
Appendix C - Airport Noise Analysis

Airport Noise Analysis

Draft

Logan-Cache Airport Noise Analysis

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Prepared for:

**Logan-Cache Airport
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&

**J-U-B Engineers, Inc
Portland, OR**

Prepared by:

**Michael Minor & Associates
Portland, Oregon**

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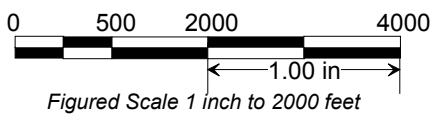
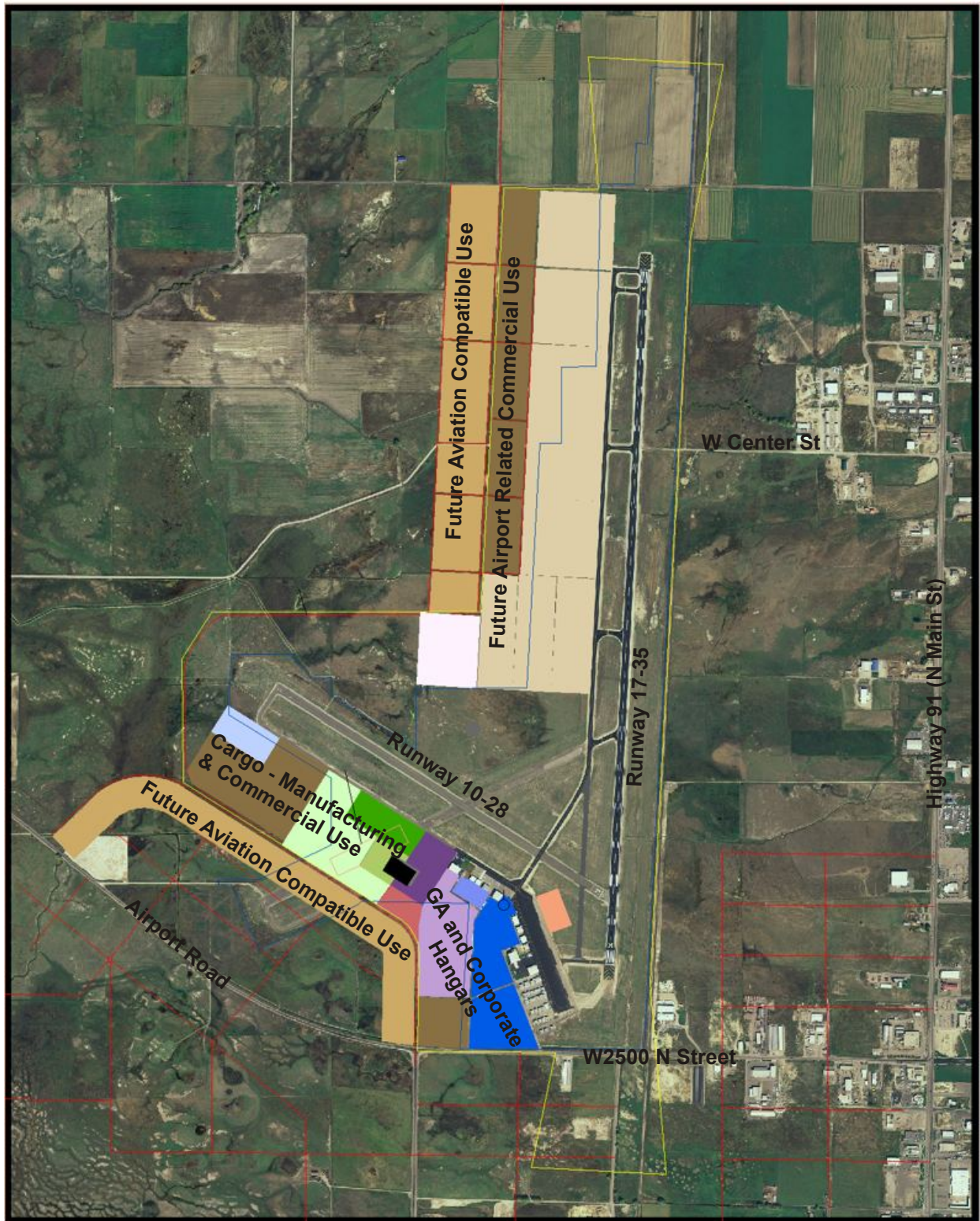
1. Introduction

