



Land Use Compatibility Plan for Grand Forks International Airport

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**Grand Forks Regional
Airport Authority**

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Chapter 1

Compatibility Planning Concepts



Introduction

The basic purpose of this compatibility plan is to promote compatibility between the Grand Forks International Airport and surrounding land uses. It serves as a tool for use by the City of Grand Forks, the County of Grand Forks, nearby townships, and the Grand Forks Regional Airport Authority. This is a long-term plan that supports anticipated growth in activity at the airport and the addition of new airport facilities. Implementation of this plan should ensure that Grand Forks International Airport remains a good neighbor as development occurs in the City of Grand Forks and unincorporated areas.

This plan is organized into three chapters. The intent of this first chapter is to set the overall context of airport land use compatibility planning. Chapter 2 contains background information on the Grand Forks International Airport that was used to guide the development of compatibility policies. The policies are presented in Chapter 3.

Compatibility Factors

Compatibility between an airport and its environs should be evaluated in terms of four factors:

- Noise
- Overflight
- Safety
- Airspace

This chapter provides a general description of the compatibility factors and describes how they have been applied at Grand Forks International Airport. Assessment of each of these factors is based principally upon the guidance contained in the 2002 *California Airport Land Use Planning Handbook*, the North Dakota Aeronautics Code,

and current industry practice. The complete text of the *Handbook* as well as other similar documents can be found at the web sites listed below.

California:

<http://www.dot.ca.gov/hq/planning/aeronaut/htmlfile/landuse.php>

North Dakota:

<http://www.state.nd.us/lr/information/statutes/cen/code.html>

Wisconsin:

<http://www.wsdot.wa.gov/aviation/Planning/AirportsLandUse.pdf>

Oregon:

<http://egov.oregon.gov/Aviation/landuseguidebook.shtml>

Noise

Noise is one of the most basic airport land use compatibility concerns. It is the factor that typically receives the majority of attention. For the purposes of airport land use compatibility planning, noise generated by the operation of aircraft to, from, and around an airport is primarily measured in terms of the cumulative noise levels of all aircraft operations. In most of the United States, the cumulative noise level metric used is the Day-Night Level (DNL or L_{dn}). This metric provides a single measure of the average sound level in decibels (dB) to which any point near an airport is exposed. To reflect assumed greater community sensitivity to nighttime noise, events during this period are counted as being louder than actually measured. Cumulative noise levels are usually illustrated on airport area maps as contour lines connecting points of equal noise exposure. Mapped noise contours primarily show areas of significant

noise exposures — ones affected by high concentrations of aircraft takeoffs and landings.

Noise contours have been developed for Grand Forks International Airport and are presented in Chapter 2. Contours for both current and future activity levels have been prepared. Anticipated changes in airfield configuration (i.e., a fourth runway) and aircraft types are reflected in the future noise contours.

Single-event noise metrics are sometimes used in evaluating impacts of proposed airport modifications. They are rarely used as a means of defining land use compatibility policies.

Noise thresholds are normally discussed in terms of the threshold established for residential uses. However, it should be realized that noise policies commonly define separate thresholds for various uses (e.g., schools, theaters, etc.)

There continues to be debate on what threshold to use for residential uses. The Federal Aviation Administration (FAA) generally limits concerns over residential uses to within the 65 DNL contour. However, the FAA has supported policies to restrict new residential uses out to the 60 DNL contour. It should be noted that federal noise policies are profoundly shaped by the implications the policies will have on the largest commercial airports in urbanized settings.

Industry practice has been to consider each airport's setting, the mix of aircraft types and other factors when establishing the noise threshold for residential uses. For general aviation airports in rural settings, the 55 DNL noise contour is commonly used as the threshold for allowing residential uses. In suburban settings, the 60 DNL contour is typically used. The 65 DNL contour is appropriate to use in urban settings with busy commercial or general aviation airports.

At Grand Forks International Airport there are a number of factors to consider when establishing the noise threshold for residential uses. The rural setting is probably the most important factor. In the low ambient noise levels, aircraft noise will be very evident. The largest, and generally noisiest, aircraft will fly generally straight in and straight out from the runway being used. The areas lateral to the runways will receive a high volume of overflights by training aircraft. Given these conditions, the 60 DNL is judged to offer the best balance of reflecting noise impacts from commercial and general aviation aircraft.

Overflight

Experience at many airports has shown that noise-related concerns do not stop at the boundary of the outermost mapped DNL contour. Many people are sensitive to the frequent presence of aircraft overhead even at low noise levels. Overflight impacts are a combination of single-event noise impacts (e.g., speech interference or sleep disturbance) and the subjective experience of annoyance.

At many airports, complaints often come from locations beyond any of the defined noise contours. Areas that underlie common flight patterns are likely places for this to occur (See Figure 3A). The basis for such complaints may be a desire and expectation that outside noise sources not be intrusive — or, in some circumstances, even distinctly audible — above background noise levels. The limited numbers of complaints that have been received at Grand Forks International Airport have been exclusively from outside the noise contours.

Recent industry practice has been to select one of two strategies depending upon the current pattern of development. Where an airport's environs are largely free of sensitive uses (e.g.,

residences) and not already committed to this type of development, compatibility policies will favor retention of the non-sensitive uses (e.g., agriculture, industrial). Where the areas subject to overflights are already largely developed or are committed to sensitive uses, compatibility policies will favor a high-low strategy. A high-low strategy is based upon the premise that overflight annoyance is less likely to occur in residential areas with higher densities due to higher ambient noise levels. Therefore, residential uses with rural densities (e.g., 40 acre parcels) or high densities (e.g., apartments or common-wall residences) are acceptable in areas subject of overflight impacts. The high-low strategy results in either a small pool of potentially annoyed residents (low density) or a large number of residents (high density), but lower likelihood of annoyance occurring.

Touch-and-go (definition): A training maneuver in which the aircraft lands and then takes off without stopping.

Safety

Safety is in many respects a more difficult concern to address in airport land use compatibility policies than noise. A major reason for this difference is that safety policies address uncertain events which may occur with occasional aircraft operations, whereas noise policies deal with known, generally predictable events which occur with every aircraft operation. Because aircraft accidents rarely happen and the time, place, and consequences of their occurrence cannot be predicted, the concept of risk is central to the assessment of safety compatibility.

Safety criteria are currently defined in three ways. The Federal Aviation Administration's Airport Design advisory circular (AC 150/5300-13) contains land use policies for runway protection zones. Runway protection zones are areas beyond runway ends in which residences

and places of public assembly are prohibited. Under this definition, places of public assembly include churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of people. The Federal Aviation Administration recommends that airports acquire the property within their runway protection zones. Grand Forks International Airport currently owns most of the land within the runway protection zones, and plans to acquire the balance.

The safety compatibility zones described in the California

Airport Land Use Planning Handbook are the next source of guidance on safety policies. The California handbook was the seminal work on this topic; most other state's handbooks have followed its guidance. In Chapter 9, the *Handbook* provides examples of various configurations of safety compatibility zones and recommended policies for each zone. While these zones offer an integrated approach to safety, they suffer from two limitations. First, the number of zones appears to be too large for Grand Forks circumstances. With little existing development, a smaller number of zones would simplify implementation. Second, the recommended land use densities are not appropriate for an area that is currently rural. A simpler version of this approach offers potential value.

An emerging trend in compatibility planning in the western United States is to directly use national accident data to create accident risk intensity contours. Similar in concept to noise contours, accident risk intensity contours define areas with similar probabilities of an aircraft accident. These zones vary in size based upon various factors. For the circumstances at Grand Forks International Airport (e.g., commercial passenger service, high numbers of general aviation operations), the safety zones would

vary from 1 to 2 miles in length. The limitation of using accident risk intensity zones is that they rely upon a national data base. This does not reflect the very distinct flight patterns at Grand Forks. The existence of distinct arrival patterns outside of the touch-and-go pattern demands a more customized approach.

Airspace

Relatively few aircraft accidents are caused by land use conditions which are hazards to flight. The potential exists, however, and protecting against it is essential to airport land use safety compatibility. Because airspace protection is in effect a safety factor, its objective can likewise be thought of in terms of risk. Specifically, the objective is to avoid development of land use conditions which, by posing hazards to flight, can increase the risk of an accident occurring. The particular hazards of concern are:

- Airspace obstructions;
- Wildlife hazards, particularly bird strikes; and
- Land use characteristics which pose other potential hazards to flight by creating visual or electronic interference with air navigation.

Whether a particular object constitutes an airspace obstruction depends upon the height of the object relative to the runway elevation and its proximity to the airport. The acceptable height of objects near an airport is most commonly determined by application of standards set forth in Part 77 of the Federal Aviation Regulations. These regulations establish a three-dimensional space in the air above an airport. Any object which penetrates this volume of airspace is considered to be an obstruction and may affect the aeronautical use of the airspace. Obstructions are evaluated using guidance contained in *United States Standards for Terminal Instrument Procedures* (called "TERPS" for historical reasons).

