPORATE GA	OTHER GA	TOTAL	
2024	**8,882**	**2,284**	**16,868**	**4,754**	**32,788**	**527,292**
2023	8,327	3,519	16,545	2,938	31,329	500,742
2022*	5,888	3,574	15,164	4,222	28,848	405,693
2021	9,310	3,592	18,730	8,996	40,628	508,838
2020	5,854	1,934	14,628	6,706	29,122	284,433
2019	7,096	2,480	11,346	6,403	27,325	454,629
2018	6,018	2,670	11,972	6,303	26,963	391,353
2017	5,632	2,322	11,794	9,241	28,989	353,776
2016	5,212	3,008	10,422	11,737	30,379	346,127
2015	4,582	2,798	10,104	10,656	28,140	316,674
2014	4,062	3,100	9,372	9,583	26,117	305,186
2013	3,592	2,530	8,822	8,549	23,493	292,176
2012	3,586	2,698	8,440	11,354	26,078	272,888
2011	3,868	2,840	8,484	10,584	25,776	281,808
2010	4,112	2,722	7,904	10,869	25,607	286,660
2009	3,738	2,736	7,702	14,826	29,002	281,674
2008	4,110	2,648	9,252	14,209	30,219	304,393
2007	3,514	2,358	10,862	13,871	30,605	275,569
2006	3,676	2,506	10,204	15,848	32,234	271,416
2005	3,774	592	10,510	18,196	33,072	241,925
2004	3,106	50	9,744	18,893	31,793	208,000
2003	3,646	334	8,844	20,769	33,593	212,731
2002	2,304	12	8,240	25,422	35,978	179,510
2001	1,666	584	7,374	30,974	40,598	169,249

Source: FAA OPSNET and TFMS data

Note: The Airport was closed between April 11, 2022, and June 27, 2022 for runway construction.*

Figure 3-1
Month-to-Month Operations for 2024



Source: Jackson Hole Airport Noise Monitoring System Data, 2024

3.3 Noise Measurement and Analysis Procedures

The following section outlines the methodology used to measure and quantify noise levels from aircraft operations and ambient noise-level conditions. Measurement methodology and analysis techniques used in the study are also included, which comply with the Use Agreement. As noise measurement and modeling technology has advanced since the 1980s when the Use Agreement was put in place, modern software and hardware are used to confirm compliance, such as replacing INM with the current version FAA Aviation Environmental Design Tool (AEDT).

Continuous Measurement of the Noise

The methodology used in this study uses the continuously recorded 1-second equivalent sound level (LEQ) noise levels at each of the eight measurement locations. From this data, different noise metrics can be calculated. This includes the aircraft Lmax, DNL, and the ambient levels. With the collection of the 1-second data, it is possible to post-process the data and calculate different metrics of interest. The process of calculating noise events from this data uses a floating threshold methodology, which allows for the measurement and identification of lower noise-level aircraft events. The parameters are adjustable and can be modified to recalculate noise events from raw data any time in the future.

3.4 Aircraft Operational and Radar Track Data

Historically, radar data was not available at the Airport. In fall of 2008, the FAA installed a BI-6 radar system at the Airport. With the installation of radar, the noise monitoring system was also upgraded to obtain this data. The upgrade consisted of numerous components, including access to the BI-6 radar data, weather data, and the addition of new features to the remote noise monitoring stations. The BI-6 radar data connection allows for the noise monitoring system to correlate an aircraft noise event to the aircraft causing the event. At the same time, the noise monitoring sites were also upgraded to measure detectability. Detectability approximates the U.S. Department of Transportation’s Volpe Center standards for measuring aircraft noise in a park setting. The audible contribution of aircraft and other noise sources to the Park’s natural quiet can be approximated using the detectability metric. The upgrade allows the noise monitoring system to measure aircraft noise levels more accurately at the noise measurement points and to also quantify the aircraft audibility levels at these locations.

The BI-6 radar was the primary source for aircraft operational information; however, the data was initially just radar tracks without aircraft identification. In 2014, a national radar feed subscription became available that provides both radar track and flight information data. The Airport maintains a live feed of all the Instrument Flight Rules (IFR) aircraft activity in the United States directly from FAA center data. This provides data on all domestic civilian IFR aircraft; the data stream includes aircraft type, position, and altitude by time. Visual Flight Rules (VFR) aircraft are often tracked, but typically there is no identifying information, such as a unique N-number. The radar coverage in the valley does not reach the Airport surface, so operations near the Airport and low-altitude flights were not typically tracked by this data source.

In 2020, the FAA's Automatic Dependent Surveillance – Broadcast (ADS-B) radar system became operational nationwide and greatly increased the coverage and accuracy of the radar data. The Airport also installed an ADS-B ground station at the Airport that allowed for better coverage of operations at low altitudes. The ADS-B radar data includes flight information for every ADS-B equipped aircraft, as well as position information along the flight track. Each flight is also assigned a unique identification number so all the data for any flight can be collected and stored. The flight information includes data such as aircraft type, airline code, departing and arriving airport codes, unique aircraft N-number, and flight ID number. The position information includes the *X* and *Y* coordinates, as well as the altitude of the aircraft at each point with greater accuracy than conventional radar information. The location information provides the information necessary to determine the direction of flow for runway usage.

ADS-B surveillance requires an aircraft to be equipped with an ADS-B transponder and that it is turned on. All commercial and large general aviation aircraft have this equipment, and it is turned on during flight. Smaller propeller aircraft are not required to have this equipment to operate in non-busy airspaces, but most aircraft are equipped. There will be some VFR aircraft that are not tracked by ADS-B due to the above reasons.

Correlation of Noise and Flight Data

The noise monitoring system was used to help correlate aircraft flight activity to the noise data. This software utilizes such methods as aircraft position information (the position of the aircraft at the time of the noise event to correlate the aircraft to the noise event), noise event sequencing, and noise event profiling to correlate noise data to the aircraft activity. Noise event profiling is used to identify characteristics of both the aircraft and non-aircraft noise events.