This technical noise analysis was performed for the Logan-Cache Airport. The study was performed in accordance with FAA regulations using the Integrated Noise Model (FAA INM) version 7.0. Version 7.0 is the most current version of the FAA INM program. Michael Minor & Associates (MM&A) worked closely with J-U-B Engineers and the Logan-Cache Airport staff to develop modeling input parameters.

1.1. Project Description

The Logan-Cache Airport proposes to expand the overall footprint of the facility to allow for future expansion. The proposed Master Plan includes additional corporate hangers, terminals, storage, manufacturing and maintenance facilities. Additional space and plans for future fuel storage, an aviation-compatible business park and an air traffic control tower are also included. Figure 1 provides an aerial view of the airport with the proposed expansion areas identified.

Under the current Master Plan there are no changes to the existing runway configurations. The main runway (17-35) is approximately 9000 feet long and the secondary runway, (28-10) is approximately 5000 feet long. Runway 17-35 is used for the majority of take-offs and landings.




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Figure 1
Project Area Overview & Future Plans
Logan-Cache Airport

2. Land Use

Land use near the airport is mixed and includes undeveloped properties, farm lands, commercial and light industrial along with some single and multi family residential. Directly south of the airport, along W 2500 N St, land use is all commercial, industrial or farming. The nearest residences to the south are located along W 1800 N, approximately one mile from the end of runway 34.

To the west of the airport, land use is virtually all farming and commercial. There may be some single family residences located on nearby farms, but all noise sensitive land use is over one mile from the airport. Directly east of the airport, land use is mainly commercial and industrial. There are some mixed commercial and residential uses along Highway 91, approximately $\frac{3}{4}$ mile east of the runway.

North of the airport, land use is primarily farming with a small group of single family residences along Pumphouse Road, approximately 3600 feet (0.7 miles) from the north end of runway 35-17.

3. Methodology

This section provides a basic understanding of acoustics and the different descriptors that are used to describe noise levels. It also provides an introduction to airport noise modeling, describes the FAA Integrated Noise Model (INM ver. 7.0), input parameters, and result format.

3.1. Acoustic Terminology

Noise is generally defined as unwanted sound. Noise is measured in terms of sound pressure level. It is expressed in decibels (dB), which are defined as $10 \log P^2/P_{ref}^2$, where P is the root-mean-square (rms) sound pressure and P_{ref} is the reference rms sound pressure of 2×10^{-5} Newtons per square meter.

The number of fluctuation cycles or pressure waves per second of a particular sound is the frequency of the sound. The human ear is less sensitive to higher and lower frequencies than to mid-range frequencies. Therefore, sound level meters used to measure environmental noise generally incorporate a weighing system that filters out higher and lower frequencies in a manner similar to the human ear. This system produces noise measurements that approximate the normal human perception of noise. Measurements made with this weighing system are termed "A-weighted" and are specified as "dBA" readings.

Several noise descriptors are used that take into account the variability of noise over time. The equivalent sound level (L_{eq}) is the level of a constant sound for a specified period of time

that has the same sound energy as an actual fluctuating noise over the same period of time. It is an energy average sound level.

The noise level metric used to assess the airport noise levels is the day-night average sound level (DNL). The DNL provides a single noise level that represents a 24-hour/day – 365-day period taking into consideration a greater sensitivity to noises that occur at nighttime. Nighttime sensitivity is weighted by the addition of a 10 dBA penalty factor included with nighttime sound levels occurring between 10 p.m. and 7 a.m. The DNL metric is recognized by the Federal Aviation Administration (FAA) for use in all FAA Part 150 (noise abatement) studies as the appropriate measure of cumulative noise exposure.

