



# CHAPTER 7: LAND USE COMPATIBILITY

## Introduction

### *Land Use Compatibility Planning*

Airports are community assets providing significant benefits. They facilitate the movement of people, goods and services, promote tourism and trade, stimulate business development and support a variety of jobs.

The objective of land use planning is to guide on-airport and off-airport land use development to be compatible with airport operations. On-airport compatible land use is controlled by the airport and primarily serves aeronautical activities. Off-airport land uses is not directly controlled by the airport. Surrounding land uses compatible with airports are typically include those uses that can co-exist with a nearby airport without either constraining the safe and efficient operation of the airport or exposing people working or living nearby to unacceptable levels of noise or safety hazards. Compatible land use also considers minimizing potential hazards to aircraft and the flying public. The impact of airport planning decisions extends well beyond the airport property line thus must be considered.

Land use planning around airports is important to airports and communities for several reasons:

- **Safety** - Compatibility is needed to maintain safety of the general and flying public. Risk should be reduced to an acceptable level. The airport must also maintain operational utility within identified safety and risk criteria.
- **Airport Utility** - Land uses around airport should provide the airport so that there are not undue restrictions placed on the airport's existing or planned future arrival and departure procedures. Opportunities for future development identified in the Airport Master Plan and shown on the Federally (FAA) approved Airport Layout Plan should be considered.
- **Human Environment** - Balancing the human environment with airport operations is important to maintain an acceptable level of airport impacts (i.e. noise and visual exposure) with the surrounding community.
- **Economic Development** - Operational restrictions placed on the airport as a result of land use compatibilities have the potential to have a trickle-down effect on the community. This reduces the community's ability to accommodate the aviation needs of the public and local businesses, thus limiting economic development opportunities.

Incompatible land uses are one of the largest issues facing airports today, often resulting in conflicts between airports and their communities. They also may result in airport operational and grant project funding implications in certain situations. Building consistency between the recommendations in this Airport Master Plan with airport land use compatibility standards and area-wide planning is vital for maintaining compatible land use.

The objective of this chapter is to assist the Sioux Falls Regional Airport in identifying land use standards and developing recommendations so that the airport can continue to meet safety criteria so that airport operations and surrounding land uses can safely co-exist into the future. This chapter should become framework to future land use planning efforts between Airport, City of Sioux Falls, Minnehaha and Lincoln Counties.



## ***Roles and Responsibilities***

### **AIRPORT SPONSOR**

As the airport sponsor, Sioux Falls Regional Airport Authority, applies and receives federal grants. These federal grants require the Airport Authority to develop and maintain the airport compatible with FAA rules and regulations through [FAA Grant Assurances \(obligations\)](#). There are currently 39 grant assurances which an airport sponsor assumes as a contractual obligation with the Federal Government when the sponsor accepts federal funds for airport development. These grant assurances describe how the sponsor must operate the airport and serve the needs of the flying public. Grant assurances 20 and

**20. Hazard Removal and Mitigation.** It will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards.

**21. Compatible Land Use.** It will take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which Federal funds have been expended.

21 pertain to compatible land use around airports.

FAA grant assurances require airports take appropriate action to protect airspace and restrict land uses in the immediate vicinity to those compatible with airport operations. Compatible land use control is the responsibility of the airport sponsor, the Sioux Falls Regional Airport Authority.

### **FEDERAL AVIATION ADMINISTRATION (FAA)**

The FAA can provide guidance and funding to promote compatible land development around airports; however, it has no regulatory authority for controlling land uses. State and local governments are responsible for land use planning, zoning and regulations. Grant assurances are developed by the FAA to protect federal investments in airports, but are the responsibility of the airport sponsor to maintain.

The FAA monitors all obligated airports to ensure they comply with the requirements of the grant assurances through its Compliance Program. If the sponsor fails to take the necessary corrective action, the FAA can legally impose penalties on the sponsor, including the loss of federal funding.

As defined by law, the FAA's authority to enforce most regulations and grant assurances is limited to within the airport boundaries. The FAA's only authority on compatible land use planning is through the grant assurances airport sponsors must adhere to in order to obtain federal funding for airport improvements. In most cases, the most practical and cost effective method for a sponsor to affect compatible land use outside of the airport's property is through zoning or easements rather than through land acquisition.

### **STATE OF SOUTH DAKOTA**

South Dakota Codified Laws allow counties and cities of the state to enter into joint planning and zoning agreements. Municipalities may also exercise zoning powers within three miles of their corporate limits subject to county approval. There are no minimum land use development and airspace standards around airports.



South Dakota Codified Laws, Title 50, Chapter 06A grants Regional Airport Authorities Zoning the power to establish comprehensive airport zoning regulations and shall have the same powers as other political subdivisions to adopt and enforce airport zoning regulations.

Additional State regulations and laws in place under Chapter 50-9 concern structures affecting aviation in South Dakota. Under Chapter 50-9-1, South Dakota Aeronautics Commission approval is required for any new or altered structure greater than 200 feet above the terrain, and for any new or altered structure within a 100:1 slope from the runway at a public airport with a runway with a length 3,200 feet or greater.

## **SURROUNDING JURISDICTIONS**

Local jurisdictions are responsible for developing and enforcing land use planning, zoning and regulations. Development proposals are reviewed and approved at this local level through an established process. Any adopted airport land use compatibility zoning that restricts the type and height of new development, for example, is enforced by the local jurisdiction. For the Sioux Falls Regional Airport, surrounding jurisdictions include the City of Sioux Falls, Minnehaha and Lincoln Counties.

# **Land Use Compatibility Elements**

## ***Overview***

Four elements should be considered in order to achieve land use compatibility:

- [Airspace](#)
- [Safety](#)
- [Noise](#)
- [Airport Compliance](#)

A general description of each element is provided based primarily on criteria developed by the FAA.

## ***Airspace***

The airspace compatibility element includes avoiding vertical development that reduces the level of safety, increases risks of aircraft accidents or measurably reduces the operational utility of airports. Types of development that may impair airports from meeting this objective include man-made structures (e.g. buildings, radio towers and wind turbines) and natural growth objects and terrain (e.g. trees, ground). Other airspace impacts include visual or electronic interference. Examples include bright lights near runways causing glare, or airborne emissions from industrial plants that may reduce pilot visibility or cause severe turbulence. The risk of accidents involving airspace obstructions can be lowered through the efforts of the FAA to evaluate and manage airspace and through local government control over the creation of incompatible structures.

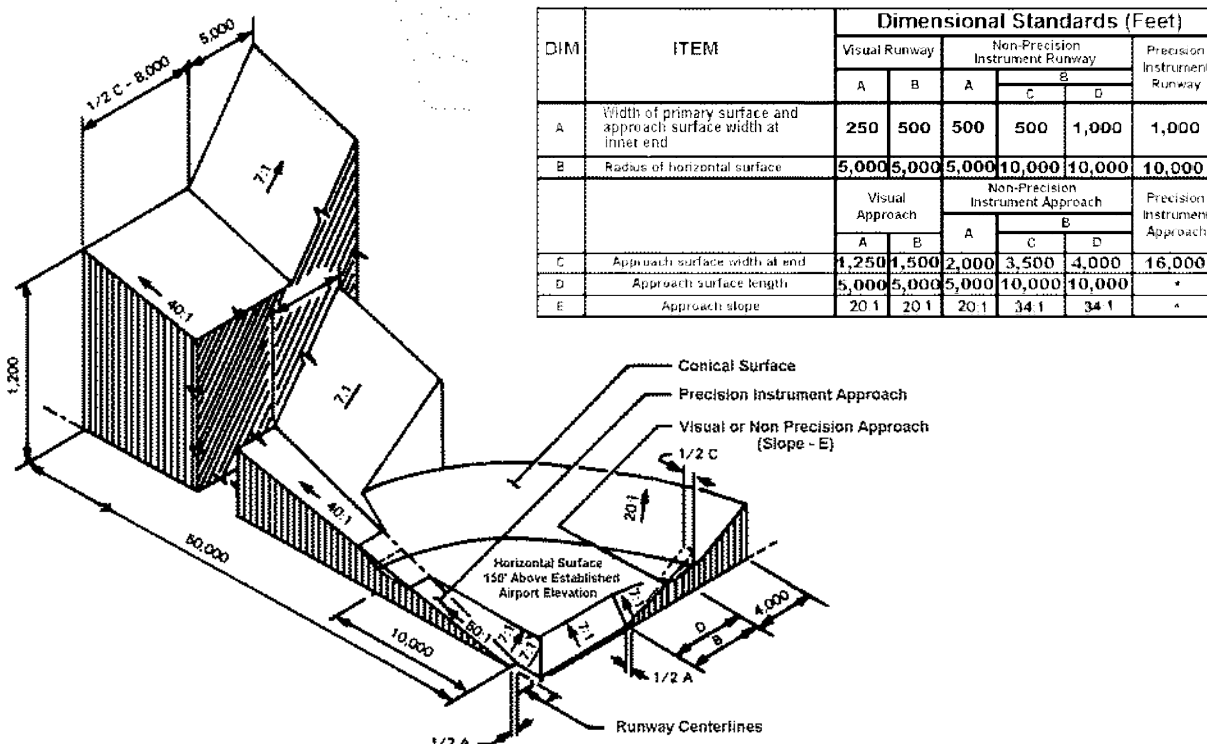
The definition of airspace requirements is primarily accomplished through standards established in Title 14 of the Code of Federal Regulations (CFR). More specifically, [14 CFR Part 77, Objects Affecting Navigable Airspace](#). The standards established in Part 77 relate to the size of the largest aircraft using the runway, the approach type, and the minimum visibility under which the runway can still be used by aircraft. Part 77 standards appear in the form of three dimensional “imaginary surfaces” as illustrated in **Figure 7-1**.