Calculation of Aircraft Noise Metrics

Once the collection and correlation of the noise and flight data is complete, the various noise metrics can be calculated. A computer process is used to calculate the single-event, cumulative, and ambient noise metrics of interest from the data collected at each of the noise monitoring sites. This includes the ambient background noise levels (dBA), Lmax, and DNL.

4.0 Annual Noise Measurement Results

4.1 Introduction

The existing noise environment for the Airport was determined through noise measurements and modeling. The results of the are summarized in the following paragraphs, presenting the overall findings from the measurements and modeling, including an explanation of the results, and is divided into the following subsections:

Noise Measurement Results

- Continuous noise measurement data
- Ambient noise measurement results by hour (dBA)
- Single-event noise measurement results (Lmax)
- Annual average measurement results (DNL)

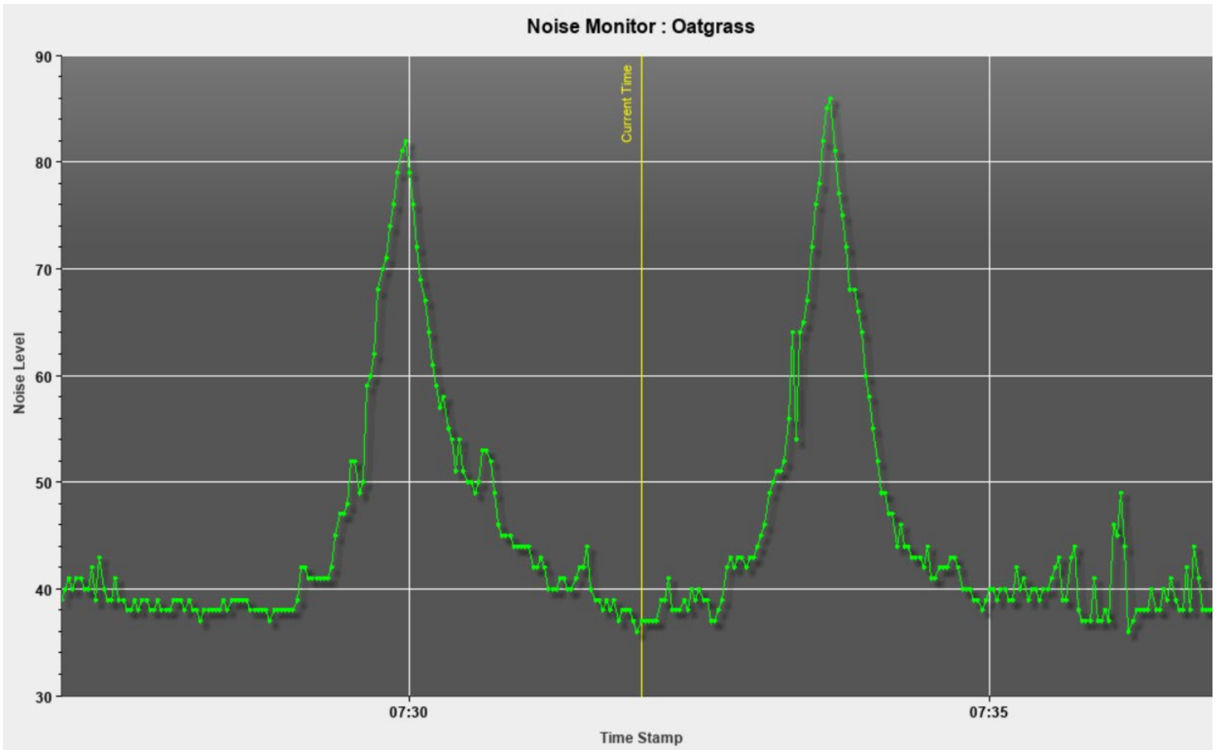
The Airport's noise monitoring system utilizes Larson Davis 824s and ACOEM 01dB CUBE noise monitors at the measurement sites. The monitoring system is state of the art and complies with all specific International Standards (IEC) and measurement standards established by the American National Standards Institute (ANSI) for Type 1 instrumentation.

The data collected by the monitors includes the continuous measurement of 1-second average equivalent sound levels (LEQ). This type of measurement system allows for the measurement and identification of Lmax noise events at a lower threshold. This allows for a more accurate measurement of lower aircraft noise levels that are typical of the sites in the Park. Analysis of this data resulted in the single-event noise levels from each individual flyover, hourly data, and the daily DNL noise levels for the measurement period.

4.2 Continuous Noise Measurement Data

Noise levels are continuously recorded at each of the noise monitoring sites. In addition to recording the noise events from aircraft, monitors also record the ambient noise level of the community surrounding the site. A sample of this data is presented in **Figure 4-1,** which displays a 15-minute segment of continuous noise data that was measured at Site 7 – Oatgrass. The measured A-weighted noise level value is shown on the vertical axis; and time of day, in minutes, is displayed on the horizontal axis. The difference between an aircraft event and the ambient noise can be easily distinguished in this plot, with each of the peaks generated by an aircraft overflight. For this example, the peak noise levels from the aircraft flyovers were in the low- to mid-80s dBA. The ambient levels between aircraft events were in the mid-30s to low 50s dBA.

Figure 4-1
Sample Time History Noise Plot of Aircraft and Ambient Noise - Oatgrass



Source: Jackson Hole Airport Noise Monitoring System, 2024

4.3 Ambient Noise Measurement Results

Background, or ambient noise levels, (not including aircraft noise) are measured at each monitoring location, and these results are presented using Percent Noise Levels (Ln). Ln characterizes intermittent or fluctuating noise by showing the noise level that is exceeded during a significant percentage of time during the noise measurement period. Ln is most often used to characterize the statistical distribution of measured noise levels. For example, L90 is the noise level exceeded 90 percent of the time, L50 is the level exceeded 50 percent of the time, and L10 is the level exceeded 10 percent of the time. Typically, L90 represents the background noise level, L50 represents the median or ambient noise level, and L10 represents the most intrusive noise levels.