3.1.1. Human Perception of Noise

Noise levels decrease with distance from a noise source. For noise from a point source (such as an engine), sound levels decrease by 6 dBA for each doubling of the distance due to geometric divergence of the sound waves. Additional noise reduction (attenuation) can be provided by vegetation, terrain, and atmospheric effects that block or absorb noise.

Subjectively, a 10 dBA change in noise level is judged by most people to be approximately a twofold change in loudness (e.g., an increase from 50 dBA to 60 dBA causes the loudness to double). A 3 dBA increase is a barely perceptible increase, while a 5 dBA change is clearly noticeable to virtually everyone.

Normal conversation ranges between 44 and 65 dBA when speakers are 3 to 6 feet apart. Noise levels in a quiet rural area at night are typically between 32 and 35 dBA. Quiet urban nighttime noise levels range from 40 to 50 dBA. Noise levels during the day in a noisy urban area are frequently as high as 70 to 80 dBA. Noise levels above 110 dBA become intolerable and then painful, while levels higher than 80 dBA over continuous periods can result in hearing loss. Figure 2 provides an overview of land use types and the DNL noise level considered compatible with each type of use. In appendix B there is a detailed land use compatibility table taken from 14 CFR, Part 150, Airport Noise Compatibility Planning.

Figure 2: Land Use Compatibility by Sound Level in DNL

Land Use Category	Community Noise Exposure DNL (dBA)							
	55	60	65	70	75	80	85	
Residential - Low Density Single Family, Duplex, Mobile Homes	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Residential - Multiple Family	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Transient Lodging- Motels, Hotels	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Schools, Libraries, Churches, Hospitals, Nursing Homes	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Auditoriums, Concert Halls, Amphitheaters	[Vertical Lines]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Sports Arenas, Outdoor Spectator Sports	[Vertical Lines]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Playgrounds, Neighborhood Parks	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Golf Courses, Riding Stables, Water Recreation, Cemeteries	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Office Buildings, Business, Commercial and Professional	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Industrial, Manufacturing, Utilities, Agriculture	[Diagonal Hatching]		[Vertical Lines]		[Cross-hatching]		[Solid Black]	
Notations:								
[Diagonal Hatching] NORMALLY ACCEPTABLE: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.								
[Vertical Lines] CONDITIONALLY ACCEPTABLE: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice. Outdoor environment will seem noisy.								
[Cross-hatching] NORMALLY UNACCEPTABLE: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.								
[Solid Black] CLEARLY UNACCEPTABLE: New construction or development should generally not be undertaken. Construction costs to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable.								
<i>Source: California Department of Health Services</i>								

3.2. Method of Analysis

Airport noise level projections were performed using the FAA INM Version 7.0. All airport noise levels in this report are assessed in terms of the yearly day-night average sound level (YDNL) contours. The FAA’s INM is widely used by the civilian aviation community for evaluating aircraft noise impacts in the vicinity of airports. INM is an average-value model and is designed to estimate long-term effects using average annual input conditions.

3.3. Modeling Methodology

The INM computer model predicts noise levels based on aircraft flying along flight tracks representing departures and arrivals operations. J-U-B Engineers and MM&A worked closely with the Logan-Cache Airport staff to develop modeling input parameters regarding average daily operational characteristics at the airport. Input data are based upon the most current forecasts based upon current traffic counts and future forecasts. Input parameters for the noise model include the type and number of fixed wing aircraft operations and runway configurations. The flight operations were divided into daytime hours (7:00am to 10:00pm) and nighttime operations (10:00pm to 7:00am).

Take-offs and landings were divided between the two runways based on information from Logan-Cache Airport Staff. The model assumes typical aircraft operations and flight paths for this type of airport. Table 1 provides the type of aircraft, number of annual aircraft operations, runway splits and nighttime operations used in the INM.