[FAA Order 8260.3B Terminal Instrument Procedures](#) (TERPS) identify airspace standards for instrument approaches and departures. These standards are defined by FAA. Obstructions to TERPS surfaces may result in reduced utility for instrument operations to an airport. These surfaces are reviewed by FAA on a case-by-case basis to ensure compatibility and safety. Other airspace surfaces and review procedures apply from FAA Order 7400.2 *Procedures for Handling Airspace Matters* including traffic pattern airspace to protect for safe aircraft maneuvering around the airport.

**Figure 7-1 – Part 77 Imaginary Surfaces**



Source: National Geodetic Survey (NGS)

Airspace standards affect land uses within and around the airport. A project proponent is required to file FAA Form 7460-1 *Notice of Proposed Construction* prior to proposing new development on-airport or within the vicinity of the airport as defined in Part 77. Three typical responses include:

- **No Objection/No Hazard:** The proposed construction/alteration did not exceed obstruction standards and lowering, lighting or marking is not required.
- **Conditional Determination/Notice of Presumed Hazard:** The proposed construction/alteration would be acceptable contingent upon implementing mitigating measures (i.e. lowering, lighting or marking the object)
- **Objectionable/Hazard:** The proposed construction/alteration is determined to be a hazard to air navigation and is thus objectionable. The reasons for this determination are outlined to the proponent.

If a Part 77 or TERPS airspace surface would be penetrated by a constructed object, the FAA then performs an extended study to determine whether the object poses an operational problem for the relevant airport. If the penetration does not pose an operational impact, it may be determined not to be a hazard.



Operational impacts are those that affect aircraft operations. Examples of measurable operational impacts include reducing available runway length, increasing the minimum flight altitude in a specific area, increasing the minimum climb gradient for airport departure, diverting air traffic away from an obstacle, or increasing the minimum descent altitude/flight visibility at the obstacle location for airport arrivals.

It is important to acknowledge that the FAA's role is limited to evaluating the aeronautical effects of proposed structures; the FAA has no legal authority to stop the construction of any proposed structure. However, as previously mentioned, FAA grant assurance obligations require sponsors to take reasonable action to prevent and remove hazards to air navigation. Typical examples include local land use zoning for FAR Part 77 and TERPS airspace surfaces.

## **Safety**

FAA design standards and regulations prescribe a number of zones and imaginary surfaces intended to protect aircraft and their occupants while landing or taking off. However, the safety element primarily associated with compatible land use is focused on minimizing risks to persons and property on the ground.

Assessing the risks of aircraft accidents and creating policies to address those risks is challenging because aircraft accidents are rare and the specific circumstances of an accident are nearly impossible to predict. FAA has identified a 1 and 10 million safety threshold as an extremely remote likelihood of occurrence<sup>1</sup>. National Transportation Safety Board (NTSB) data gathered between 1990 and 2000 indicated that approximately 95 percent of all aircraft accidents happen either on or near airports, with most occurring during the approach or departure phases of flight.

In an effort to reduce the public safety risk associated with aircraft operations, communities typically use FAA airport design standards and safety compatibility guidelines developed by state aeronautical agencies to formulate safety policies. FAA has defined minimum land use standards in the form of a Runway Protection Zone with additional safety requirements defined by State and local jurisdictions.

## **RUNWAY PROTECTION ZONES**

FAA airport design standards, as contained in [Advisory Circular \(AC\) 150/5300-13A Airport Design](#) define a number of zones, areas, and imaginary surfaces that are intended to protect aircraft and their occupants during operations on and around an airport. One zone, the Runway Protection Zone (RPZ), is intended to protect people and property on the ground for approach and departure areas beyond the runway end. It also mitigates the risk of an aircraft collision with an object on the ground.

According to FAA, the function of the RPZ is as follows:

*"The RPZ function is to enhance the protection of people and property on the ground. Where practical, airport owners should own the property under the runway approach and departure areas to at least the limits of the RPZ. It is desirable to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, as a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities."*

Formerly known as clear zones, the RPZ is a trapezoidal-shaped area, centered on the extended runway centerline and normally begins 200 feet beyond the end of the runway or area useable for landing or takeoff. The RPZ dimensions were developed through the analysis of aircraft accidents and calculated to enclose the area on the ground with the highest probability of risk due to an aircraft accident.

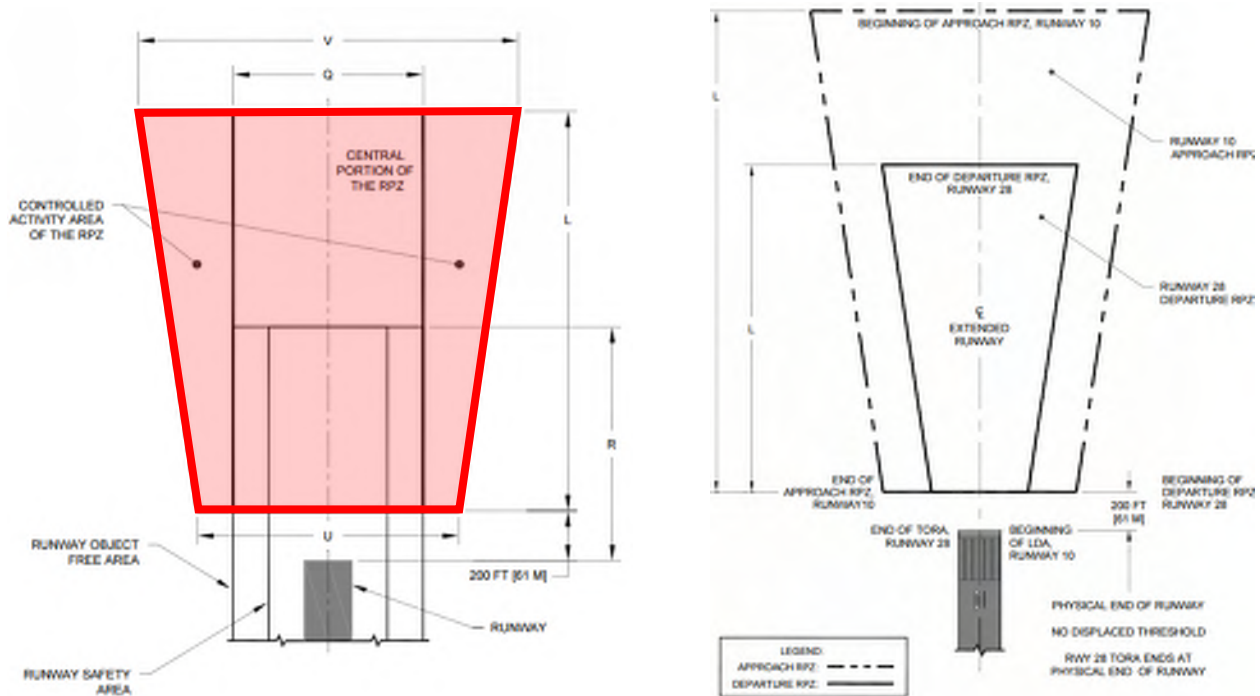
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<sup>1</sup> FAA System Safety Handbook (Federal Aviation Administration, 2000)



There are two components of RPZs that are evaluated and analyzed in the master planning process. One component is the required dimensions of the RPZ, which are functions of the design aircraft, type of operation and visibility minimums. There are separate approach and departure RPZs however the approach RPZ is usually more stringent. The Central Portion of the RPZ is the area beyond the Runway Object Free Area and is the area with the highest risk to persons or property on the ground. The second component is the use of the land within the boundaries of the RPZ, which must meet FAA criteria and regulations, and is commonly discussed as an element of compatible land use. FAA desires a clear RPZ and airport control within its limits. **Figure 7-2** identifies the shape of a typical approach and departure RPZ.