Other noise sources that are part of a background noise environment include roadway, wind in the trees, and community activities. This data aids in assessing how intrusive aircraft noise is on the ambient environment.

Results of the ambient noise measurement survey at each measurement site are displayed **Table 4-1,** which presents the annual statistical summary of the ambient measurements at each site using the Ln noise levels for L99, L90, L50, L10, and L1. L1 is presented for the loudest 1-second dBA value measured, while the L99 is the lowest 1-second dBA value measured. This table illustrates the range in noise levels that exist at each site. Aircraft noise events are included in this data and are typically the source of the peak or maximum noise levels.

Table 4-1
Annual Ambient Noise Measurement Results (2024)

Name	Statistical Noise Levels (dBA)				
	L1	L10	L50	L90	L99
Moulton Loop	61	49	40	35	33
Golf Course	56	47	42	39	38
Barker Ranch	48	42	39	37	35
Moose	53	42	38	36	34
4 Lazy F Ranch	43	34	30	29	28
Timber Island	44	36	29	25	23
Oatgrass	55	40	34	32	30
Zenith	52	39	33	30	29

Source: BridgeNet International, 2024

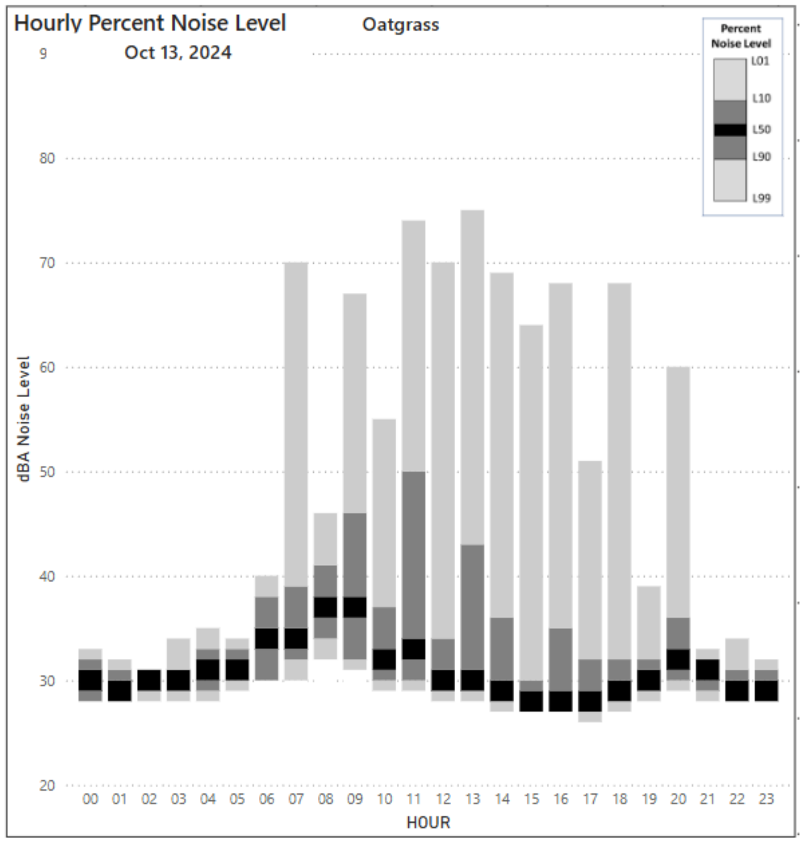
Industry practices indicate that L90 is a good representation of the background noise level and L50 the ambient noise level. These represent the levels that are exceeded 90 percent of the time and 50 percent of the time, respectively. L90 is referred to as the residual noise when other sources of noise are not present and is the level above which noise events occur, such as an aircraft overflight or a vehicle pass-by. Aircraft noise would have very little, if any, contribution to this noise level because of the relatively short duration of these noise events. The L50 noise level is referred to as the median or ambient noise level. Half of the time, the noise is below this level, and half of the time it is above. Even during peak hours of aircraft activity, the L50 noise level would not be influenced by aircraft noise. This level is generally reflective of background sound levels when other sounds are not present.

The measurements show that background L90 noise levels ranged from a low of 20 dBA to a high in the mid-30s dBA. Most sites had an average L90 noise level right around the mid-30s dBA. The ambient L50 noise levels ranged from the high 20s dBA to 40s dBA. The majority of these sites are located in relatively quiet settings that are not exposed to other noise sources, such as highways or community activities. However, a number of the sites are near the Snake River or Gros Ventre River, which does influence the background and ambient noise levels.

Ambient noise levels vary by day, and time of day as summarized in the data from the Oatgrass site, which is presented in **Figure 4-2**. The figure shows each hour of ambient measurement data for a typical fall day (October 13, 2024) at that site. Day-to-day ambient noise levels are generally similar, with higher levels occurring during high wind conditions. Ambient noise levels vary by time of day, with quieter levels typically occurring during night and early-morning hours, and with higher levels occurring during daytime hours. Typical quiet ambient noise hours range from 5 to 10 dBA lower than average hours.