Operations Name (FAA INM Type)	Existing (2009)	Future (2019)	Runway 17-35	Runway 10-28	Night Ops (7am - 10pm)
Single Engine Piston (Cessna 172)	82,080	124,915	85%	15%	20%
Multi-Engine Piston (Baron BEC58P)	1,000	1,500	85%	15%	25%
Turbo-Prop (DHC6 Dash 6)	450	675	100%	0%	20%
Small Jet (Cessna 550)	1550	2850	100%	0%	20%
Large Jet (MD80/MD81)	20	260	100%	0%	20%

4. Airport Noise Modeling Results and Exposure Maps

Based on the operational parameters from Table 1, continuous sound level contours from 55 dBA DNL through 80 dBA DNL (in increments of 5 dBA) were developed for Existing (2009) operations and Future (2019) operations. Sound level contours from 60 through 75 dBA DNL were plotted on an aerial base map. The base map includes an outline of the airport property line and surrounding area land uses. Graphics of the noise contours on area maps are provided in the following sections.

4.1. Existing 2009 Modeled Noise Levels

Currently, there are no noise sensitive land uses inside the existing 65 dBA DNL contour lines. The 65 dBA DNL contour is entirely contained on airport property, and there are no noise impacts projected. Figure 3 is a plot of the 60, 65, 70 and 75 dBA DNL contours under the existing operations.

4.2. Future 2019 Modeled Noise Levels

Under the year 2019 analysis, the 65 DNL contour will remain within airport property and no noise impacts are predicted. Actual increases in noise levels are predicted to be less than 3 dBA, which is not noticeable to an average person. Figure 4 is a plot of the 60, 65, 70 and 75 dBA DNL contours under the 2019 operations.