*Figure 7-2 – Runway Protection Zone*



Source: FAA AC 150/5300-13A, *Airport Design*

RPZs and the effort to ensure compatible land use within them are currently a high priority for the FAA. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement. The increased emphasis has resulted in additional requirements to monitor and analyze RPZs for conformance to established policies and standards. In September 2012, FAA published [Interim Guidance on Land Uses Within a Runway Protection Zone](#) providing airports with guidance on land use compatibility standards. In some cases, a separate RPZ Alternatives Analysis must be prepared to meet these requirements. The standards are summarized below:

- **New or Modified Land Uses:** FAA coordination is required for new or modified land uses within the RPZ as a result of an airfield project, change in RPZ dimensions or local development proposal.
- **Land Uses Requiring FAA Coordination:** Building and structures, residential land uses, transportation facilities (i.e. roads, parking, rail), fuel storage, hazardous material storage, wastewater treatment, above-ground utility infrastructure





- **Alternatives Analysis:** A full range of alternatives must be evaluated prior to FAA coordination that avoid introducing the land use into the RPZ, minimize the impact of the land use in the RPZ and mitigate risk to people and property on the ground.
- **Existing Land Uses in the RPZ:** No change in policy, airports should work with FAA to remove or mitigate the risk of any existing incompatible land uses in the RPZ. Incompatible land uses in the RPZ from previous FAA guidance include but are not limited to residences, places of public assembly (i.e. uses with high concentration of persons), fuel storage facilities and wildlife attractants.

FAA has acknowledged the ongoing update to the land use compatibility advisory circular where an RPZ land use consideration section will be added. As of the writing of this Master Plan, the document has not yet been released by FAA in draft form.

## OTHER SAFETY ZONES

Communities typically use FAA airport design standards and safety compatibility guidelines developed by state aeronautical agencies to formulate safety policies. A good source for safety compatibility guidelines is the [California Airport Land Use Planning Handbook](#). The guidelines in this document have been used as the foundation for the land use compatibility planning nationwide. Several state aeronautical agencies have adapted it for use in developing their own airport land use planning handbooks. The method used in these handbooks involves the creation of as many as six safety compatibility zones that encompass airport owned property and lands surrounding the airport. Each safety compatibility zone is assigned compatible development criteria involving acceptable and prohibited land uses and acceptable maximum development densities. The development criteria for each safety zone are directly related to noise levels and the risk of aircraft accidents within that zone. These identified standards and guidance help airports, communities and jurisdictions prevent incompatible land uses around airports.

Airports and States have recognized the need to protect land use around airports beyond the Runway Protection Zones. Some states including California, Washington and Minnesota have developed land use compatibility guidebooks adopted minimum airport zoning standards. Minnesota, for example, requires a minimum level of land use and airspace zoning to receive aviation funding. No such minimum land use standards exist in South Dakota, however Regional Airport Authorities have the authority to zone similar to municipalities.

## WILDLIFE HAZARDS

The wildlife element is focused on minimizing risks associated with wildlife in the vicinity of an airport. Hazardous wildlife use natural or artificial habitats on or near an airport for food, water or cover. Wildlife in the area of airport operations may result in an aircraft-wildlife strike. [FAA AC 150/5200-33, Hazardous Wildlife Attractants On or Near Airports](#), recommends wildlife attractants be located at least 10,000 feet away from the Air Operations Area (AOA) for airports primarily serving turbine-powered aircraft. The AOA is any area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft. For all airports, the FAA recommends a distance of 5 statute miles between the furthest edges of the airport's AOA and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace.



According to NTSB, 78 percent of bird strikes happen below 1,000 feet and 90 percent occur under 3,000 feet. A 5 statute mile distance from the AOA protects approach, departure and circling airspace.



Examples of potential wildlife hazards include storm water management facilities (unless designed to minimize wildlife attractiveness), wetlands that attract wildlife, artificial bodies of water, golf courses (unless they have a wildlife management program) and confined livestock operations within 10,000 feet for turbine-powered aircraft. Facilities not recommended within 5 miles of the AOA include new wastewater treatment facilities and new landfills.

The FAA recommends that public-use airport sponsors implement the standards and practices contained in AC 150/5200-33. The FAA also recommends the guidance in this Advisory Circular for land-use planners, and developers of projects, facilities, and activities on or near airports.

## Noise

The noise element is focused on minimizing the number of people exposed to high frequency and event levels of aircraft noise. Noise emitted from aircraft can affect the well-being of persons living or working near an airport. While there are several effects of aircraft noise upon people, the most common is annoyance. Annoyance can be defined as the overall adverse reaction of people to noise. Other effects of aircraft noise include sleep disturbance and speech interference. Noise affects each individual differently.

Noise analysis for airports is typically conducted using FAA's Integrated Noise Model (INM) software. The noise measurement recommended by FAA for use in the analysis of aircraft noise is the Day-Night Average Sound Level (DNL). The DNL is defined as the average annual weighted sound level produced by aircraft at a location during a 24-hour period. It is not a measure of an individual noise event. An additional 10 decibel (dB) weight is applied to aircraft noise occurring between 10 p.m. and 7 a.m., when aircraft noise is more likely to create an annoyance. Land use compatibility guidelines for DNL average sound levels has been established by FAA for residential, public, commercial manufacturing and recreational land uses. The FAA has accepted a maximum of 65 dB DNL as the threshold of concern for noise impacts over residential areas without mitigation. The FAA has determined that a significant noise impact would occur if a detailed noise analysis indicates an action would result in an increase of 1.5 dBs or greater within the DNL 65 dB contour over a noise sensitive area.



COMMON SOUNDS AND THEIR ASSOCIATED DECIBEL LEVELS

[FAR Part 150 Airport Noise Compatibility Planning](#) regulation identifies rules and guidelines and authorizes Federal financial assistance for the preparation of airport noise compatibility programs. FAR Part 150 is a voluntary program that airports may complete to seek compatible land uses. The Part 150 Study process identifies aircraft traffic mix, creates Noise Exposure Maps, identifies land use incompatibilities around the airport as a result of noise exposure, and recommends measures to mitigate existing and prevent future land use incompatibilities as part of a Noise Compatibility Program. A Part 150 study completed by an airport is approved by FAA. According to FAA, 256 airports received FAA funding nationwide through 2013 to complete a Part 150 study. Implementing noise mitigation projects may then be eligible for FAA funding.





## ***Airport Compliance***

Airports that receive FAA funds are subject to FAA grant assurances (obligations). These assurances typically last a period of 20 years since the last FAA grant was accepted by the airport sponsor. Land identified for use as an airport is also subject to conditions. Currently, there are 39 grant assurances identified by FAA. FAA has published [Order 5190.6B Airport Compliance Manual](#) to assist FAA personnel and airport sponsors to maintain compliance with grant and land obligations. Airports that do not abide by grant assurances are subject to withholding of FAA grant funding.

Common airport compliance issues relating to land use include non-aeronautical land uses, airport land releases and “through-the-fence” operations.