Figure 4-2
Site-Specific Ambient Noise Measurement Results - Oatgrass
October 13, 2024

Hour	L01	L10	L50	L90	L99
00	34	32	30	28	28
01	33	31	29	28	28
02	32	31	30	29	28
03	35	31	30	29	28
04	36	33	31	29	28
05	35	33	31	30	29
06	41	38	34	30	30
07	71	39	34	32	30
08	47	41	37	34	32
09	68	46	37	32	31
10	56	37	32	30	29
11	75	50	33	30	29
12	71	34	30	29	28
13	76	43	30	29	28
14	70	36	29	28	27
15	65	30	28	27	27
16	69	35	28	27	27
17	52	32	28	27	26
18	69	32	29	28	27
19	40	32	30	29	28
20	61	36	32	30	29
21	34	32	31	29	28
22	35	31	29	28	28
23	33	31	29	28	28
Daily	52	35	31	29	28



Source: Jackson Hole Airport Noise Monitoring System, 2024

4.4 Aircraft Single-Event Noise Measurement Results

Aircraft single-event noise levels were identified at each measurement site. The acoustic data included Lmax, as well as other noise metrics used in noise model validation. The single events measured during the survey were correlated with flight operation information. With this correlated single-event noise data, it was possible to separately identify the single-event noise levels from the different sources of aircraft noise.

The single-event data were analyzed to determine the distribution of events. An example of the range in noise data is presented for the Moose and 4 Lazy F sites in **Figure 4-3** and **Figure 4-4**, respectively. These figures present the average Lmax noise level by category of jet and a histogram of Lmax values for all measured aircraft events colored by aircraft category. These noise events are all jet arrivals to the south on Runway 19. The Moose site is representative of a location closest to the Airport to the north, and the 4 Lazy F Ranch site is representative further to the north of the Airport. These results show the wide range in noise level generated by aircraft events that occur at each site and the difference in noise by category of aircraft, which are all jet arrivals to the south on Runway 19.

Figures 4-5 through **Figure 4-8** present the same results for the Moulton Loop, Golf Course, Oatgrass and Zenith sites to the south, which are primarily exposed to departure noise on Runway 19. This data also shows the ranges in single-event noise levels organized by total category of jet aircraft.

Additionally, single-event data was also analyzed by noise level per aircraft type shown on the bottom of **Figures 4-3** through **4-8**. The lower left bar graph illustrates the average Lmax noise level measured by each commercial/regional jet aircraft type. The lower right graph shows the Lmax levels for GA jets with the loudest events, which were generally produced by older-generation aircraft. The data shows that on average, the commercial/regional jet aircraft generate noise events about 3 to 5 dBA higher than the corporate GA.

Figure 4-3
Noise Event Summary, Moose
Operation: Runway 19 Arrivals

Site: MOOSE **AVERAGE MAXIMUM LEVEL BY TYPE OF AIRCRAFT**

Year: 2024 Operation: Arrival Runway: 01

Average Maximum Noise Level by Jet Category

Jet Category	Lmax (Avg)
Commercial	77
Regional	76
Corporate GA	71
Average	73

Average Maximum Noise Level by Commercial/Regional Jets

Aircraft	Jet Category	Lmax (Avg)
B737	Commercial	79
B752	Commercial	77
A319	Commercial	77
A320	Commercial	77
E75L	Regional	76
CRJ7	Regional	74
Average		77

Average Maximum Noise Level by 10 loudest Corporate GA Aircraft

Aircraft	Jet Category	Lmax (Avg)
FA7X	Corporate GA	76
FA50	Corporate GA	75
GLF4	Corporate GA	75
H25B	Corporate GA	74
C25A	Corporate GA	74
G150	Corporate GA	73
PC24	Corporate GA	73
GALX	Corporate GA	73
E35L	Corporate GA	73
CL60	Corporate GA	73
Average		71

Source: Jackson Hole Airport Noise Monitoring System, 2024

Figure 4-4
Noise Event Summary, 4 Lazy F Ranch
Operation: Runway 19 Arrivals

Site: 4LAZYF — **AVERAGE MAXIMUM LEVEL BY TYPE OF AIRCRAFT**

Year: 2024 Operation: Arrival Runway: 19

Average Maximum Noise Level by Jet Category

Jet Category	Lmax (Avg)
Commercial	68
Regional	67
Corporate GA	63
Average	65

Average Maximum Noise Level by Commercial/Regional Jets

Aircraft	Jet Category	Lmax (Avg)
B737	Commercial	69
A319	Commercial	68
A320	Commercial	68
B752	Commercial	68
E75L	Regional	68
CRJ7	Regional	65
Average		68

Average Maximum Noise Level by 10 loudest Corporate GA Aircraft

Aircraft	Jet Category	Lmax (Avg)
FA50	Corporate GA	68
FA7X	Corporate GA	67
GLF4	Corporate GA	66
H25B	Corporate GA	65
E35L	Corporate GA	65
GLEX	Corporate GA	65
C25A	Corporate GA	64
CL60	Corporate GA	64
PC24	Corporate GA	64
F900	Corporate GA	64
Average		63

Source: Jackson Hole Airport Noise Monitoring System, 2024

Figure 4-5
Noise Event Summary, Moulton Loop
Operation: Runway 19 Departures

Site: MOULTON **AVERAGE MAXIMUM LEVEL BY TYPE OF AIRCRAFT**

Year: 2024 **Operation:** Departure **Runway:** 19

Average Maximum Noise Level by Jet Category

Jet Category	Lmax (Avg)
Commercial	90
Regional	88
Corporate GA	84
Average	87

Average Maximum Noise Level by Commercial/Regional Jets

Aircraft	Jet Category	Lmax (Avg)
B752	Commercial	93
B737	Commercial	92
A319	Commercial	89
A320	Commercial	89
E75L	Regional	88
CRJ7	Regional	87
Average		89

Average Maximum Noise Level by 10 loudest Corporate GA Aircraft

Aircraft	Jet Category	Lmax (Avg)
FA50	Corporate GA	95
BE40	Corporate GA	90
F900	Corporate GA	88
C560	Corporate GA	88
FA7X	Corporate GA	88
H25B	Corporate GA	88
GALX	Corporate GA	88
GLF4	Corporate GA	88
GLEX	Corporate GA	87
E35L	Corporate GA	86
Average		84