The significance of other potential hazards to flight is principally measured in terms of the hazards' specific characteristics and their distance from the airport and/or its normal traffic patterns. At an airport that regularly receives use by jet aircraft, as Grand Forks International Airport does, hazards are of most concern within 10,000 feet of runways used by jets.

The vicinity of Grand Forks International Airport is unfortunately rich in potential wildlife attractants, principally bird attractants. There are large numbers of natural ponds, and a few man-made ponds and canals. There is also a landfill. As an agricultural area both crops and irrigation systems are potential bird attractants. Other wildlife attractants include reservoirs, sewage treatment and disposal facilities, and certain hunting practices.

It is difficult to identify all potential sources of visual and electronic interference in advance. Visual interference can be minimized by careful evaluation of lighting in new development. Flashing lights and lights in long parallel lines are of particular concern. The selling and release of fireworks within the airport vicinity can also be a safety hazard. The high concentrations of people around the fireworks stands are a safety concern. Additionally, fireworks, when fired, release light, smoke, and floating materials which can interfere with aircraft operations. New commercial and industrial uses that might generate radio frequency signals could also conflict with air operations.

It is appropriate to describe the Federal Aviation Administration's (FAA) role in reviewing development proposals. FAA's only formal role is to review projects for airspace conflicts. Developers are required by federal statutes to have proposed development reviewed if it would penetrate the imaginary surfaces defined in

Federal Aviation Regulations Part 77 (shown in the airspace plan). Given the area's flat topography, only unusually tall structures (e.g., cell towers) are likely to need review. The review process is started with submission of FAA Form 7460. If the FAA concludes that the proposed development would not be a hazard to aviation, a "no objection" letter will be issued. Alternatively, the FAA can indicate that a red obstruction light is needed or that specific elements of the project would be a hazard.

The FAA does not have any direct enforcement mechanism; as a federal agency it does not have authority over local land use decisions. The FAA, however, does provide guidance in Advisory Circular (AC) 150/5200-33A, *Hazardous Wildlife Attractants On or Near Airports*, for land-use planners, airport operators, and developers. This AC identifies certain land uses that have the potential to attract hazardous wildlife on or near public-use airports and provides recommendations on how to minimize wildlife risks to aviation and human safety while protecting valuable environmental resources.

However, if FAA recommendations in the airspace review are not followed, operations at Grand Forks International Airport could be directly affected. For example, visibility minimums could be raised on an existing instrument approaches, existing instrument procedures could be eliminated, or proposed instrument procedures could be prohibited. Ultimately, the FAA could determine that conditions were sufficiently unsafe that commercial passenger service would be discontinued.

Chapter 2

Background Data



Airfield Layout

As can be seen in Figure 2A, Grand Forks International Airport currently has three runways. Most large aircraft operations are on Runway 17R-35L, while the majority of the smaller airplanes use Runway 17L-35R. The runway with an east-west orientation (Runway 8-26) is principally used for operations during crosswinds. The larger jet aircraft typically continue to use the main runway even when crosswinds exist.

The current master plan update anticipates several important changes to the airfield at Grand Forks International Airport. In the immediate future two additional runways are proposed to be added:

- A second crosswind runway (Runway 8R-26L)
- A third runway with a north-south orientation (17C-25C)

The second crosswind runway will be designed to accommodate small aircraft (e.g., single- and twin-engine piston aircraft). The design of the third north-south runway is intended to serve helicopter training flights.

Other airfield changes are also planned. However, these not expect to be needed in the immediate future. The airport's main runway (17R-35L) is proposed to be extended a bit over 1,500 feet to a length of 8,900 feet. The additional length would permit passenger flights with larger jets to more distant destinations. The

existing crosswind runway (Runway 8L-26R) is also proposed to be extended. An extension of about 2,100 feet is contemplated to provide a crosswind runway for the largest aircraft expected to regularly use the airport.

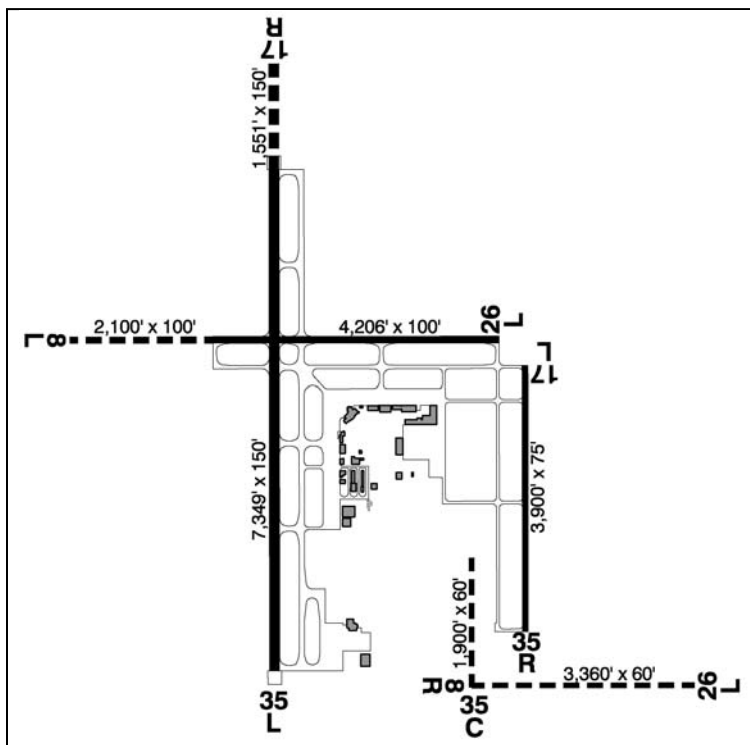


Figure 2A
Airport Layout

Airport Activity

In 2005 there were a total of 243,778 aircraft operations (an operation being either a takeoff or a landing). This volume of activity is forecast to rise to 315,450 annual operations by 2025. Approximately 90% of these operations are associated with flight training by students in the University of North Dakota's aerospace programs. These flight training activities are forecast to continue to account for 90% of the activity at Grand Forks International Airport.

Although single-engine piston aircraft and helicopters dominate the activity at the airport, a wide range of aircraft types can be seen daily. The largest aircraft that regularly uses Grand Forks International Airport are the Boeing 737-200s operated by FedEx. The other large jet regularly using the airport is the DC-9 flown by Northwest Airlines. Details on the mix of aircraft types can be seen in Table 2A.

The individuals interviewed are aviation professionals with direct, daily experience with flight operations at Grand Forks International Airport.

Those interviewed were asked to define common flight tracks based upon their experience. In each case, a scaled aerial photograph of the Grand Forks International

Table 2A
Current and Forecast Aircraft Operations

Aircraft Type	2005		2025	
	Ops	%	Ops	%
Single-engine piston	195,000	80.0%	234,000	74.2%
Twin piston	12,159	5.0%	15,000	4.8%
Turboprop single	3,600	1.5%	6,000	1.9%
Small turboprop twin (e.g. King Air)	1,500	0.6%	2,000	0.6%
Medium turboprop (e.g., Saab 340)	850	0.3%	100	0.0%
Business jet	750	0.3%	1,500	0.5%
Regional jet	1,456	0.6%	2,500	0.8%
Air carrier jet	3,139	1.3%	4,000	1.3%
Civilian helicopter	25,000	10.3%	50,000	15.9%
Military helicopter	324	0.1%	350	0.1%
Total	243,778	100.0%	315,450	100.0%

Flight Tracks

It is important to document common flights tracks for two reasons. First, flight tracks must be defined before noise contours can be developed. Additionally, areas underlying common flights tracks are potential sources of overflight annoyance.

Detailed flight tracks for Grand Forks International Airport were developed from interviews with knowledgeable individuals associated with its operations, including staff from:

- FAA's Airport Traffic Control Tower
- Flight Operations of the John D. Odegard School of Aerospace Sciences, University of North Dakota
- GFK Flight Support

Airport environs was provided as an aid. In many cases those interviewed sketched the flight tracks on the drawing. Where there were differences of opinion, the guidance of FAA's air traffic control staff were used. The results of this effort are shown in Figure 3A. The graphic also shows the flight pattern envelope for the future runways. The on-airport flight tracks for training helicopters have been omitted for clarity.

It is important to realize the variability in the flight tracks. Everywhere within five miles of the airport will be overflown in an average year. The graphic depicts only those areas where approximately 80% of aircraft are flying at about traffic pattern altitude. Typically traffic pattern altitude for small aircraft is 1,000 feet above airport elevation, for large aircraft 1,500 feet above airport elevation. Touch-and-go flight

tracks have greater predictability than arrival and departure tracks.