### **NON-AERONAUTICAL USE OF AIRPORT PROPERTY**

Airport property is to be used for aeronautical purposes. In order for an airport to develop land for non-aeronautical use, the FAA must first approve of the change in airport property use from aeronautical to non-aeronautical. All airport property is identified in the Exhibit “A”/Airport Property Map.

### **LAND RELEASES**

When requested, the FAA will consider a release, modification, reform, or amendment of any airport agreement to the extent that such action has the potential to protect, advance, or benefit the public interest in civil aviation. Such action may involve only relief from specific limitations or covenants of an agreement or it may involve a complete and total release that authorizes subsequent disposal of federally obligated airport property. Common types of release requests include concurrent use, request for change in use or the sale/disposal of airport property.

### **THROUGH-THE-FENCE OPERATIONS**

Agreements that permit access to the airfield by aircraft based on land adjacent to, but not a part of, the airport property are commonly referred to as a “through-the-fence” operation (even though a perimeter fence may not be visible). “Through-the-fence” arrangements can encumber the airport property and reduce an airport’s ability to meet its federal obligations.

As a general principle, the FAA does not support airport requests to enter into any agreement that grants “through-the-fence” access to the airfield for aeronautical businesses that would compete with an on-airport aeronautical service provider such as a Fixed-Based Operator (FBO).

Commercial service airports are not permitted to enter into residential through-the-fence arrangements. However, sponsors of general aviation airports may enter into such an arrangement if the airport sponsor complies with the requirements of section 136. This must be a written agreement that requires the property owner to pay access charges that are comparable to similar on-airport tenants, bear the cost of maintaining infrastructure, maintain the property for non-commercial use and prohibit additional access and prohibit aircraft refueling.

## **Land Use Compatibility Review**

### ***Surrounding Land Use Overview***

Land uses surrounding the airport are primarily located within the City of Sioux Falls, but also fall into areas of Minnehaha County within a joint extraterritorial zoning jurisdiction area.

Within Sioux Falls city limits, areas south of the airport consist of multiple land uses including recreational, commercial, industrial and single family residential land uses. Elmwood Golf Course is located immediately southwest of airport property. A portion of the golf course is currently within



airport property but is pending release back to the City of Sioux Falls. Portions east of the airport area surrounded by industrial and office land uses. Areas north of the airport are generally undeveloped with conservation/green space and agricultural/transition land uses within the Sioux Falls city limits. The Big Sioux River and Diversion Channel provide 100-year floodplain protection with a drainage way to the north, away from the airport.

Within the last five years, land immediately west of the airport has been developed into what is known as the Sanford Sports Complex. This area includes a City park, Pentagon sports arena, indoor sports facilities, restaurants and hotels. This area is generally classified as general institutional and recreational/conservation land uses. Other areas west of the airport are identified as agricultural/transition land uses with commercial land uses further northwest within Sioux Falls.

Land uses within Minnehaha County are located north of the airport. Land in these areas are now generally used for rural residential and agricultural land uses. Other areas north of 60<sup>th</sup> Street West are identified as conservation, light residential, light industrial and planned development.

Surrounding land uses/zoning as compared with existing and proposed airport development are identified in **Exhibit 7-1**.

## ***Land Use Plans***

### **COMPREHENSIVE DEVELOPMENT PLANS**

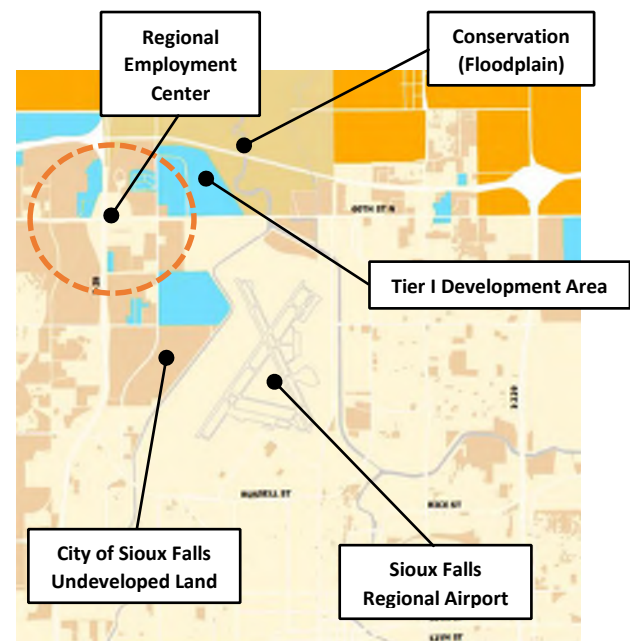
#### **SHAPE Sioux Falls 2035 Comprehensive Plan**

The City of Sioux Falls adopted their SHAPE Sioux Falls 2035 Comprehensive Plan in 2009. This comprehensive land use plan provides for the orderly development of the City of Sioux Falls.

Most of the land uses to the south and east of the airport are not planned to change. Areas to the west and north of the airport within the Runway 15 approach along and near 60<sup>th</sup> Street are identified as Tier 1 development areas indicating they are priority development areas for the City. These areas are planned for light industrial land uses. Land uses associated with a regional employment center are planned around the Interstate 29 and 60<sup>th</sup> Street interchange.

#### **Minnehaha County Comprehensive Plan**

Minnehaha County adopted their comprehensive land use planning document in 1998. Land to the north of the airport on the immediate edge of the City of Sioux Falls is identified as transition area for potential urban expansion of City limits. Land to the north of the airport along and east of the Big Sioux River are within the 100-year floodplain which limits development.



**2035 SHAPE SIOUX FALLS COMPREHENSIVE PLAN  
GROWTH AREAS**



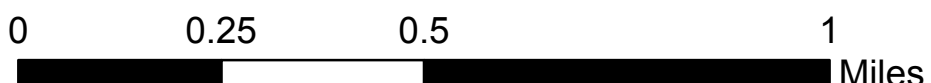
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\*Intended for Planning Purposes Only



PRELIMINARY



**Sioux Falls Regional Airport**  
**Joe Foss Field**  
**Surrounding Land Use**  
**Exhibit 7-1**





## COMMUNITY LAND USE PLANS

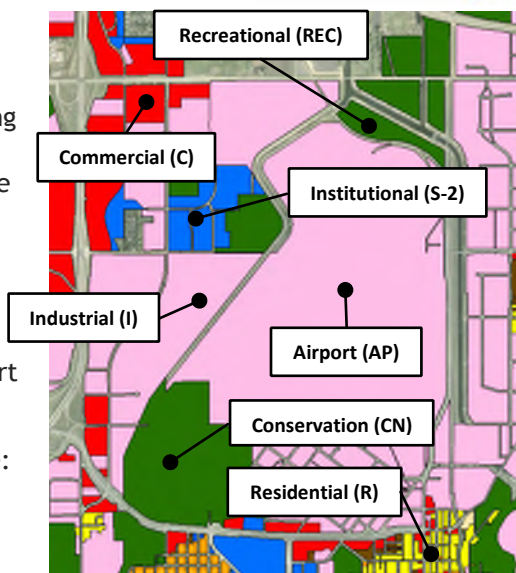
### SHAPE Sioux Falls Zoning Ordinance

The City of Sioux Falls adopted their SHAPE Sioux Falls zoning ordinance in April 2014 based on the local comprehensive plan. The interactive zoning map is available online from the [City of Sioux Falls](http://www.cityofsouthdakota.com/shape).

Airport property is identified as AP or CN zoning districts. Provisions are in place to ensure compatibility with FAA airspace and wildlife hazard management. The Airport Authority is responsible for approving land uses within airport property.