Source: Jackson Hole Airport Noise Monitoring System, 2024

Figure 4-6
Noise Event Summary, Golf Course
Operation: Runway 19 Departures

Site: GOLF **AVERAGE MAXIMUM LEVEL BY TYPE OF AIRCRAFT**

Year: 2024 **Operation:** Departure **Runway:** 19

Average Maximum Noise Level by Jet Category

Jet Category	Lmax (Avg)
Regional	71
Commercial	70
Corporate GA	66
Average	68

Average Maximum Noise Level by Commercial/Regional Jets

Aircraft	Jet Category	Lmax (Avg)
B737	Commercial	72
E75L	Regional	71
CRJ7	Regional	71
B752	Commercial	70
A319	Commercial	70
A320	Commercial	69
Average		70

Average Maximum Noise Level by 10 loudest Corporate GA Aircraft

Aircraft	Jet Category	Lmax (Avg)
FA50	Corporate GA	73
C650	Corporate GA	72
BE40	Corporate GA	71
GALX	Corporate GA	69
H25B	Corporate GA	69
C560	Corporate GA	69
FA7X	Corporate GA	68
CL35	Corporate GA	68
F900	Corporate GA	68
CL30	Corporate GA	68
Average		66

Source: Jackson Hole Airport Noise Monitoring System, 2024

Figure 4-7
Noise Event Summary and Histogram Report, Oatgrass
Operation: Runway 19 Departures

Site: Oatgrass — **AVERAGE MAXIMUM LEVEL BY TYPE OF AIRCRAFT**

Year: 2024 **Operation:** Departure **Runway:** 19

Average Maximum Noise Level by Jet Category

Jet Category	Lmax (Avg)
Regional	78
Commercial	78
Corporate GA	74
Average	76

Average Maximum Noise Level by Commercial/Regional Jets

Aircraft	Jet Category	Lmax (Avg)
B737	Commercial	81
B752	Commercial	79
CRJ7	Regional	78
E75L	Regional	78
A320	Commercial	78
A319	Commercial	77
Average		78

Average Maximum Noise Level by 10 loudest Corporate GA Aircraft

Aircraft	Jet Category	Lmax (Avg)
FA50	Corporate GA	86
C650	Corporate GA	83
BE40	Corporate GA	81
H25B	Corporate GA	79
C560	Corporate GA	79
F900	Corporate GA	78
GL7T	Corporate GA	78
FA7X	Corporate GA	78
GLEX	Corporate GA	77
GALX	Corporate GA	77
Average		74

Source: Jackson Hole Airport Noise Monitoring System, 2024

Figure 4-8
Noise Event Summary and Histogram Report, Zenith
Operation: Runway 19 Departures

Site: Zenith — **AVERAGE MAXIMUM LEVEL BY TYPE OF AIRCRAFT**

Year: 2024 **Operation:** Departure **Runway:** 19

Average Maximum Noise Level by Jet Category

Jet Category	Lmax (Avg)
Regional	77
Commercial	75
Corporate GA	72
Average	73

Average Maximum Noise Level by Commercial/Regional Jets

Aircraft	Jet Category	Lmax (Avg)
B737	Commercial	79
E75L	Regional	78
B752	Commercial	75
CRJ7	Regional	75
A320	Commercial	75
A319	Commercial	74
Average		76

Average Maximum Noise Level by 10 loudest Corporate GA Aircraft

Aircraft	Jet Category	Lmax (Avg)
F900	Corporate GA	76
FA7X	Corporate GA	76
BE40	Corporate GA	76
C560	Corporate GA	76
H25B	Corporate GA	75
GALX	Corporate GA	74
GLF4	Corporate GA	74
GLEX	Corporate GA	74
CL35	Corporate GA	73
PC24	Corporate GA	73
Average		72

Source: Jackson Hole Airport Noise Monitoring System, 2024

4.5 DNL Noise Measurement Results

Aircraft-related DNL levels were calculated for each of the eight noise monitoring locations including the new sites in Bar B Bar Ranch called Oatgrass and a site to the south on Zenith Road at 6200 Zenith Road using AEDT and validated with the measured data. **Table 4-2** presents the annual results of the DNL noise measurements at the eight noise monitoring locations.

Table 4-2
Annual Aircraft DNL Results (2024)

Name	Description	Aircraft Annual DNL
Moulton Loop	Zenith Drive and Spring Gulch Road	62
Golf Course	Jackson Hole Golf & Tennis Club	49
Barker Ranch	Circle H Ranch (Barker Residence)	33
Moose	Moose Entrance	52
4 Lazy F Ranch	4 Lazy F Ranch	48
Timbered Island	East of Timbered Island	32
Oatgrass	Bar B Bar Ranch	54
Zenith	6200 Zenith	52

Source: Jackson Hole Airport Noise Monitoring System, 2024

5.0 Annual Noise Contours

5.1 Introduction

Contour modeling is a key element of the report. Generating accurate noise contours is largely dependent on the use of a reliable, validated, and updated noise model. The FAA's Aviation Environmental Design Tool (AEDT) was used to model the flight operations at Jackson Hole Airport and is the accepted industry standard software to model aircraft noise at airports in the United States as well as for international environmental analysis. The AEDT has an extensive database of civilian aircraft noise characteristics.

Airport noise contours were generated using AEDT Version 3g. Version 3g, the latest version, was released for use in August 2024, and is state-of-the-art airport noise modeling. AEDT is a computer program developed to plot noise contours for airports. The program includes standard aircraft noise and performance data for more than 200 aircraft types and can be tailored to the characteristics of the airport in question.