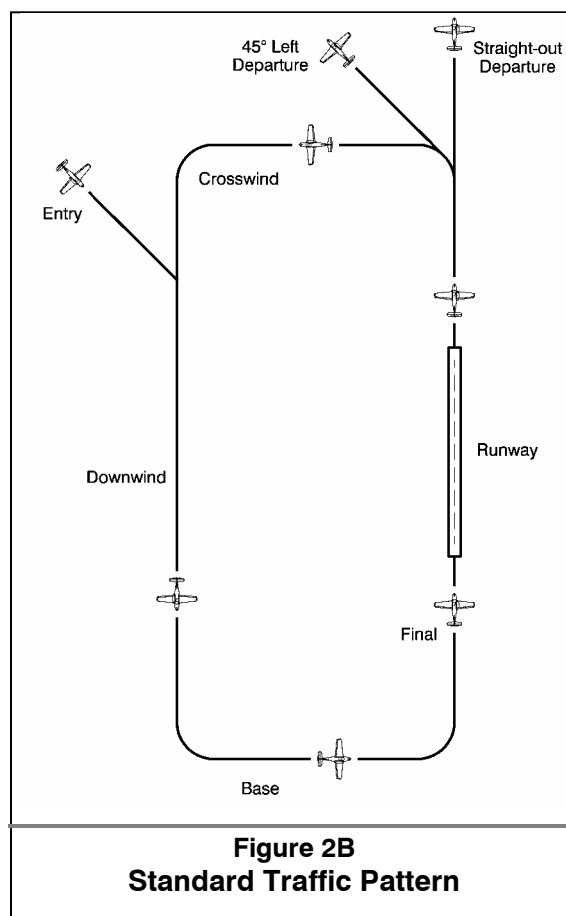
Each segment of flight in a traffic pattern has a standard name. The standard names used in this discussion are identified in Figure 2B. Pilots typically refer to each segment as a “leg” (e.g., downwind leg).

Winds commonly favor use of the two north-south runways. When these runways are in use, large aircraft will make arrivals and departures that are essentially straight in and straight out; they will seldom make turns closer than 3 miles from a runway end. Touch-and-goes will occur on both runways with aircraft flying the downwind legs away from the airport center. This permits helicopters to arrive and depart along north-south routes between the runways. Depending upon the number of aircraft in the pattern, the touch-and-go pattern will stretch from 3,000 to 12,000 feet from the runway ends. During crosswind conditions, fixed-wing aircraft are limited to one runway. However, the general pattern remains the same.

Outside the touch-and-go pattern, common arrival tracks have been defined to aid in sequencing arriving aircraft into the pattern. For fixed-wing aircraft, these tracks are defined by 8 VFR waypoints: 4 inner waypoints and 4 outer waypoints. The inner waypoints are established 2 to 2.5 miles outboard from ends of the two north-south runways. The 4 outer waypoints are established a further 3 to 5 miles away. Arriving pilots use these as reporting points. Similar inner and outer reporting points have been developed for helicopters.

VFR (definition): Visual Flight Rules. Those rules adopted by the FAA governing flight when visual meteorological conditions exist.

These waypoints define corridors that will be commonly overflowed (80% of operations) by training aircraft returning to Grand Forks International Airport. Although aircraft will be initially higher than traffic pattern altitude, the potential for overflight annoyance is possible along these routes.



Noise Contours

Noise contours were prepared using the activity levels and flights tracks presented earlier in this plan (Figures 2C and 2D). The FAA's Integrated Noise Model (Version 6.1) was used to develop the contours. What is most striking about the noise contours is how much smaller the future noise contours are. The reduction in contour size occurs in spite of a forecast 30% increase in annual operations. This reduction is caused

by the anticipated replacement of the Boeing 737 and DC-9 with newer-generation jets. The improvements in engine technology have resulted in significant reductions in sound levels produced by these larger jets.

Airspace Surfaces

Figure 2E presents the current airspace plan for Grand Forks International Airport. It was prepared as part of the 1994 airport master plan. Although it will be revised in the current master planning effort, this graphic gives a sense of the scale of the airspace surfaces.



Federal Express Boeing 737



Northwest Airlines DC-9



Legend

Compatibility Factors

- 60 dB DNL
- 65 dB DNL

Boundary Lines

- Existing Airport Property Line

Existing (2005)

- Annual Operations - 243,778
- Daily Operations - 667

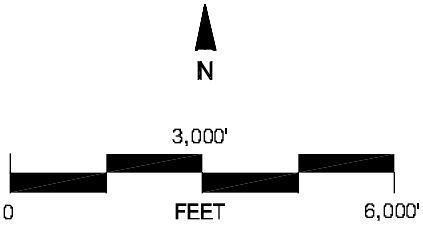
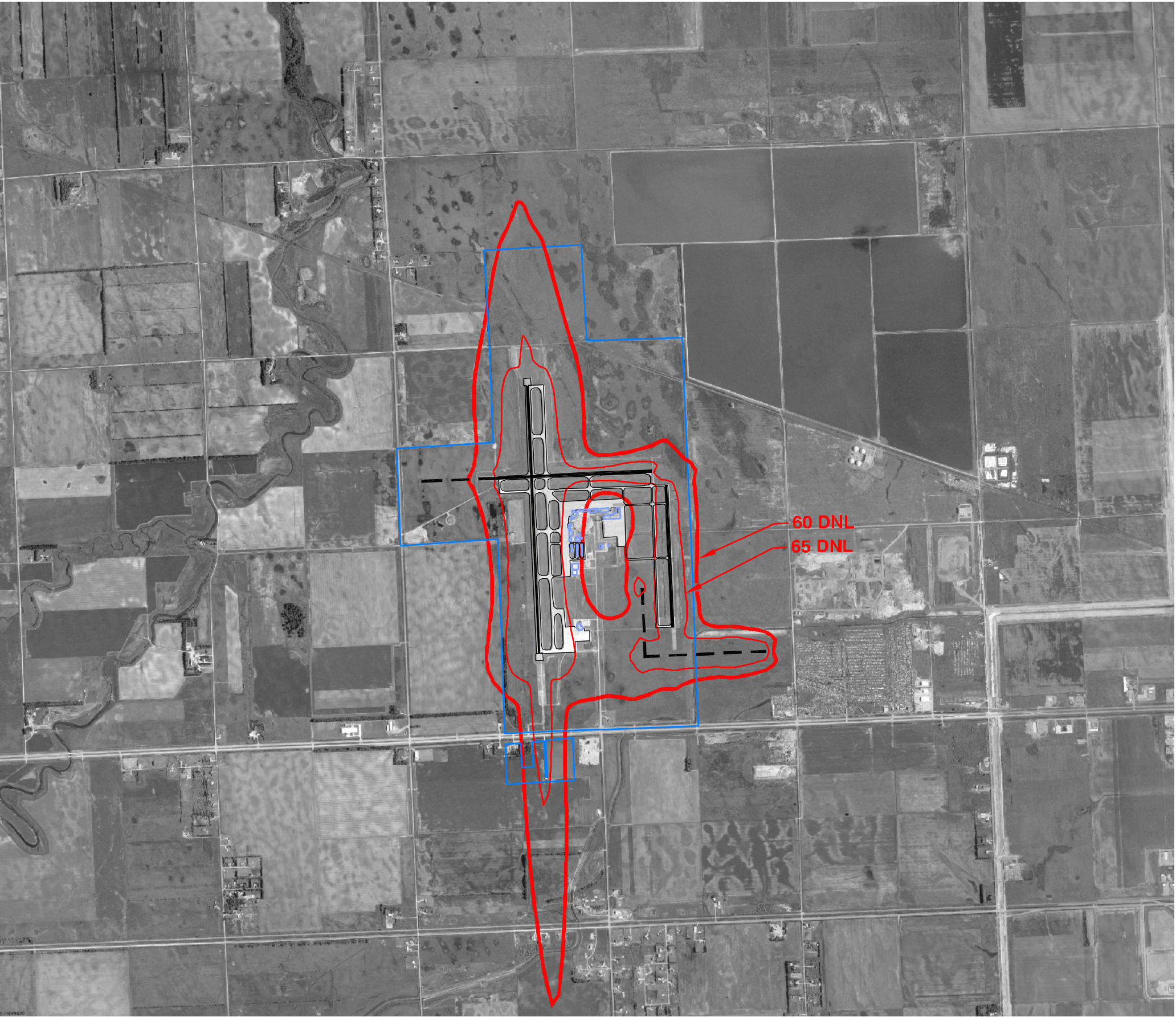