Zoning districts found in and surrounding the airport include:

- AP (Airport): Sioux Falls Regional Airport
- CN (Conservation): Open space and nature areas including Elmwood Golf Course
- REC (Recreational): Recreational opportunities and open space
- AG (Agricultural): Transition zone
- I-1 (Light Industrial): Light manufacturing, offices, wholesale, warehouses
- I-2 (Heavy Industrial): Industrial that may crease some nuisance
- S-2 (Campus Institutional Planned Unit Development): Major institutions including Sanford Sports Complex
- RS (Single-Family Residential - Suburban): Lower density residential
- RT-1 (Single-Family Residential - Traditional): Higher density residential
- RD-1 (Residential - Single and Twin): Moderate density residential
- C-2 (Neighborhood Commercial): Newer neighborhood retail development no greater than 25,000 square feet



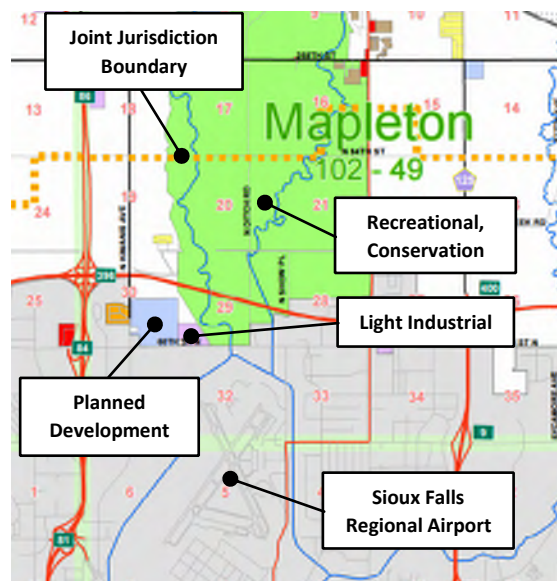
SHAPE SIOUX FALLS ZONING DISTRICTS

The surrounding land use zones in in comparison to existing and future airport noise impact contours and RPZ areas are illustrated in **Exhibit 7-1**.

### Minnehaha County Extraterritorial Zoning

South Dakota Codified Laws allow counties and cities of the state to enter into joint planning and zoning agreements. Municipalities may also exercise zoning powers within three miles of their corporate limits subject to county approval.

There is joint extraterritorial zoning ordinance with jurisdiction between Minnehaha County and the City of Sioux Falls. The purpose is to plan for the orderly extension of urban facilities and services establishing a common working relationship between the two jurisdictions to carry out goals and objectives. Administrative and enforcements authority moved to the county in 1983. The extraterritorial zoning ordinance should be completely updated to maintain uniformity with the county ordinance and incorporate



MINNEHAHA COUNTY/JOINT JURISDICTION  
EXTRATERRITORIAL ZONING



changes based on the adopted Sioux Falls 2015 Growth Management Plan. The current ordinance is from 2002. Joint jurisdiction between Sioux Falls and Minnehaha County exists within approximately two miles north of the airport.

Areas to the northwest of the airport within or near the Runway 15 approach are zoned as Planned Development (PD), Agricultural (A1) and Recreation/Conservation (RC) for Big Sioux River floodplain protection.

## **REGIONAL TRANSPORTATION PLANS**

### **Direction 2035 - Sioux Falls MPO Transportation Plan**

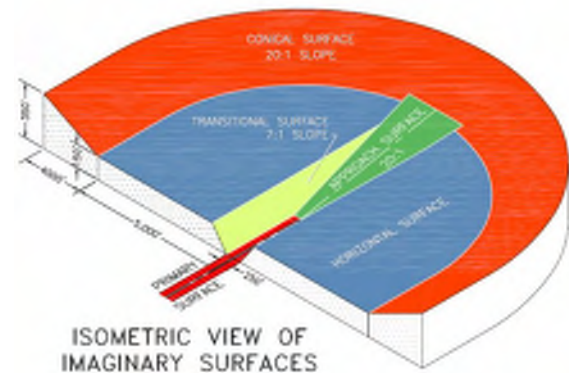
The Sioux Falls Metropolitan Planning Organization (MPO) adopted the “Direction 2035” long-range transportation plan in November 2010. The plan assess the needs and desires of users of the regional transportation system and provides development recommendations.

In the vicinity of the airport, planned projects include upgrading 60<sup>th</sup> Street from a 2-lane to a 4-lane road between 2016 and 2020. Associated infrastructure will have to be reviewed for Runway 3 departure airspace compliance in accordance with the current FAA guidance at that time. The upgrade of Benson Road and Westport Avenue is also planned for 2021-2025, which could tie into a future West Airport Access Road project.

## **Airspace**

### **COMPATIBILITY GUIDELINES**

The Sioux Falls Regional Airport currently has airspace zoning in place at the airport covering FAR Part 77 surfaces for the existing and future airport configurations from the 2007 Airport Master Plan. No changes to runway end locations are identified in this Master Plan study. This zoning helps prevent new airspace incompatibilities. FAA recommends airports take steps to adopt zoning that protects both existing and future airport airspace. [FAA AC 150/5190-4A, A Model Zoning Ordinance to Limit Height of Objects Around Airports](#) provides guidance to develop such an ordinance. State of South Dakota allows airports to develop zoning ordinances for this purpose.



Specific airspace dimensions and surface slopes are a factor of runway utility and instrument approach type. **Table 7-3** identifies the FAR Part 77 approach airspace standards for the existing, future and ultimate configurations at the Sioux Falls Regional Airport as identified in this Airport Master Plan. Other airspace surfaces include primary, transitional, horizontal and conical airspace surfaces that are identified in the Airport Layout Plan.

Airspace protections around airports typically include FAR Part 77 surfaces, FAA Approach Surface, and FAA Departure Surfaces. Most airports have compatibility zoning to protect for FAR Part 77 standards which covers the minimum FAA Approach Surface standards. The FAA Approach Surface must be clear for the runway end and approach type to meet minimum safety and compatibility standards. **Table 7-4** identifies the FAA approach airspace standards for the existing, future and ultimate configurations at the Sioux Falls Regional Airport as identified in this Airport Master Plan. There are no changes from the 2007 Airport Master Plan.





**Table 7-3 – FAR Part 77 Approach Surface Standards**

Runway End	Phase	Utility	Approach Type (Visibility Minimums)	Inner Surface Dimensions	Surface Slope
3	Existing-Ultimate	OTU	Precision (< ¾ mi.)	1,000' x 16,000' x 50,000'	50:1/40:1
21	Existing-Ultimate	OTU	Precision (< ¾ mi.)	1,000' x 16,000' x 50,000'	50:1/40:1
15	Existing	OTU	Non-Precision (1 mile)	500' x 3,500' x 10,000'	34:1
15	Future-Ultimate	OTU	Non-Precision (¾ mi.)	1,000' x 4,000' x 10,000'	34:1
33	Existing	OTU	Non-Precision (1 mile)	500' x 3,500' x 10,000'	34:1
33	Future-Ultimate	OTU	Non-Precision (¾ mi.)	1,000' x 4,000' x 10,000'	34:1
9	Existing	OTU	Non-Precision (1 mile)	500' x 3,500' x 10,000'	34:1
27	Existing	OTU	Non-Precision (1 mile)	500' x 3,500' x 10,000'	34:1
9	Future	U	Non-Precision (1 mile)	500' x 2,000' x 5,000'	20:1
27	Future	U	Non-Precision (1 mile)	500' x 2,000' x 5,000'	20:1

Source: [14 CFR Part 77](#), KLJ Analysis.

Note: OTU = Other-Than-Utility Runway, U = Utility Runway

**Table 7-4 – FAA Approach Surface Standards**

Runway End	Phase	FAA Surface #	Runway Type	Inner Surface Dimensions	Surface Slope
3	Existing-Ultimate	7	Lower than ¾ mile Vis.	800' x 3,800' x 10,000'	34:1
21	Existing-Ultimate	7	Lower than ¾ mile Vis.	800' x 3,800' x 10,000'	34:1
15	Existing	5	Instrument Night > CAT B	800' x 3,800' x 10,000'	20:1
15	Future-Ultimate	6	Vis. < 1 mi., ≥ ¾ mile	800' x 3,800' x 10,000'	20:1
15	Existing-Ultimate	8	Vertical Guidance	350' x 1,520' x 10,000'	30:1
33	Existing	5	Instrument Night > CAT B	800' x 3,800' x 10,000'	20:1
33	Future-Ultimate	6	Vis. < 1 mi., ≥ ¾ mile	800' x 3,800' x 10,000'	20:1
33	Existing-Ultimate	8	Vertical Guidance	350' x 1,520' x 10,000'	30:1
9	Existing-Future	4	Instrument Night CAT A/B	400' x 3,800' x 10,000'	20:1
9	Future	8	Vertical Guidance	350' x 1,520' x 10,000'	30:1
27	Existing-Future	4	Instrument Night CAT A/B	400' x 3,800' x 10,000'	20:1
27	Future	8	Vertical Guidance	350' x 1,520' x 10,000'	30:1