One of the most important factors in generating accurate noise contours is the collection of accurate operational data. AEDT requires the input of the physical and operational characteristics of an airport. Physical characteristics include runway coordinates, airport elevation, temperature, and optional topographical data. Operational characteristics include various types of aircraft data. This includes not only the aircraft types and flight tracks but also departure procedures, arrival procedures, and stage lengths specific to the operations at the airport. While AEDT contains a wealth of information, there were minor adjustments made to these inputs to better reflect local conditions as captured and validated by the noise monitors in the Park and south of the Airport. Aircraft data needed to generate noise contours include:

- Number of operations by aircraft type
- Types of aircraft
- Daytime/nighttime distribution by aircraft type
- Flight tracks
- Flight track utilization by aircraft type
- Flight profiles
- Typical operational procedures
- Average meteorological conditions

5.2 Existing Aircraft Operations

The existing noise environment for the Airport was analyzed based upon the 2024 annual operations. The data was derived from various sources, which include aircraft tower counts and noise monitoring system operational data. A variety of operational data is necessary to determine the noise environment around the airport. This data includes the following summary information and is discussed in detail in the following paragraphs:

- Aircraft activity levels
- Fleet mix
- Time of day
- Runway use
- Flight path utilization

The tower count data showed that for 2024, there was a total of 32,788 annual operations. The breakdown by aircraft category was determined from a variety of sources that include:

- Airport radar
- FAA Operations Network OPSNET
- FAA Operations TFMSC

The 2024 aircraft operations for each category of operation are summarized in **Table 5-1.** These operations are categorized as commercial jets, regional jets, small commuters, general aviation, business jets, turbo- and piston-propeller, helicopter, and military. The total number of annual GA jet aircraft was determined from the Airport's radar data, which provides information on aircraft that file IFR flight plans, accounting for nearly all larger aircraft including business jets. Larger twin-engine propeller aircraft are also counted in airport radar, but smaller aircraft flying VFR are not always included. The AEDT model was based upon a compilation of all 32,788 operations at the Airport.

Table 5-1
Summary of Operations - 2024

Category Type	Annual Operations	Daily Operations	Percent Nighttime
Commercial Jet	8,882	24.3	0.88%
Regional Jet	2,284	6.3	0.09%
Small Commuter	0	0.0	0.00%
General Aviation			
Corporate GA	16,868	46.2	0.47%
Turbo-/Piston-Propeller	2,212	10.1	2.81%
Helicopter	890	2.4	0.56%
Military	186	0.5	0.00%
Total Operations	32,788	89.8	1.10%

Source: FAA OPSNET, FAA TFMS data, and Jackson Hole Airport Noise Monitoring System

Fleet Mix: The fleet mix of aircraft that operate at the airport is one of the most important factors of the aircraft noise environment. The fleet mix data was determined from a review of various sources including the airport radar database and FAA TFMS data.

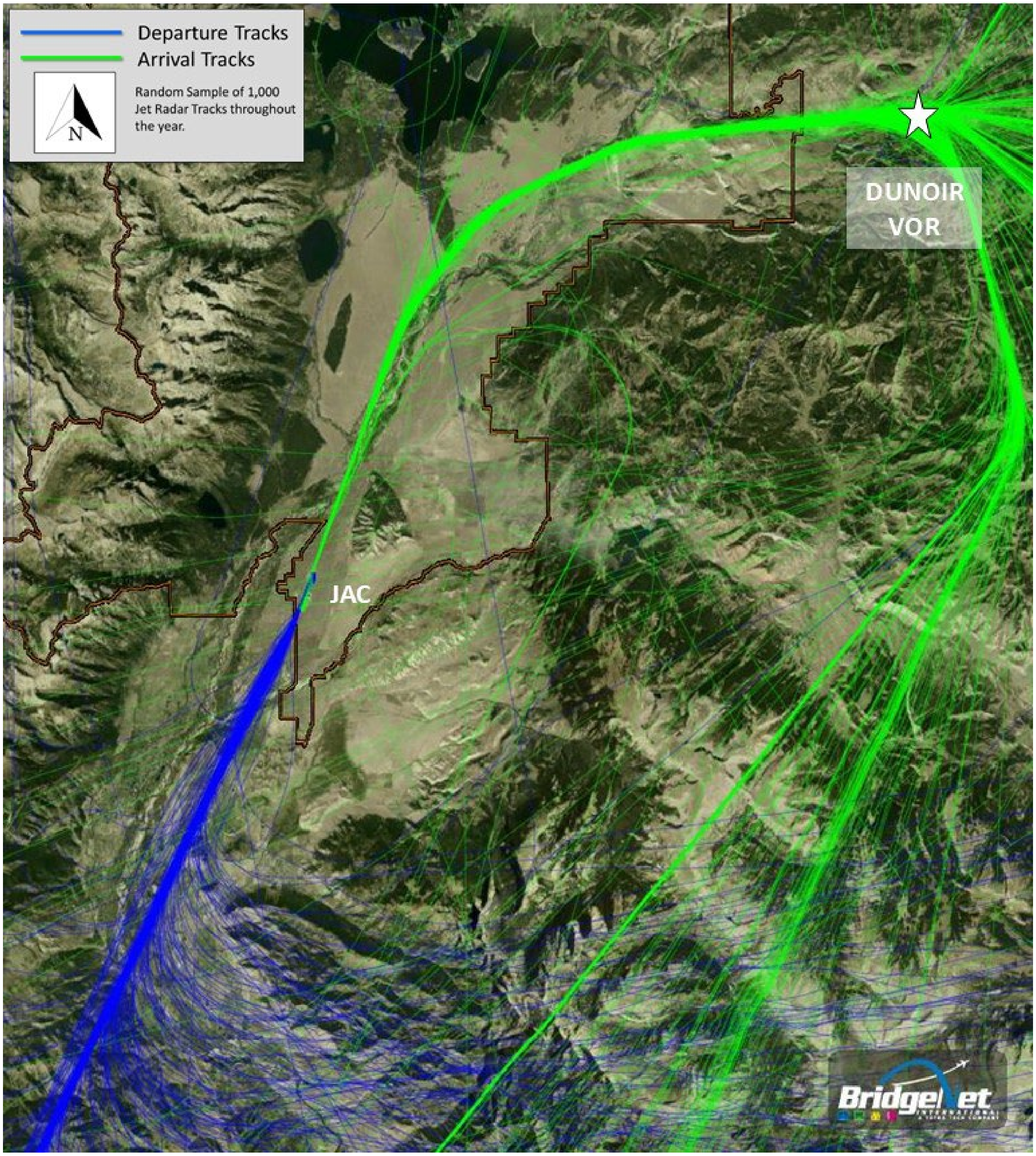
Time of Day: In the DNL metric, any operations that occur after 10 p.m. and before 7 a.m. are labeled "nighttime operations." These operations are considered more intrusive and are weighted by 10 dBA. Therefore, the number of nighttime operations is critical in determining the DNL noise environment and is also important to the residences around the Airport. The nighttime operational assumption data is summarized in **Table 5-1**.