5. Project Noise Mitigation and Land Use Recommendations

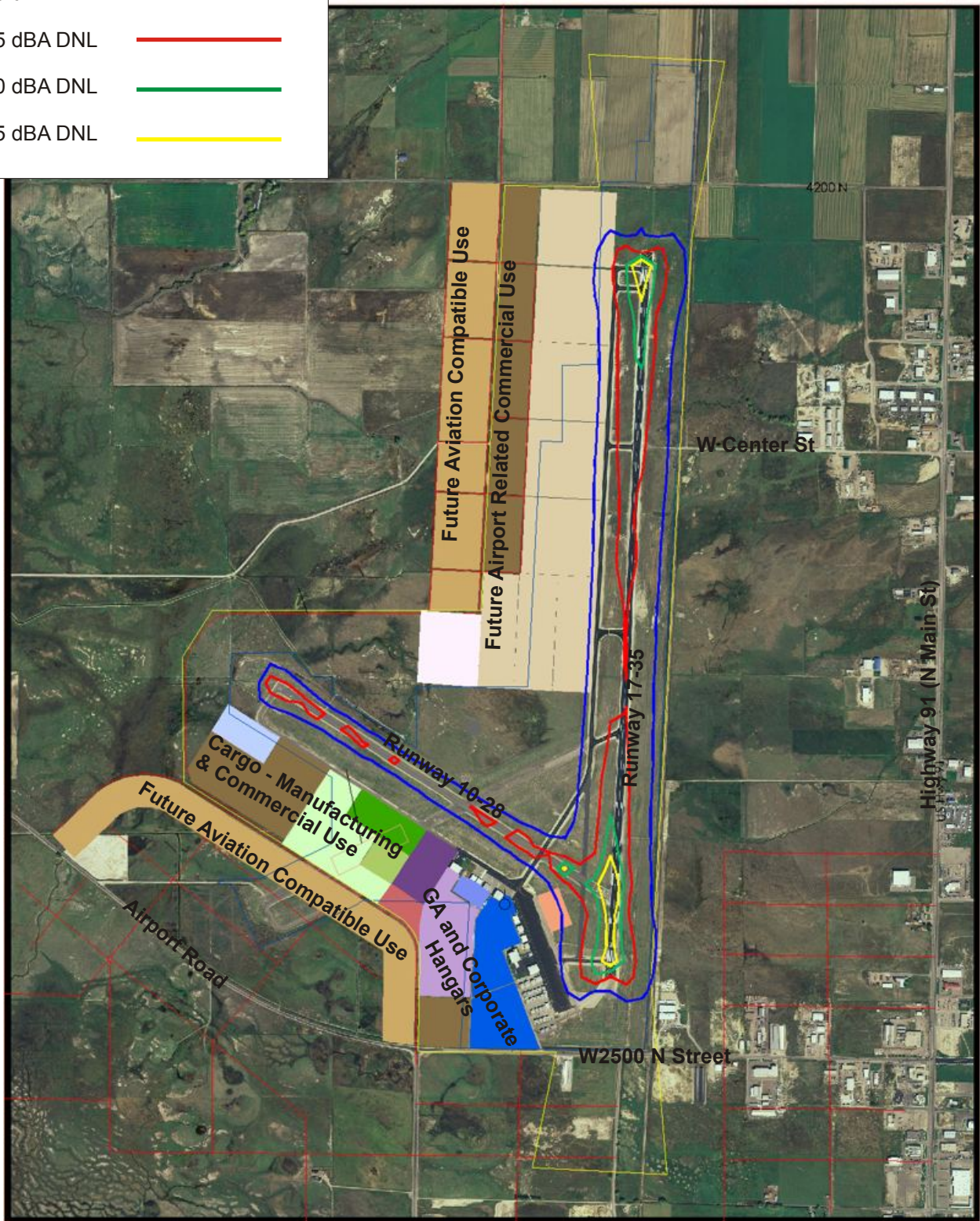
Because there are no noise impacts projected, no noise mitigation is recommended. FAA land use compatibility guidelines given in 14 CFR Part 150 is attached in Appendix B for reference. This land use compatibility table is also acceptable as the basis for land use planning in Utah. Land uses not compatible with noise levels above 65 dBA DNL include residences, schools, and nursing homes. The decision to allow construction of noise sensitive land uses and to regulate local area development is the responsibility of the local governments.

6. Conclusion

There are no noise sensitive receivers within the existing or future 65 dBA DNL, and therefore existing and planned airport operations are within the FAA regulations. Care should be taken to assure that no noise sensitive uses are allowed to be constructed near the airport to maintain compatibility.

Sound Level Contours:

- 60 dBA DNL —
- 65 dBA DNL —
- 70 dBA DNL —
- 75 dBA DNL —



0 500 2000 4000

1.00 in

Figured Scale 1 inch to 2000 feet

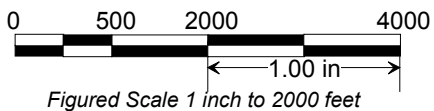
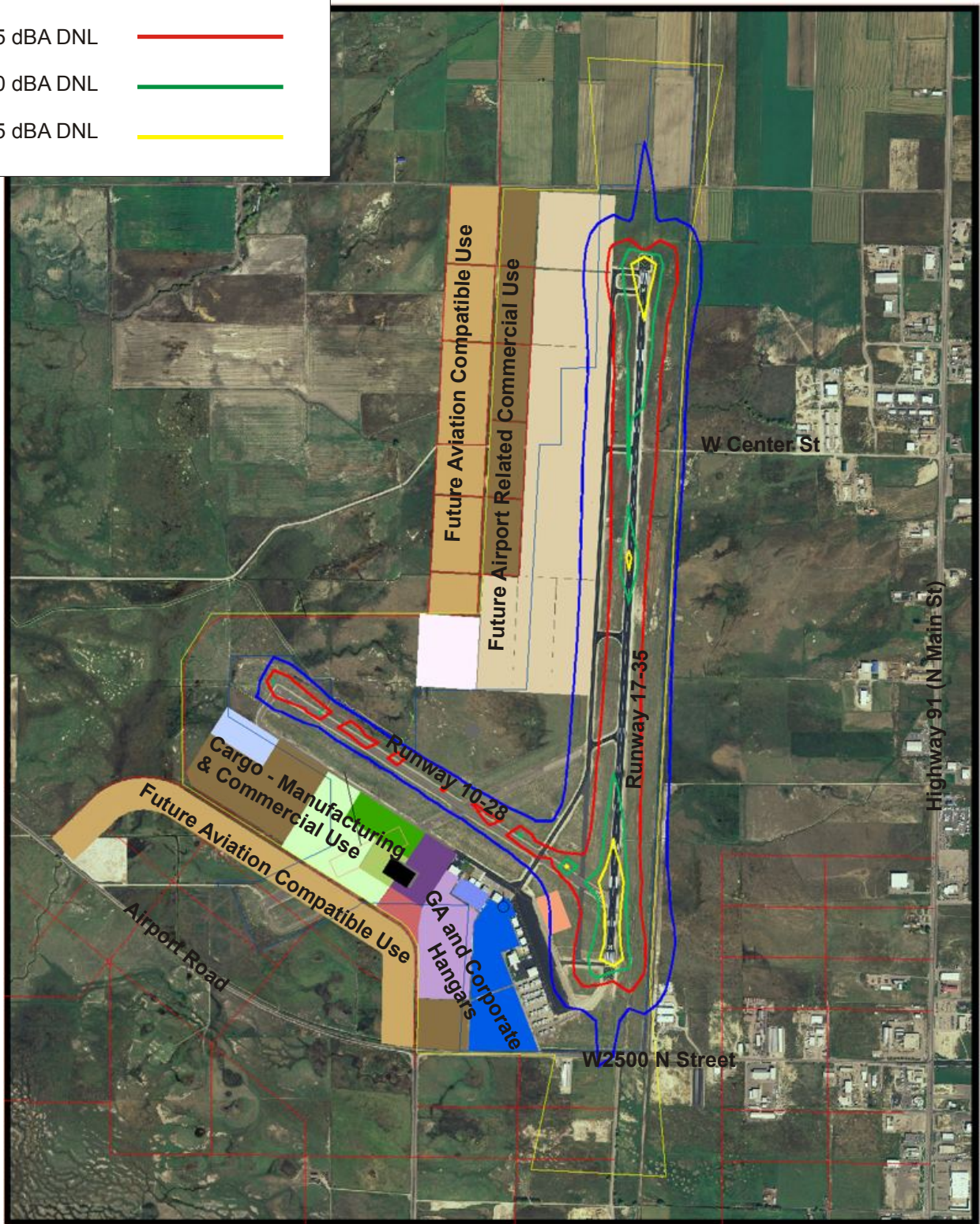


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Portland, Oregon

Figure 3
Existing (2009) DNL Contours
Logan-Cache Airport

Sound Level Contours:

- 60 dBA DNL —————
- 65 dBA DNL —————
- 70 dBA DNL —————
- 75 dBA DNL —————




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Figure 4
Future (2019) DNL Contours
Logan-Cache Airport

Appendix A: References

U.S. Department of Transportation. *Integrated Noise Model Version 7.0 User's Guide*. Federal Aviation Administration, Washington D.C, 1999, revised 2005.

US Code of Federal Regulations, *14 CFR, Title 14, Aeronautics and Space, Part 150 – Airport Noise Compatibility Planning*. Washington D.C., e-CFR current as of December 10, 2007.