Source: [FAA AC 150/5300-13A \(Change 1\)](#), KLJ Analysis

Note: Most restrictive surfaces shown

In some cases, the FAA Departure Surfaces and operator-specific one-engine departure surfaces are more restrictive than FAR Part 77 standards. FAA Departure Surfaces standards identify a 40:1 obstacle clearance surface for all instrument runways. This surface is 1,000 feet wide and typically begins at the departure runway end. The one-engine inoperative departure surface slope in was 62.5:1 in previous FAA guidance<sup>2</sup>. Air carrier airports like Sioux Falls should work with individual operators to determine their minimums standards. A comprehensive airspace surface identified in an airport zoning ordinance would protect all airspace compatibility standards from new obstructions. Preventing new obstacles will maintain the utility of the airport by preventing new operational restrictions such as increased climb rates. To achieve an increased climb rate aircraft operators may have to reduce aircraft fuel, passenger and cargo loads which causes operational limitations. **Table 7-5** identifies the FAA departure airspace standards for the existing, future and ultimate configurations at the Sioux Falls Regional Airport as identified in this Airport Master Plan.

<sup>2</sup> FAA is currently working to develop revised one-engine inoperative obstacle identification surface standards for airports (per April 28 and June 10, 2014 Federal Register Notices). Comment period closed July 28, 2014.



**Table 7-5 – FAA Departure Surface Standards**

Runway Ends	Phase	FAA Surface #	Approach Type (Visibility Mins.)	Surface Dimensions	Surface Slope
3, 21, 15, 33, 9, 27 (All)	Existing-Ultimate	9	Instrument Operations	1,000' x 6,466' x 10,200'	40:1

Source: [FAA AC 150/5300-13A \(Change 1\)](#), KLJ Analysis

## AIRPORT CONDITIONS

According to the Airport Layout Plan contained in **Appendix X**, the Sioux Falls Regional Airport currently has several natural growth and man-made objects that penetrate the FAR Part 77 airspace surfaces. These are considered airspace obstructions. Some of these objects in the approach and departure surfaces may affect the utility of the airport. **Table 7-6** identifies the existing critical obstructions.

**Table 7-6 – Existing Airspace Conditions (Approach)**

Runway End	FAR Part 77 Approach	FAA Approach	Object Type(s)
Runway 3	<b>10:1</b> (50:1)	34:1 CLEAR	On-Airport Perimeter Road
Runway 3	<b>43:1</b> (50:1)	34:1 CLEAR	Trees
Runway 21	<b>26:1</b> (50:1)	<b>26:1</b> (34:1)	Trees
Runway 21	<b>35:1</b> (50:1)	34:1 CLEAR	Railroad
Runway 15	<b>29:1</b> (34:1)	20:1 CLEAR	Trees
Runway 15	<b>31:1</b> (34:1)	20:1 CLEAR	Pole
Runway 33	<b>21:1</b> (34:1)	20:1 CLEAR	Water Tank, Tree
Runway 33	<b>21:1</b> (34:1)	20:1 CLEAR	Tree
Runway 9	20:1 CLEAR	20:1 CLEAR	N/A
Runway 27	20:1 CLEAR	20:1 CLEAR	N/A

Source: KLJ Analysis.

Note: XX:X indicates clear slope, (XX:X) indicates required slope to clear

Existing obstacles to FAR Part 77, FAA Approach Surface, FAA Departure Surface and operator-specific one-engine inoperative surfaces should be addressed on a case-by-case basis based on an FAA aeronautical study in the Airport Layout Plan. This will help achieve compatible airspace around the airport. Obstructions may cause operational limitations if not removed, lowered, lighted or marked.

As identified in the Airport Layout Plan, an FAA aeronautical study is requested for man-made objects to determine the aeronautical effect and future action plan for obstructions. Actions include do nothing (possibly resulting in reduction in airport utility), obstruction lighting/markings, lowering or removing the obstruction.

**In the future the upgrading of Runway 15 and 33 ends from 1 mile visibility minimums to ¾ mile will widen the existing FAR Part 77 approach surface inner width by 500 feet.** Additional obstacles will be encompassed by this surface. The surface slope will remain at 34:1. FAA approach standards for Category C and D aircraft, however, will not change.

## LAND USE CONTROLS

Local land use controls help control the creation of new airspace obstructions and hazards beyond airport property boundary.

The City of Sioux Falls had developed an Airport Influence Overlay District. According to the City:

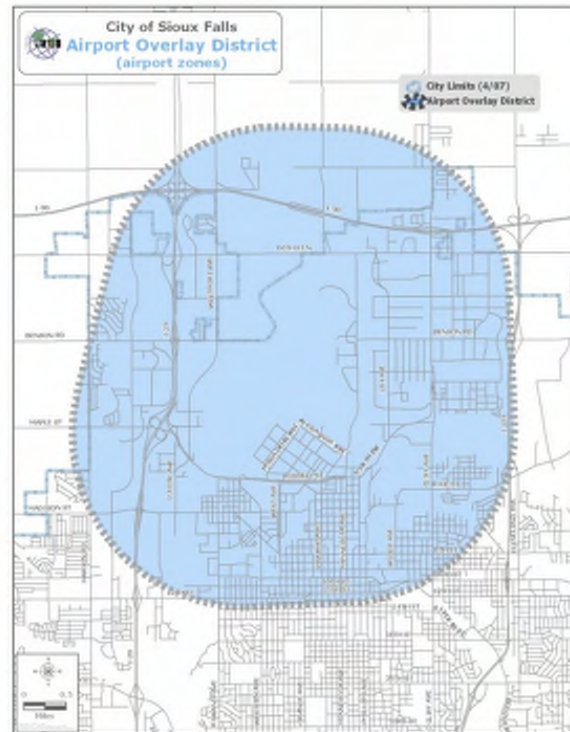
*“The airport influence overlay district is composed of lands located within an area affected by noise or safety hazards associated with aircraft operations at the Sioux Falls Regional Airport. The land use compatibility evaluation of the 2007 airport master plan was completed to determine the highest risks*



*to properties and protect the community. The airport influence overlay district includes all or portions of the approach zone, transition zone, conical zone and airport noise exposure zone. The airport influence overlay district is identified as an overlay district.”*

The Airport Influence Overlay District was adopted in 2007 (City Ordinance 76-07). The Shape Sioux Falls 2014 Zoning Ordinance was developed incorporating this Airport Influence Overlay District. Chapter 160.418 of the City’s Code of Ordinances acknowledges an airport influence overlay district from the 2007 Airport Master Plan as the currently adopted district.

*“The intent is to secure safety, promote health and general welfare of our community, and to avoid undue concentration of land where there are environmental constraints, an airport influence overlay district has been placed to address notification aspects of land use encroachment upon an operating airport. This shall ensure that the Sioux Falls Regional Airport is an integral part of the local community and the national aviation system through the proactive enforcement of the surrounding land uses.”*



**CITY OF SIOUX FALLS  
2007 AIRPORT OVERLAY DISTRICT**

The following City of Sioux Falls Code of Ordinances, Title XV: Land Usage zoning chapters identify airspace regulations:

- Chapter 160.419 - Approach Zone
  - 50:1 slope for instrument runways; 40:1 for non-instrument runways
- Chapter 160.420 - Transition Zones
  - 7:1 slope
- Chapter 160.421 - Conical Zone
  - 150 feet above airport elevation plus a 20:1 slope consistent with FAR Part 77
  - Does not limits growth, construction or maintenance of any tree or structure up to 20 feet above the surface of the land

Outside of the Sioux Falls city limits, Minnehaha and Lincoln counties both have zoning ordinances with airspace controls limiting heights of objects within the approach, transition and conical airspace zones consistent with language in the City of Sioux Falls zoning. These restrictions apply to joint jurisdiction areas and County zoning ordinances identified below:

- Chapter 158 of the City of Sioux Falls Code of Ordinances, *2006 Joint Zoning Regulations for Lincoln County and Sioux Falls* identify these restrictions for Lincoln County Joint Extraterritorial Areas.
- Chapter 159 of the City of Sioux Falls Code of Ordinances, *Comprehensive Extraterritorial Zoning Regulations* and Article 15.13 of the *2002 Revised Joint Zoning Ordinance for Minnehaha County and the City of Sioux Falls*.
- Article 15.13 of the *2009 Revised Zoning Ordinance for Lincoln County*.