Runway Use: An additional important consideration in developing the noise contours is the percentage of time each runway is utilized. The speed and wind direction dictate the runway direction utilized by an aircraft. From a safety standpoint, it is safest for an aircraft to arrive and depart into the wind; when wind direction changes, operations are shifted to the runway that favors the new wind direction. For the Airport, wind is generally calm with the predominate wind direction from the south. Runway 19 is used more than the reverse runway direction, Runway 01. As described in Section 2.3.1, the Access Plan contains a Noise Abatement Plan that includes preferential runway use, which can be used when weather and operational conditions allow.

Flight Path Utilization: These paths are not precisely defined ground tracks, but represent a broad area over which the aircraft will generally fly. The modeling analysis includes a total of eight departure flight tracks and six arrival flight tracks to model the aircraft flight paths at the Airport.

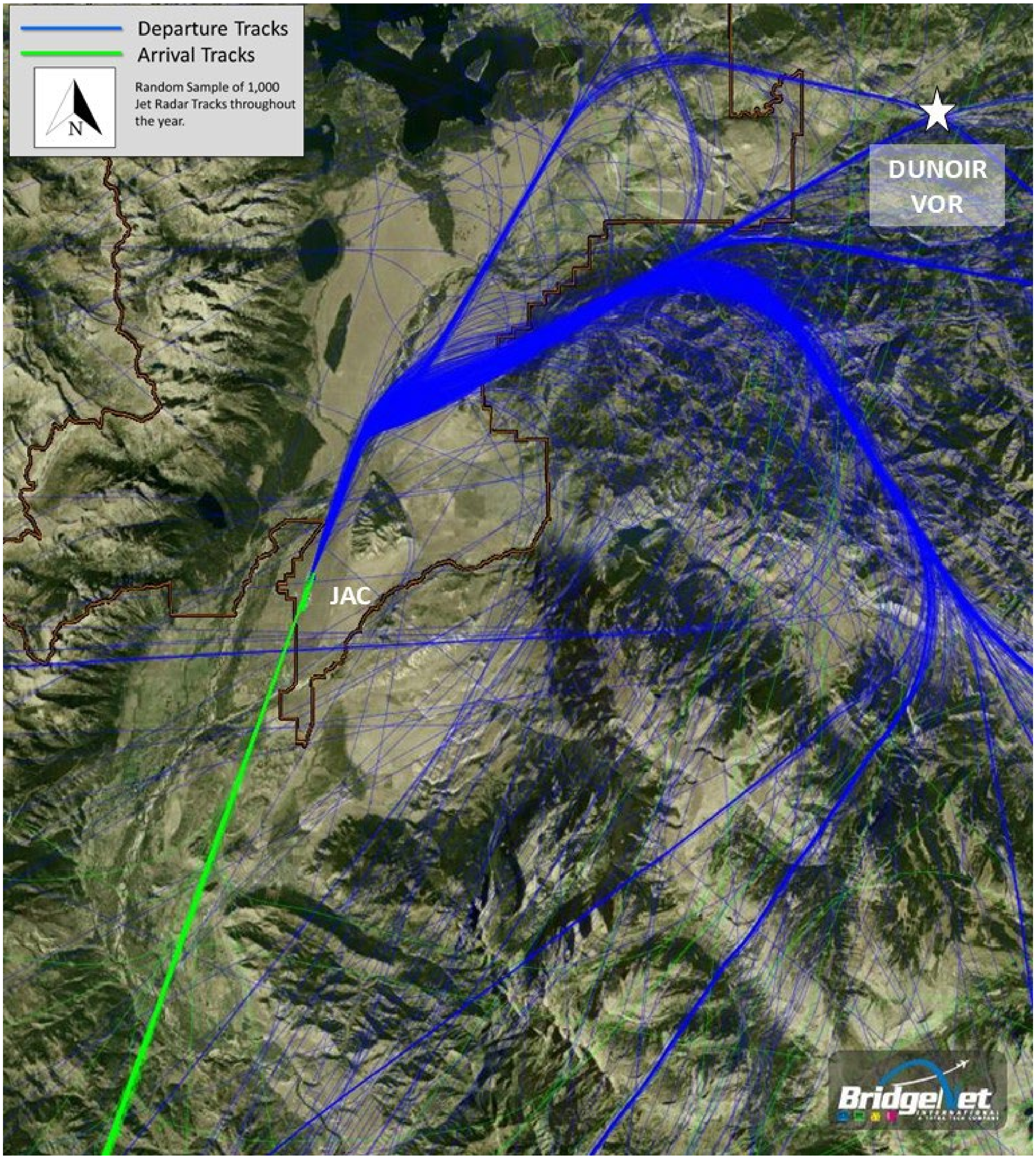
A sample of the 2024 flight tracks used in AEDT modeling are presented in **Figure 5-1** and **5-2**. **Figure 5-1** presents departure and arrival flight paths for jets in south flow on Runway 19. **Figure 5-2** presents departure and arrival flight paths for jets in north flow on Runway 01. The flight track data was used to help define the location of the aircraft flight paths and in the correlation of the noise measurement data with the aircraft operational data.