Figure 2C

2005 Existing Noise
Grand Forks International Airport

Source: Mead & Hunt, Inc. (July 2006)



Legend

Compatibility Factors

- 60 dB DNL
- 65 dB DNL

Boundary Lines

- Existing Airport Property Line

Future (2025)

- Annual Operations - 315,450
- Daily Operations - 864

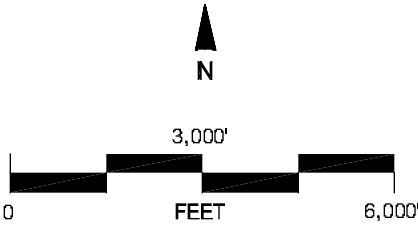


Figure 2D

2025 Future Noise
Grand Forks International Airport

Source: Mead & Hunt, Inc. (July 2006)

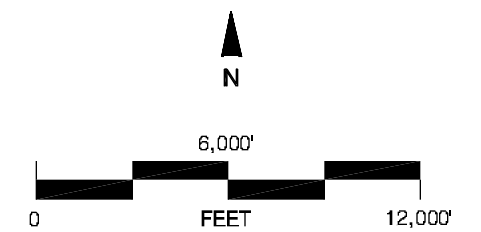
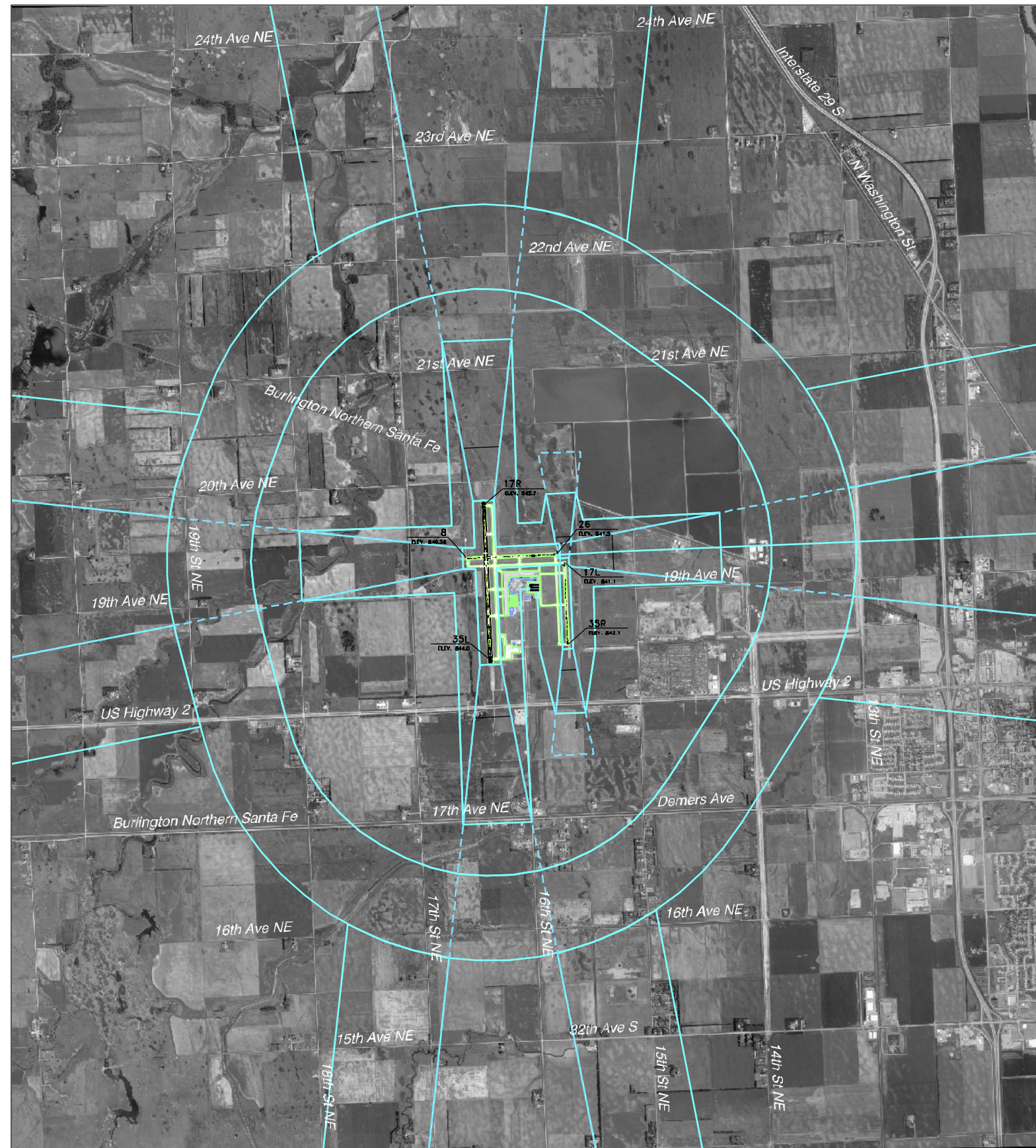


Figure 2E

1994 Master Plan Airspace Surfaces Grand Forks International Airport

Chapter 3

Compatibility Policies



Introduction

These policies have been developed to provide the Metropolitan Planning Organization, the City of Grand Forks, and Grand Forks County with guidance in planning for development in the vicinity of the Grand Forks International Airport. The intent is to provide a comprehensive set of policies for consideration by these agencies that would ensure the maximum compatibility of new development with the airport. These policies address several specific issues:

- Define where new residential uses will be permitted. Creation of rural subdivisions in the airport's vicinity is of particular concern. In the long term, suburban development may also be a concern.
- Characterize the types of commercial and industrial uses that will be permitted near the airport, particularly along Gateway Drive. Safety of occupants is the principal concern, although noise may be an issue for some uses.
- Identify a means of protecting airspace needed for flight training without unreasonably limiting where towers may be placed.
- Identify land use controls that will minimize wildlife hazards, particularly, bird attractants, without limiting the viability of agriculture or unnecessarily constraining flood control or other facilities.

Basic Approach

The traditional method of addressing compatibility concerns is to have a separate set of criteria and an associated map for each of the four factors (noise, overflight, safety, and risk). In this way, each of the factors can be examined

individually and thus the land use restrictions can be more specific.

An alternative method involves the creation of a composite set of criteria and zones that address the compatibility concerns in a combined manner. Advantages to this technique include greater flexibility in delineating the compatibility zones and greater ease in implementation. For instance, although the zone boundaries must be based upon noise contours, flight paths, and areas of high risk, they can be drawn to follow roads and other geographic features. Implementation is facilitated because, for the most part, parcels are not split by the compatibility zones and reference need only be made to a single map and set of criteria for determination of compatibility. These advantages make this option the preferred method for addressing compatibility concerns around Grand Forks International Airport.

Airport Influence Area

To determine the overall airport influence area for Grand Forks International Airport, decisions must be made as to where the compatibility factors described herein represent significant concerns.

The airport influence area is generally the area in which current and future airport-related noise, overflight, safety and/or airspace protection factors may affect land uses or necessitate restrictions on the uses. The airport influence area is determined by the location and configuration of the airport runways, existing and projected aircraft operations, the location of the flight paths, and the extent of the noise and safety impacts of the airport.

The airport influence area also includes areas where proposed construction requires Federal Aviation Administration (FAA) airspace hazard review under Part 77 of the Federal Aviation Regulations.

Figure 3A, *Compatibility Factors Map*, shows an overlay composite of the projected noise contours, flight envelopes, accident risk areas, and airspace surfaces for Grand Forks International Airport. Examination of this map indicates that the FAR Part 77 surfaces are the most geographically extensive of any of the aeronautical factors. However, only very tall objects (over 150 feet in height) are a concern in the outer portions of this area.

A final point to emphasize is that inclusion of an area within the airport influence area does not necessarily mean that major restrictions on land use development are required. Typically, the outer portions of an airport influence area have few restrictions other than on tall structures. Real estate transaction disclosure requirements are the only other significant policy that would be applicable within this area.

Compatibility Zone Delineation

The compatibility map for Grand Forks International Airport is comprised of four compatibility zones (Zones A through D). The aeronautical factors used to establish the compatibility zone boundaries are described below and outlined in Table 3A, *Compatibility Zone Factors*. The *Compatibility Map* (Figure 3B) depicts the four compatibility zones proposed for the airport.

Zone A is comprised of the runways themselves and the runway protection zones immediately beyond the ends of the runways. The areas lateral to the runways are defined by essential setbacks and by the Building Restriction Line

(BRL). The BRL for existing runways was taken from the *Airport Layout Plan*, dated December 27, 2002. The BRL for proposed runways was taken from the *Airport Layout* graphic prepared as part of Phase 1 of the airport master plan update.