Other structures such as Wind Energy Conversions Systems (WECS) are noted to have height restrictions compatible with FAA regulations or airport approach zones.

There are no land use controls within the airport overlay district for other activities potentially impacting aircraft within the airspace including, but not limited to bright lights, smoke or steam emissions, and electronic interference.

## RECOMMENDATIONS

Recommendations to promote airspace compatibility include:

- Update the Airport Overlay Zoning Ordinance to help maintain land use compatibility and promote consistent enforcement between the City of Sioux Falls, Minnehaha County and Lincoln County jurisdictions.
- The airport should take steps to remove existing natural growth obstructions and address man-made obstacles that penetrate FAR Part 77 and FAA Approach/Departure surfaces. Particular emphasis should be made to address obstructions to the Runway 21 approach, followed by the Runway 33 approach surface.
- Evaluate the FAA airspace determination for each of the airspace obstructions identified in the Airport Layout Plan. Work with local landowners, FAA and airport operators to develop an agreeable solution to address obstructions on a case-by-case basis. Actions may include no action, lowering, lighting or marking the obstruction.
- Work with existing airport operators to identify one-engine inoperative departure surface requirements. Address existing obstacles to the fullest extent possible. Submit standards to FAA to incorporate into the FAA airspace review process.
- Develop a combined airspace protection surface that considers existing and future FAR Part 77, FAA Approach/Departure surfaces and operator-specific surfaces.
- Update the Airport Overlay Zoning Ordinance District to reflect the combined obstruction identification surface in cooperation with the City of Sioux Falls, Minnehaha and Lincoln counties.
- In an Airport Overlay Zoning Ordinance update, addressing surrounding land use compatibilities with aviation operations in the surrounding airspace including controlling activities that cause pilot glare, impair visibility or create electromagnetic interference.
- Consider added language in the Airport Overlay Zoning Ordinance District to require FAA Form 7460-1 *Notice of Proposed Construction* to be submitted and reviewed by the Airport as part of the local building permit approval process. Reference South Dakota State law Chapter 50-9-1 requirements. Address follow-up requirements for FAA Form 7460-2 forms to report new objects to FAA.
- Consider including enforcement measures in a future Airport Overlay Zoning Ordinance District to address new natural-growth objects that penetrate airspace surfaces. If enforcement is not possible through zoning, acquire avigation easements to provide further protection in areas where future natural-growth obstructions are identified to penetrate the FAR Part 77 surfaces.
- Monitor development of the 60<sup>th</sup> Street/Minnesota Avenue intersection development. Engage with the City of Sioux Falls to identify proposed height of new structures. Review compatibility with current FAA regulations at the time to consider possible operational restrictions. Implement zoning ordinance prior to roadway development.



## Safety

### COMPATIBILITY GUIDELINES

#### Runway Protection Zones

The Runway Protection Zone (RPZ), is intended to enhance the protection of people and property on the ground for approach and departure areas beyond the runway end. This is an FAA design standard identified in FAA AC 150/5300-13A, *Airport Design* for each runway. FAA guidelines for RPZs were modified in 2012.

#### Geometry

This trapezoidal shaped area applies to areas prior to the landing threshold and beyond the runway departure end. The geometric size is relative to the runway design code (design aircraft) and approach visibility. The inner width of RPZ ranges from 250 feet to 1,000 feet. The length ranges from 1,000 feet to 2,500 feet. The RPZ begins 200 feet off the runway end.

The standards for the existing, future and ultimate runway configurations at the Sioux Falls Regional Airport are identified in **Table 7-7**. The size of the approach RPZ will increase for Runway 15 and 33 in the future. When approach visibility minimums reduce from 1 mile to  $\frac{3}{4}$  mile in the future, the inner width and outer width increases by 500 feet. Portions of the existing and future RPZ for Runway 33 is located outside airport property line. For Runway 9-27, the future configuration identifies the runway to be classified for small aircraft which decreases the overall width of the RPZ by 250 feet.

**Table 7-7 – FAA RPZ Dimensional Standards**

Runway End(s)	Operation	Phase	Design Code	Distance from End	Inner Width	Outer Width	Length	Acres
3-21	Approach	Existing-Ultimate	D/IV/1600	200'	1,000'	1,750'	2,500'	78.914
3-21	Departure	Existing-Ultimate	D/IV	200'	500'	1,010'	1,700'	29.465
15-33	Approach	Existing	D/IV/5000	200'	500'	1,010'	1,700'	29.465
15-33	Approach	Future-Ultimate	D/IV/4000	200'	1,000'	1,510'	1,700'	48.978
15-33	Departure	Existing-Ultimate	D/IV	200'	500'	1,010'	1,700'	29.465
9-27	Approach	Existing	B/II/5000	200'	500'	700'	1,000'	13.770
9-27	Approach	Future	B/II/5000 (Small)	200'	250'	450'	1,000'	8.035
9-27	Departure	Existing-Future	B/II	200'	250'	450'	1,000'	8.035

Source: [FAA AC 150/5300-13A](#), *KLJ Analysis*

The RPZ is divided into two zones, the “central portion of the RPZ” and the “controlled activity area”. The Central Portion of the RPZ is the area within the width of the Runway Object Free Area (ROFA) extended. The Controlled Activity Area (CAA) includes the areas of the RPZ outside of the central portion.

#### Control

Where practical, the FAA strongly recommends that airport sponsors own the complete approach and departure RPZ area in fee simple title. This enables the sponsor to fully control all development and activity with the RPZ. If this is not practical, the sponsor is expected to control land use and activities in the RPZ through easements, leases, zoning, or restrictive covenants that provide for height restrictions and restrict current and future use of the land surface to preclude incompatible uses. The sponsor is also expected to take all possible measures to remove or mitigate incompatible land uses.

#### Acceptable or Compatible Land Uses

The ultimate goal is to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, as a minimum, must clear the RPZ of incompatible objects and activities. Some uses are permitted in the CAA, provided they do not attract wildlife, are outside of the central portion of





the RPZ and do not interfere with navigational aids. FAA AC 150/5300-13A provides for some land uses in the RPZ that are permissible without further evaluation:

- Farming or agricultural activities that meet airport design standards
- Irrigation channels that meet the requirements of AC 150/5200-33 *Hazardous Wildlife Attractants On or Near Airports* and FAA/USDA manual, *Wildlife Hazard Management at Airports*
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, if applicable
- Unstaffed NAVAIDs and facilities, such as equipment for airport facilities that are considered fixed-by-function in regard to the RPZ

#### *Unacceptable or Incompatible Land Uses*

The FAA had previously identified a number of activities that are considered incompatible within the RPZ. Those activities include:

- Fuel handling and storage facilities (except that underground fuel tanks are allowed in the CAA)
- Facilities that generate smoke, dust, or other plumes
- Facilities with misleading lights or that create glare
- Any land use or activity that attracts wildlife
- Residences and places of public assembly (churches, schools, hospitals, office buildings, shopping centers, etc.)