Appendix B: Land Use Compatibility with Yearly Day-Night Average Sound Levels

Land use	Yearly day-night average sound level (L _{dn}) in decibels					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N ⁽¹⁾	N ⁽¹⁾	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N ⁽¹⁾	N ⁽¹⁾	N ⁽¹⁾	N	N
Public Use						
Schools	Y	N ⁽¹⁾	N ⁽¹⁾	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y ⁽²⁾	Y ⁽³⁾	Y ⁽⁴⁾	Y ⁽⁴⁾
Parking	Y	Y	Y ⁽²⁾	Y ⁽³⁾	Y ⁽⁴⁾	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware and farm equipment	Y	Y	Y ⁽²⁾	Y ⁽³⁾	Y ⁽⁴⁾	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y ⁽²⁾	Y ⁽³⁾	Y ⁽⁴⁾	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y ⁽²⁾	Y ⁽³⁾	Y ⁽⁴⁾	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y ⁽⁶⁾	Y ⁽⁷⁾	Y ⁽⁸⁾	Y ⁽⁸⁾	Y ⁽⁸⁾
Livestock farming and breeding	Y	Y ⁽⁶⁾	Y ⁽⁷⁾	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y ⁽⁵⁾	Y ⁽⁵⁾	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

*The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

Key to Table 1

SLUCM=Standard Land Use Coding Manual.

Y (Yes)=Land Use and related structures compatible without restrictions.

N (No)=Land Use and related structures are not compatible and should be prohibited.

NLR=Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35=Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Table 1

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal level is low.

(5) Land use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

Sec. A150.103 Use of computer prediction model.

(a) The airport operator shall acquire the aviation operations data necessary to develop noise exposure contours using an FAA approved methodology or computer program, such as the Integrated Noise Model (INM) for airports or the Heliport Noise Model (HNM) for heliports. In considering approval of a methodology or computer program, key factors include the demonstrated capability to produce the required output and the public availability of the program or methodology to provide interested parties the opportunity to substantiate the results.

(b) Except as provided in paragraph (c) of this section, the following information must be obtained for input to the calculation of noise exposure contours:

(1) A map of the airport and its environs at an adequately detailed scale (not less than 1 inch to 2,000 feet) indicating runway length, alignments, landing thresholds, takeoff start-of-roll points, airport boundary, and flight tracks out to at least 30,000 feet from the end of each runway.

(2) Airport activity levels and operational data which will indicate, on an annual average-daily-basis, the number of aircraft, by type of aircraft, which utilize each flight track, in both the standard daytime (0700–2200 hours local) and nighttime (2200–0700 hours local) periods for both landings and takeoffs.

(3) For landings—glide slopes, glide slope intercept altitudes, and other pertinent information needed to establish approach profiles along with the engine power levels needed to fly that approach profile.

(4) For takeoffs—the flight profile which is the relationship of altitude to distance from start-of-roll along with the engine power levels needed to fly that takeoff profile; these data must reflect the use of noise abatement departure procedures and, if applicable, the takeoff weight of the aircraft or some proxy for weight such as stage length.

(5) Existing topographical or airspace restrictions which preclude the utilization of alternative flight tracks.

(6) The government furnished data depicting aircraft noise characteristics (if not already a part of the computer program's stored data bank).

(7) Airport elevation and average temperature.

(c) For heliports, the map scale required by paragraph (b)(1) of this section shall not be less than 1 inch to 2,000 feet and shall indicate heliport boundaries, takeoff and landing pads, and typical flight tracks out to at least 4,000 feet horizontally from the landing pad. Where these flight tracks cannot be determined, obstructions or other limitations on flight tracks in and out of the heliport shall be identified within the map areas out to at least 4,000 feet horizontally from the landing pad. For static operation (hover), the helicopter type, the number of daily operations based on an annual average, and the duration in minutes of the hover operation shall be identified. The other information required in paragraph (b) shall be furnished in a form suitable for input to the HNM or other FAA approved methodology or computer program.

Sec. A150.105 Identification of public agencies and planning agencies.

(a) The airport proprietor shall identify each public agency and planning agency whose jurisdiction or responsibility is either wholly or partially within the $L_{dn}65$ dB boundary.

(b) For those agencies identified in (a) that have land use planning and control authority, the supporting documentation shall identify their geographic areas of jurisdiction.