Zone B encompasses areas exposed to high noise and high risk. These areas are located within the 65 dB DNL noise contour and the inner portion of the runway approach and departure corridors. Aircraft within these areas are flying at low altitudes — typically between 100 and 400 feet above the runway elevation on arrival.

Zone C contains areas affected by moderate noise impact and risk level. It includes lands within the 60 dB DNL noise contour and areas where most (approximately 80%) of the closed-circuit flight training activity takes place. Typical flight pattern altitude for small aircraft is 1,000 feet above the airport elevation and 1,500 feet for large aircraft. Additional areas around the primary flight envelopes are included to account for aircraft transitioning into the closed-circuit flight pattern. Arriving aircraft commonly use fixed VFR waypoints to establish proper altitudes before enter the downwind leg of the flight pattern. These overflight areas are subject to individual aircraft noise events which are potentially loud enough to be disruptive.

Zone D is intended to provide a buffer to the airport's airspace, as defined in Federal Aviation Regulations Part 77, *Objects Affecting Navigable Airspace*. Airspace protection is the major concern because aircraft sometime pass over these areas while flying to, from, or around the airport.

Zone	Locations	Standards			Additional Criteria	
		Minimum Parcel Size ¹	Other Uses maximum people/ac ²		Unacceptable Uses ³	Other Development Conditions
			Average ⁴	Single Acre ⁵		
A	Within Building Restriction Line and Runway Protection Zone ⁶	No New Dwellings Allowed	0	0	› All structures except ones with location set by aeronautical function › Assemblages of people › Objects exceeding FAR Part 77 height limits › Storage of hazardous materials › Hazards to flight ⁷	› Avigation easement dedication ⁸
B	High Noise and Inner Approach/Departure Zone	No New Dwellings Allowed Except on Existing Legal Lot	40	100	› Children's schools, day care centers, libraries › Hospitals, nursing homes; places of worship › Bldgs with >2 aboveground habitable floors › Aboveground bulk storage of hazardous materials ⁹ › Highly Noise-sensitive outdoor nonresidential uses ¹⁰ › Hazards to flight ⁷	› Locate structures maximum distance from extended runway centerline › Critical community infrastructure facilities generally unacceptable ^{11, 12} › Potential NLR requirement of 20 dB in residences (including mobile homes) and office buildings ¹³ › Airspace review required for objects >35 feet tall ¹⁴ › Avigation easement dedication
C	Flight Corridor Zone	≥40.0 ac.	100	250	› Children's schools, day care centers, libraries › Hospitals, nursing homes › Bldgs with >3 aboveground habitable floors › Highly noise-sensitive outdoor nonresidential uses ¹⁰ › Hazards to flight ⁷	› Aboveground bulk storage of hazardous materials generally unacceptable ⁹ › Airspace review required for objects >70 feet tall › Deed notice required ⁸
D	Airspace Protection Buffer Area	No Restriction	No Restriction ¹⁵		› Highly noise-sensitive outdoor nonresidential uses ¹⁰ › Hazards to flight ⁷	› Children's schools, hospitals, nursing homes generally unacceptable ¹² › Major spectator-oriented sports stadiums, amphitheaters, concert halls generally unacceptable › Airspace review required for objects >100 feet tall › Deed notice required ⁸

Table 3A

Compatibility Zone Factors

Grand Forks International Airport

NOTES:

- ¹ Single-family dwellings on legal lots of record are permissible. Clustering of units is encouraged. Densities are to be calculated in terms of site size. Noise level reduction and aviation easement requirements for the compatibility zone in which the dwellings are to be located are to be applied.
- ² Usage intensity calculations shall include all people (e.g., employees, customers/visitors, etc.) who may be on the property at a single point in time, whether indoors or outside.
- ³ The uses listed here are ones that are explicitly unacceptable regardless of whether they meet the intensity criteria. In addition to these explicitly unacceptable uses, other uses will not be permitted in the respective compatibility zones because they do not meet the usage intensity criteria.
- ⁴ The total number of people permitted on a project site at any time, except rare special events, must not exceed the indicated usage intensity times the gross acreage of the site. Rare special events are ones (such as an air show at the airport) for which a facility is not designed and normally not used and for which extra safety precautions can be taken as appropriate.
- ⁵ Clustering of nonresidential development is permitted. However, no single acre of a project site shall exceed the indicated number of people per acre.
- ⁶ Runway protection zone (RPZ) and building restriction line (BRL) limits that delineate *Zone A* are derived from locations indicated on the airport layout plan. *Zone A* is typically on airport property or otherwise under airport control.
- ⁷ Hazards to flight include physical (e.g., tall objects), visual, and electronic forms of interference with the safety of aircraft operations. Land use development that may cause the attraction of birds to increase is also unacceptable.
- ⁸ As part of certain real estate transactions involving residential property within any compatibility zone (that is, anywhere within an airport influence area), information regarding airport proximity and the existence of aircraft overflights should be disclosed. Easement dedication and deed notice requirements indicated for specific compatibility zones would apply only to new development and to reuse if discretionary approval is required.
- ⁹ Storage of aviation fuel and other aviation-related flammable materials on the airport is exempted from this criterion. Storage of up to 6,000 gallons of nonaviation flammable or other hazardous materials is also exempted.
- ¹⁰ Examples of highly noise-sensitive outdoor nonresidential uses that are unacceptable include amphitheaters and drive-in theaters. Caution should be exercised with respect to uses such as poultry farms and nature preserves.
- ¹¹ Critical community facilities include power plants, electrical substations, and public communications facilities.
- ¹² Generally unacceptable uses are those that are incompatible with airport operations. These uses should not be permitted unless no feasible alternative is available.
- ¹³ To attain an interior noise level of no more than 45 dB DNL, the structure would need to provide up to the indicated Noise Level Reduction (NLR) given the maximum noise exposure for the specific compatibility zone.
- ¹⁴ Objects up to 35 feet in height are permitted. However, the Federal Aviation Administration may require marking and lighting of certain objects. This height criterion is for general guidance. Shorter objects normally will not be airspace obstructions unless situated at a ground elevation well above that of the airport. Taller objects may be acceptable if determined not be obstructions.
- ¹⁵ Although no explicit upper limit on usage intensity is defined for *Zone D*, land uses of the types listed—uses that attract very high concentrations of people in confined areas—are generally unacceptable in locations below or near the principal arrival and departure flight tracks.

Table 3A, continued

For Grand Forks International Airport, Zone D includes areas that are routinely overflowed by aircraft transitioning into the airport's airspace using established VFR waypoints to enter into the local traffic pattern. Along the approach and departure corridor, aircraft are flying at significantly lower altitudes. Using the standard approach angle of 3° as a measure, aircraft on final approach at a distance of about 2.5 statute miles from the end of the runway are below 800 feet above the runway elevation. Departing aircraft are climbing at a faster rate and therefore reach higher altitudes closer to the runway. Thus, the outer limits of Zone D define the extent of the airport influence area for Grand Forks International Airport.

Focused Compatibility Criteria

A set of compatibility criteria is established for each respective zone and indicated in Table 3B, *Compatibility Criteria*. Noteworthy land use restrictions and key planning terminology are described below.

Zone A - Most of the area within this zone is located on the airport or otherwise under existing or planned airport control. It is strongly recommended that all the areas within Zone A be controlled by the airport proprietor. Thus, an avigation easement should be required. An easement conveys rights associated with aircraft overflight of a property, including creation of noise, limits on the height of structures and trees to the airport proprietor.

Zone A prohibits all development not established by aeronautical function. There are limited exceptions for this zone.

Zone B – Lands within this zone are located within the 65 dB DNL contour and/or the inner portions of the approach and departure corridors. With the exception of construction on

existing legal residential lots, no new dwellings should be permitted in Zone B. Non-residential development should be limited to low intensity uses.

Zone C – Compatibility Zone C represents locations having noise levels of approximately 60 to 65 dB DNL but limited safety concerns. To reduce the number of people exposed to overflight impacts, only rural residential densities (e.g., 1 dwelling unit per 40 acres) are acceptable. The usage intensity (people per acre) limits for non-residential uses allow most uses except high-rise development, major sports arenas, and the like.

Zone D - Zone D includes areas needed to protect the airspace around the airport from activities that can impair the use of the facility or even be the cause of an accident. The height of structures in the nearby area is the most critical concern in this regard. Other land use activities also can adversely affect airport usage, however. These include uses that attract birds, generate electronic interference with aircraft navigation or communications, or generate visual impairments such as smoke, glare, or distracting lights.

A unique concern at Grand Forks International Airport is the discharge of fireworks within the airport's vicinity. The release of projectiles into the airspace utilized by aircraft can physically interfere with the safe operation of an aircraft. Additionally, the aerial displays of fireworks (e.g., bright or flashing lights) can visually impair a pilot's ability to safely navigate through the air.