Figure 5-1
Jet Arrival and Departure Flight Tracks
Operation: Runway 19 South Flow



Source: Jackson Hole Airport Noise Monitoring System, 2024

Figure 5-2
Jet Arrival and Departure Flight Tracks
Operation: Runway 01 North Flow

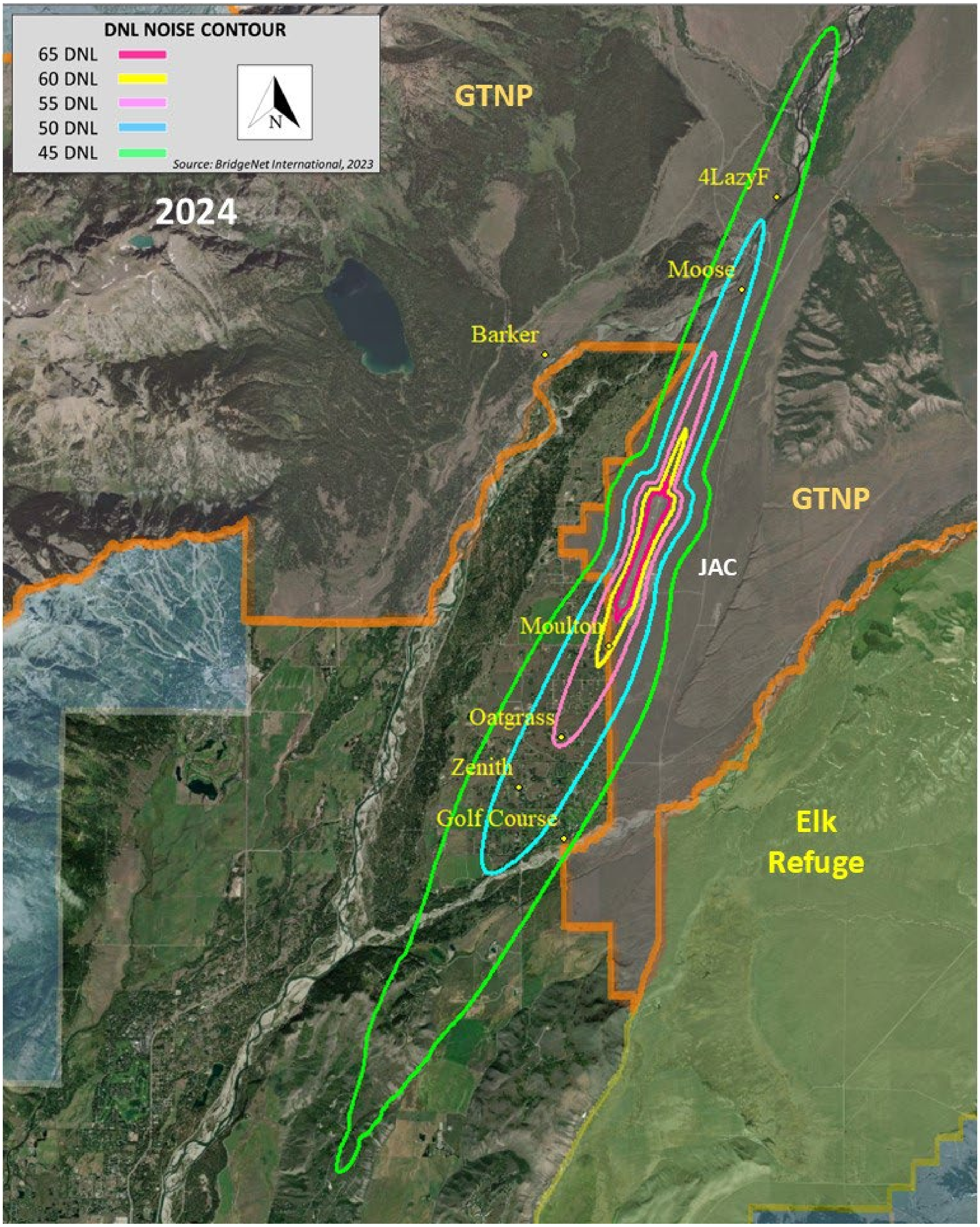


Source: Jackson Hole Airport Noise Monitoring System, 2024

5.3 Noise Modeling Results

The noise metric used to assess the 2024 annual noise contour is the Day Night Average Sound Level (DNL). This model uses FAA standard modeling assumptions that would be required within an FAA-sponsored environmental study. The DNL is a 24-hour time-weighted energy average noise level based on the A-weighted decibel. It is a measure of the overall noise experienced during an entire year of flight operations. The 2024 AEDT contours are presented in **Figure 5-3**.

Figure 5-3
2024 Annual DNL Noise Contour



Source: BridgeNet International, 2024

6.0 **Summary**

6.1 Overall Summary

The results of the noise measurements and modeling report show that the Airport is in compliance with the requirements of the Airport Use Agreement as reflected in Table 4-2. The measured/modeled noise levels are compliant with the Agreement. The Agreement includes the annual DNL noise level contour from aircraft noise at two noise monitoring sites, Moose and Barker are required to be 55 DNL and 45 DNL, respectively. The DNL contour at both sites is below the level in the Agreement. The 65 DNL noise contour does not extend beyond the Airport boundary. There are *no* residential land uses exposed to measured/modeled noise levels more than 65 DNL.

The annual 2024 DNL noise levels at the Airport have very slightly increased from the 2023 levels. The levels are below the 2021 noise levels. An important factor for the trend in reduction in noise that has occurred at the airport since 1984 is the increased utilization of new-generation aircraft, including Stage 4 and Stage 5 aircraft, which are substantially quieter than aircraft operated here in the past. This trend continued in 2024.