Bird strikes are also of great concern. Aircraft collisions with birds and other wildlife are a serious economic and public safety problem. As Grand Forks International Airport lies within an agricultural area, specific agricultural crops and activities (e.g., tilling and harvesting), existing

wetlands, and the city's sewage ponds are key concerns. These uses act as a food source or gathering place that attract many birds. Large congregations of birds create an aeronautical safety hazard. Alternative crops, relegating plowing and cultivating activities to hours of darkness or periods when the problem species are less active, and other mitigation practices can be employed to reduce the attractiveness of these uses to birds and other wildlife.

The policies recommended in this plan would only apply to those projects requiring local discretionary approval. However, in regards to agriculture, North Dakota state law does not allow townships and counties to prohibit agricultural uses through local zoning ordinances.

For those uses that either exist or do not require agency approval, the airport would need to coordinate with and encourage local jurisdictions and private land-owners to take steps to reduce the attractiveness of these types of uses. This coordination effort is also required by the Federal Aviation Administration. As a commercial service airport, Grand Forks International Airport, is obligated under Title 14 of the Code of Federal Regulations, Part 139, to comply with the wildlife hazard management requirements, standards, and recommendations set forth in Advisory Circular 150/5200-33A, *Hazardous Wildlife Attractants On or Near Airports*. The airport has a wildlife hazardous management plan in place.

Additionally, the geographic extent of the area encompassed by Zone D makes restrictions on residential development impractical. Accordingly, the compatibility criteria table shows no restrictions on new residential uses within this zone. In exchange, a deed notice requirement is added.

Noise Level Reduction – The Department of Housing and Urban Development (HUD) guidelines for the acceptability of residential land use are set forth in the Code of Federal Regulations Title 24, Part 51, *Environmental Criteria and Standards*. The guidelines identify a noise exposure of DNL 65 dB or less as acceptable, between 65 and 75 dB as normally acceptable if appropriate sound attenuation is provided, and above DNL 75 dB as unacceptable. The goal for interior noise levels is DNL 45 dB. These guidelines apply only to new construction supported by HUD grants and are not binding upon local communities.

Thus, Zone B requires a noise level reduction of 20 dB (65 dB – 45 dB) to attain an interior noise level of 45 dB DNL.

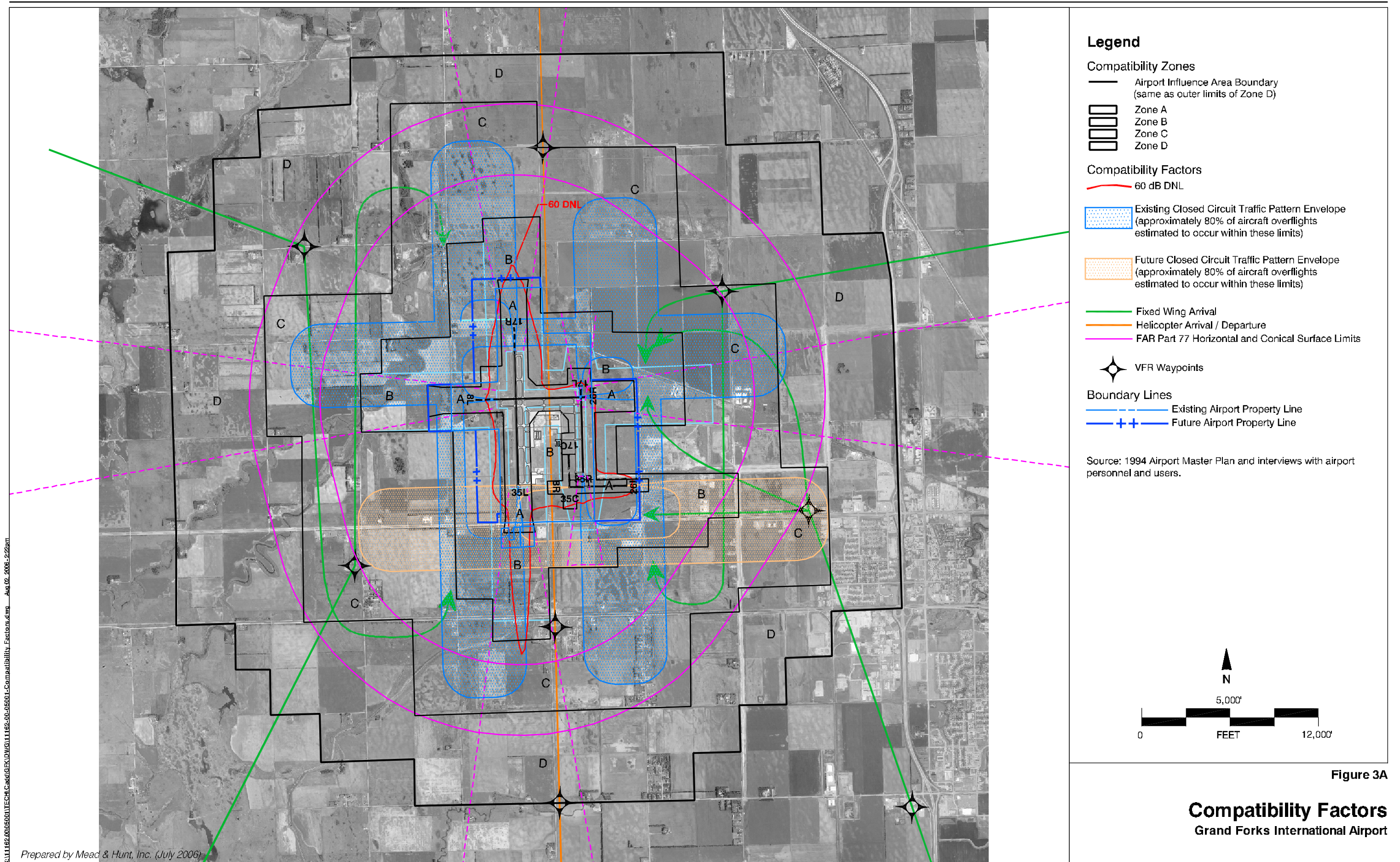
Deed Notices – As part of residential real estate transactions, some states require that information be disclosed regarding whether the property is situated within the airport influence area. With certain exceptions, this requirement would apply both to the sale or lease of newly subdivided lands and to the sale of existing residential property.

It is recommended that the affected land use jurisdictions around Grand Forks International Airport adopt a policy designating the airport influence area as the area wherein disclosure of airport influences is required in conjunction with the transfer of residential real estate. Such local jurisdiction policies also should be applied to lease or rental agreements for existing residential property.

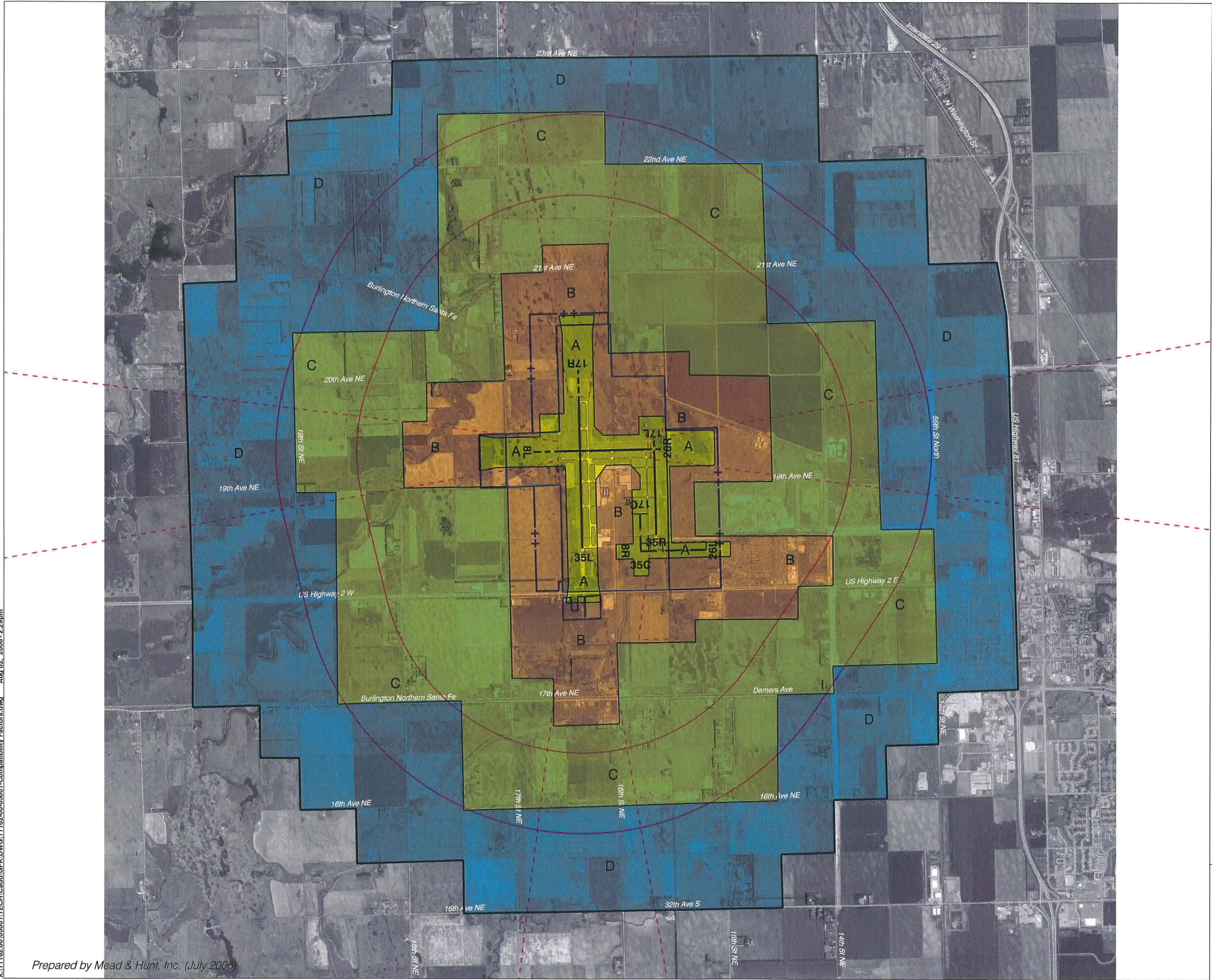
Conclusion

The proposed set of compatibility zones and criteria described above address the noise, overflight, safety and risk concerns associated with operations at Grand Forks International

Airport. Decisions must be made as to the overall approach of evaluating where the compatibility factors represent significant concerns. It is recognized that adjustments to the zone boundaries and refinements to the compatibility criteria will be required as new information is made available as part of the ongoing master planning effort.



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Legend

Compatibility Zones

- Airport Influence Area Boundary (same as outer limits of Zone D)
- Zone A
- Zone B
- Zone C
- Zone D

Boundary Lines

- Existing Airport Property Line
- ++ Future Airport Property Line
- FAR Part 77 Horizontal and Conical Surface Limits

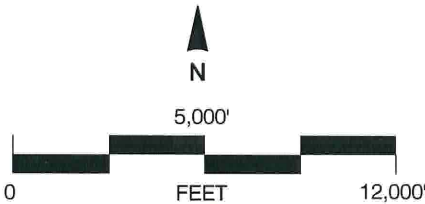


Figure 3B

Adopted Compatibility Map
Grand Forks International Airport

Appendix



APPENDIX A

Glossary of Terms

Air Carriers: The commercial system of air transportation, consisting of the certificated air carriers, air taxis (including commuters), supplemental air carriers, commercial operators of large aircraft, and air travel clubs.

Air Installation Compatible Use Zone (AICUZ): A land use compatibility plan prepared by the U.S. Department of Defense for military airfields. AICUZ plans serve as recommendations to local government bodies having jurisdiction over land uses surrounding these facilities.

Aircraft Accident: An occurrence incident to flight in which, as a result of the operation of an aircraft, a person (occupant or nonoccupant) receives fatal or serious injury or an aircraft receives substantial damage.

- Except as provided below, *substantial damage* means damage or structural failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component.
- Engine failure, damage limited to an engine, bent fairings or cowling, dented skin, small puncture holes in the skin or fabric, ground damage to rotor or propeller blades, damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered substantial damage.

Aircraft Incident: A mishap associated with the operation of an aircraft in which neither fatal or serious injuries nor substantial damage to the aircraft occur.

Aircraft Mishap: The collective term for an aircraft accident or an incident.

Aircraft Operation: The airborne movement of aircraft at an airport or about an en route fix or at other point where counts can be made. There are two types of operations: local and itinerant. An operation is counted for each landing and each departure, such that a touch-and-go flight is counted as two operations. (FAA Stats)

Airport: An area of land or water that is used or intended to be used for the landing and taking off of aircraft, and includes its buildings and facilities if any. (FAR 1)

Airport Elevation: The highest point of an airport's useable runways, measured in feet above mean sea level. (AIM)

Airport Layout Plan (ALP): A scale drawing of existing and proposed airport facilities, their location on an airport, and the pertinent clearance and dimensional information required to demonstrate conformance with applicable standards.

Airport Master Plan (AMP): A long-range plan for development of an airport, including descriptions of the data and analyses on which the plan is based.

Airport Reference Code (ARC): A coding system used to relate airport design criteria to the operation and physical characteristics of the airplanes intended to operate at an airport. (Airport Design AC)

Ambient Noise Level: The level of noise that is all-encompassing within a given environment for which a single source cannot be determined. It is usually a composite of sounds from many and varied sources near to and far from the receiver.

Approach Protection Easement: A form of easement which both conveys all of the rights of an aviation easement and sets specified limitations on the type of land uses allowed to be developed on the property.

Approach Speed: The recommended speed contained in aircraft manuals used by pilots when making an approach to landing. This speed will vary for different segments of an approach as well as for aircraft weight and configuration. (AIM)

Aviation-Related Use: Any facility or activity directly associated with the air transportation of persons or cargo or the operation, storage, or maintenance of aircraft at an airport or heliport. Such uses specifically include runways, taxiways, and their associated protected areas defined by the Federal Aviation Administration, together with aircraft aprons, hangars, fixed base operations, terminal buildings, etc.

Avigation Easement: A type of easement which typically conveys the following rights:

- A right-of-way for free and unobstructed passage of aircraft through the airspace over the property at any altitude above a surface specified in the easement (usually set in accordance with FAR Part 77 criteria).
- A right to subject the property to noise, vibrations, fumes, dust, and fuel particle emissions associated with normal airport activity.
- A right to prohibit the erection or growth of any structure, tree, or other object that would enter the acquired airspace.
- A right-of-entry onto the property, with proper advance notice, for the purpose of removing, marking, or lighting any structure or other object that enters the acquired airspace.
- A right to prohibit electrical interference, glare, misleading lights, visual impairments, and other hazards to aircraft flight from being created on the property.

Based Aircraft: Aircraft stationed at an airport on a long-term basis.

Ceiling: Height above the earth's surface to the lowest layer of clouds or obscuring phenomena. (AIM)

Circling Approach/Circle-to-Land Maneuver: A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or not desirable. (AIM)

Combining District: A zoning district which establishes development standards in areas of special concern over and above the standards applicable to basic underlying zoning districts.

Commercial Activities: Airport-related activities which may offer a facility, service or commodity for sale, hire or profit. Examples of commodities for sale are: food, lodging, entertainment, real estate, petroleum products, parts and equipment. Examples of services are: flight training, charter flights, maintenance, aircraft storage, and tiedown. (CCR)

Commercial Operator: A person who, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property, other than as an air carrier. (FAR 1)

Compatibility Plan: As used herein, a plan, usually adopted by an airport land use commission, which sets forth policies for promoting compatibility between airports and the land uses which surround them. Often referred to as a *Comprehensive Land Use Plan (CLUP)*.

Controlled Airspace: Any of several types of airspace within which some or all aircraft may be subject to air traffic control. (FAR 1)

Day-Night Average Sound Level (DNL): The noise metric adopted by the U.S. Environmental Protection Agency for measurement of environmental noise. It represents the average daytime noise level during a 24-hour day, measured in decibels and adjusted to account for the lower tolerance of people to noise during nighttime periods. The mathematical symbol is L_{dn} .

Decibel (dB): A unit measuring the magnitude of a sound, equal to the logarithm of the ratio of the intensity of the sound to the intensity of an arbitrarily chosen standard sound, specifically a sound just barely audible to an unimpaired human ear. For environmental noise from aircraft and other transportation sources, an *A-weighted sound level* (abbreviated dBA) is normally used. The A-weighting scale adjusts the values of different sound frequencies to approximate the auditory sensitivity of the human ear.

Deed Notice: A formal statement added to the legal description of a deed to a property and on any subdivision map. As used in airport land use planning, a deed notice would state that the property is subject to aircraft overflights. Deed notices are used as a form of buyer notification as a means of ensuring that those who are particularly sensitive to aircraft overflights can avoid moving to the affected areas.

Designated Body: A local government entity, such as a regional planning agency or a county planning commission, chosen to act in the capacity of an airport land use commission.

Displaced Threshold: A landing threshold that is located at a point on the runway other than the designated beginning of the runway (see *Threshold*). (AIM)

Easement: A less-than-fee-title transfer of real property rights from the property owner to the holder of the easement.

Equivalent Sound Level (L_{eq}): The level of constant sound which, in the given situation and time period, has the same average sound energy as does a time-varying sound.

FAR Part 77: The part of the Federal Aviation Regulations which deals with objects affecting navigable airspace.

FAR Part 77 Surfaces: Imaginary airspace surfaces established with relation to each runway of an airport. There are five types of surfaces: (1) primary; (2) approach; (3) transitional; (4) horizontal; and (5) conical.

Federal Aviation Administration (FAA): The U.S. government agency which is responsible for ensuring the safe and efficient use of the nation's airports and airspace.

Federal Aviation Regulations (FAR): Regulations formally issued by the FAA to regulate air commerce.

Findings: Legally relevant subconclusions which expose a government agency's mode of analysis of facts, regulations, and policies, and which bridge the analytical gap between raw data and ultimate decision.

Fixed Base Operator (FBO): A business which operates at an airport and provides aircraft services to the general public including, but not limited to, sale of fuel and oil; aircraft sales, rental, maintenance, and repair; parking and tiedown or storage of aircraft; flight training; air taxi/charter operations; and specialty services, such as instrument and avionics maintenance, painting, overhaul, aerial application, aerial photography, aerial hoists, or pipeline patrol.

General Aviation: That portion of civil aviation which encompasses all facets of aviation except air carriers. (FAA Stats)

Glide Slope: An electronic signal radiated by a component of an ILS to provide vertical guidance for aircraft during approach and landing.

Global Positioning System (GPS): A navigational system which utilizes a network of satellites to determine a positional fix almost anywhere on or above the earth. Developed and operated by the U.S. Department of Defense, GPS has been made available to the civilian sector for surface, marine, and aerial navigational use. For aviation purposes, the current form of GPS guidance provides en route aerial navigation and selected types of nonprecision instrument approaches. Eventual application of GPS as the principal system of navigational guidance throughout the world is anticipated.

Helipad: A small, designated area, usually with a prepared surface, on a heliport, airport, landing/takeoff area, apron/ramp, or movement area used for takeoff, landing, or parking of helicopters. (AIM)

Heliport: A facility used for operating, basing, housing, and maintaining helicopters. (HAI)

Infill: Development which takes place on vacant property largely surrounded by existing development, especially development which is similar in character.

Instrument Approach Procedure: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority (refer to *Nonprecision Approach Procedure* and *Precision Approach Procedure*). (AIM)

Instrument Flight Rules (IFR): Rules governing the procedures for conducting instrument flight. Generally, IFR applies when meteorological conditions with a ceiling below 1,000 feet and visibility less than 3 miles prevail. (AIM)

Instrument Landing System (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids: (1) Localizer; (2) Glide Slope; (3) Outer Marker; (4) Middle Marker; (5) Approach Lights. (AIM)

Instrument Operation: An aircraft operation in accordance with an IFR flight plan or an operation where IFR separation between aircraft is provided by a terminal control facility. (FAA ATA)

Instrument Runway: A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach procedure having straight-in landing minimums has been approved. (AIM)

Inverse Condemnation: An action brought by a property owner seeking just compensation for land taken for a public use against a government or private entity having the power of eminent domain. It is a remedy peculiar to the property owner and is exercisable by that party where it appears that the taker of the property does not intend to bring eminent domain proceedings.

Land Use Density: A measure of the concentration of land use development in an area. Mostly the term is used with respect to residential development and refers to the number of dwelling units per acre. Unless otherwise noted, policies in this compatibility plan refer to *gross* rather than *net* acreage.

Land Use Intensity: A measure of the concentration of nonresidential land use development in an area. For the purposes of airport land use planning, the term indicates the number of people per acre attracted by the land use. Unless otherwise noted, policies in this compatibility plan refer to *gross* rather than *net* acreage.

Large Airplane: An airplane of more than 12,500 pounds maximum certificated takeoff weight. (Airport Design AC)

Localizer (LOC): The component of an ILS which provides horizontal course guidance to the runway. (AIM)

Minimum Descent Altitude (MDA): The lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circle-to-land maneuvering in execution of a standard instrument approach procedure where no electronic glide slope is provided. (FAR 1)

Missed Approach: A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing. (AIM)

National Transportation Safety Board (NTSB): The U.S. government agency responsible for investigating transportation accidents and incidents.

Navigational Aid (Navaid): Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight. (AIM)

Noise Contours: Continuous lines of equal noise level usually drawn around a noise source, such as an airport or highway. The lines are generally drawn in 5-decibel increments so that they resemble elevation contours in topographic maps.

Noise Level Reduction (NLR): A measure used to describe the reduction in sound level from environmental noise sources occurring between the outside and the inside of a structure.

Nonconforming Use: An existing land use which does not conform to subsequently adopted or amended zoning or other land use development standards.

Nonprecision Approach Procedure: A standard instrument approach procedure in which no electronic glide slope is provided. (FAR 1)

Nonprecision Instrument Runway: A runway with an approved or planned straight-in instrument approach procedure which has no existing or planned precision instrument approach procedure. (Airport Design AC)

Obstruction: Any object of natural growth, terrain, or permanent or temporary construction or alteration, including equipment or materials used therein, the height of which exceeds the standards established in Subpart C of Federal Aviation Regulations Part 77, *Objects Affecting Navigable Airspace*.

Overflight: Any distinctly visible and audible passage of an aircraft in flight, not necessarily directly overhead.

Overflight Easement: An easement which describes the right to overfly the property above a specified surface and includes the right to subject the property to noise, vibrations, fumes, and emissions. An overflight easement is used primarily as a form of buyer notification.

Overflight Zone: The area(s) where aircraft maneuver to enter or leave the traffic pattern, typically defined by the FAR Part 77 horizontal surface.

Overlay Zone: See *Combining District*.

Precision Approach Procedure: A standard instrument approach procedure where an electronic glide slope is provided. (FAR 1)

Precision Instrument Runway: A runway with an existing or planned precision instrument approach procedure. (Airport Design AC)

Runway Protection Zone (RPZ): An area (formerly called a *clear zone*) off the end of a runway used to enhance the protection of people and property on the ground. (Airport Design AC)

Safety Zone: For the purpose of airport land use planning, an area near an airport in which land use restrictions are established to protect the safety of the public from potential aircraft accidents.

Small Airplane: An airplane of 12,500 pounds or less maximum certificated takeoff weight. (Airport Design AC)

Sound Exposure Level (SEL): A time-integrated metric (i.e., continuously summed over a time period) which quantifies the total energy in the A-weighted sound level measured during a transient noise event. The time period for this measurement is generally taken to be that between the moments when the A-weighted sound level is 10 dB below the maximum.

Straight-In Instrument Approach: An instrument approach wherein a final approach is begun without first having executed a procedure turn; it is not necessarily completed with a straight-in landing or made to straight-in landing weather minimums. (AIM)

Taking: Government appropriation of private land for which compensation must be paid as required by the Fifth Amendment of the U.S. Constitution. It is not essential that there be physical seizure or appropriation for a *taking* to occur, only that the government action directly interferes with or substantially disturbs the owner's right to use and enjoyment of the property.

Terminal Instrument Procedures (TERPS): Procedures for instrument approach and departure of aircraft to and from civil and military airports. There are four types of terminal instrument procedures: precision approach, nonprecision approach, circling, and departure.

Threshold: The beginning of that portion of the runway usable for landing (also see *Displaced Threshold*). (AIM)

Touch-and-Go: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. (AIM)

Traffic Pattern: The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg, and final approach. (AIM)

Visual Approach: An approach where the pilot must use visual reference to the runway for landing under VFR conditions.

Visual Flight Rules (VFR): Rules that govern the procedures for conducting flight under visual conditions. VFR applies when meteorological conditions are equal to or greater than the specified minimum—generally, a 1,000-foot ceiling and 3-mile visibility.

Visual Runway: A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved airport layout plan. (Airport Design AC)

Zoning: A police power measure, enacted primarily by units of local government, in which the community is divided into districts or zones within which permitted and special uses are established, as are regulations governing lot size, building bulk, placement, and other development standards. Requirements vary from district to district, but they must be uniform within districts. A zoning ordinance consists of two parts: the text and a map.

Glossary Sources

FAR 1: *Federal Aviation Regulations Part 1, Definitions and Abbreviations*

AIM: *Aeronautical Information Manual*

Airport Design AC: Federal Aviation Administration, *Airport Design* Advisory Circular 150/5300-13

FAA ATA: Federal Aviation Administration, *Air Traffic Activity*

FAA Stats: Federal Aviation Administration, *Statistical Handbook of Aviation*

HAI: Helicopter Association International

NTSB: National Transportation and Safety Board