On September 27, 2012, the FAA issued interim guidance on land use within an RPZ. The interim guidance clarifies specific land uses that are not permissible inside the RPZ, but the guidance does not apply to existing land uses. The guidance requires coordination with the FAA if certain land uses enter the RPZ as a result of:

- An airfield project (e.g., runway extension, runway shift)
- A change in the critical design aircraft that increases the RPZ dimensions
- A new or revised instrument approach procedure that increases the RPZ dimensions
- A local development proposal in the RPZ (either new or reconfigured)

The following land uses are considered incompatible in the RPZ and must be coordinated with the FAA as identified in Table 1 from the [FAA's Interim RPZ Guidance](#):

- *Buildings and structures (Examples include, but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)*
- *Recreational land use (Examples include, but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.)*
- *Transportation facilities. Examples include, but are not limited to:*
  - *Rail facilities - light or heavy, passenger or freight*
  - *Public roads/highways*
  - *Vehicular parking facilities*
- *Fuel storage facilities (above and below ground)*
- *Hazardous material storage (above and below ground)*
- *Wastewater treatment facilities*
- *Above-ground utility infrastructure (i.e. electrical substations), including any type of solar panel installations.*



## RPZ Alternative Analysis

The FAA interim guidance requires an analysis of alternatives be conducted before coordinating with the FAA if any of the land uses, described above, would be introduced into the new or modified RPZ. This analysis includes the identification and documentation of the full ranges of alternatives that could:

- Avoid introducing the land use issue within the RPZ.
- Minimize the impact of the land use in the RPZ (i.e., routing a new roadway through the controlled activity area, move farther away from the runway end, etc.).
- Mitigate risk to people and property on the ground (i.e., tunneling, depressing and/or protecting a roadway through the RPZ, implement operational measures to mitigate any risks, etc.).

The FAA guidance recommends that the documentation of the alternatives should include:

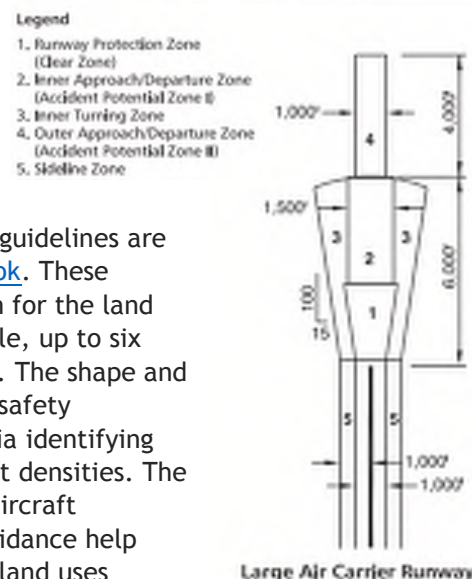
- A description of each alternative, including a narrative discussion and exhibits or figures depicting the alternative.
- Full cost estimates associated with each alternative regardless of potential funding sources.
- A practicability assessment based on the feasibility of the alternative in terms of cost, constructability, and other factors.
- Identification of the preferred alternative that would meet the project purpose and need while minimizing risk associated with the location within the RPZ.
- Identification of all Federal, State, and local transportation agencies involved or interested in the issue.
- Analysis of the specific portion(s) and percentages of the RPZ affected, drawing a clear distinction between the Central Portion of the RPZ versus the Controlled Activity Area, and clearly delineating the distance from the runway end and runway landing threshold.
- Analysis of (and issues affecting) sponsor control of the land within the RPZ.
- Any other relevant factors for FAA consideration.

## Other Safety Zones

There are no minimum compatibility requirements for airports in South Dakota to comply with other safety zones. South Dakota law does provide enabling legislation for overlay zoning to be implemented. Sioux Falls Regional Airport has the option to develop their own customized safety zones beyond the Runway Protection Zones to preserve safety and compatible land use.

As an example, comprehensive airport land use compatibility guidelines are contained in the [California Airport Land Use Planning Handbook](#). These guidelines in that document have been used as the foundation for the land use compatibility planning nationally. In the California example, up to six safety compatibility zones encompass airport owned property. The shape and size of each zone is driven by the runway classification. Each safety compatibility zone is assigned compatible development criteria identifying incompatible land uses and acceptable maximum development densities. The development criteria is based on noise levels and the risk of aircraft accidents within that zone. These identified standards and guidance help airports, communities and jurisdictions prevent incompatible land uses around airports beyond the Runway Protection Zone.

### EXAMPLE CALIFORNIA AIRPORT LAND USE COMPATIBILITY ZONES





## Wildlife Hazards

The presence of wildlife in an around an airport can be a significant concern for aircraft operations. A wildlife strike on the ground or in the air has the potential to cause catastrophic damage to life and property. Hazardous wildlife around airports may include but are not limited to ground mammals such as deer or avian species including geese. Compatibility standards include controlling land uses to reduce the risk of existing hazards and controlling the creation of new wildlife hazards.

FAA AC 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports* identifies land uses that may attract wildlife hazardous to aviation activities. **Table 7-8** identifies the land uses that are not recommended and acceptable according to this FAA guidance.

**Table 7-8 – FAA Hazardous Wildlife Attractants On or Near Airports**

Land Use Guidance as Related to Wildlife Attractants
<b>Typically not recommended within 10,000 feet of airports primarily serving turbine-powered aircraft:</b>
<ol style="list-style-type: none"><li>1. New landfills (prohibited within 6 statute miles of airports)</li><li>2. Underwater waste discharges</li><li>3. Storm water management facilities (unless modified/ designed so as to minimize attractiveness to wildlife)</li><li>4. Wastewater treatment facilities</li><li>5. Artificial marshes, stock ponds and recreational lakes</li><li>6. Wastewater discharge and sludge disposal</li><li>7. Wetlands that attract wildlife</li><li>8. Dredge spoil containment areas (if they contain materials that could attract wildlife)</li><li>9. Confined livestock operations (feedlots, dairy operations hog/chicken production facilities, etc.)</li><li>10. Aquaculture (unless they can show it does not pose a bird hazard)</li><li>11. Golf courses (allowed if they develop a program to reduce wildlife attractiveness)</li></ol>
<b>Typically not recommended within 5 mile radius of airport:</b>
<ol style="list-style-type: none"><li>1. Any items listed above if they would cause wildlife movement across approach/departure surface.</li><li>2. New wastewater treatment facilities</li><li>3. New golf courses</li><li>4. New landfills</li></ol>
<b>Typically compatible with airports:</b>
<ol style="list-style-type: none"><li>1. Enclosed trash transfer stations</li><li>2. Composting operations (yard waste; does not include food/municipal solid waste)</li><li>3. Recycling centers</li><li>4. Construction and demolition debris facilities</li><li>5. Fly ash disposal</li></ol>

Source: [FAA AC 150/5200-33B](#)

Certificated airports under FAR Part 139 that have detected wildlife hazards are required to complete a year-long Wildlife Hazard Assessment (WHA) and associated Wildlife Hazard Mitigation Plan (WHMP). The purpose of this study is to provide the airport with information to identify hazardous species/attractants, prevent future strikes and evaluate wildlife risk level. The WHA identifies the observed wildlife species, identifies attractants, hazards and provides recommendations to reduce wildlife hazards. The WHMP develops a plan to mitigate wildlife risks. The WHA required to be completed by a qualified wildlife biologist. WHA/WHMP requirements are an FAA priority and are trickling down to general aviation airports.



## **AIRPORT CONDITIONS**

### **Runway Protection Zones**

The existing RPZs were evaluated to determine existing land uses and airport control. A graphical illustration of the RPZs is identified in **Exhibit 7-9** on the following page. Within the off-airport RPZ areas there are various classified land uses. Runway 3 contains Conservation (CN) district with the Elmwood Golf Course. The Runway 21 RPZ contains Conservation (CN), Recreational (REC) and Agricultural (AG) districts. Existing development within the Runway 21 RPZ is classified as light Industrial (I-1). The existing Runway 33 RPZ has zoning districts classified as light Industrial (I-1) and a small portion of neighborhood Commercial (C-2). The existing and future Runway 15, 9 and 27 RPZs are contained on-airport.

The Runway 21 RPZ contains a portion of an industrial structure and the Runway 15 RPZ contains a small portion of a commercial building. Both structures are located off-airport without direct airport land use control.

Existing land uses within the RPZ may remain provided they are determined to be compatible by FAA. As of this Master Plan, the Airport is not aware of the FAA identifying any existing land use as incompatible. The RPZ size and the structures within the Runway 21 RPZ, for example, has safely existed for over 10 years and several FAA-funded projects have been completed during that time.

One identified Airport Master Plan project that would require an FAA coordination and an FAA Alternatives Analysis would be enhancing the Runway 33 approach to  $\frac{3}{4}$  mile visibility minimums. This would increase the size of the RPZ into new structures and industrial zoned areas. New land uses identified in Table 1 of the interim guidance would be introduced. No formal RPZ alternatives analysis was completed for this Airport Master Plan as the projects are proposed beyond the short-term (0-5 year) implementation timeframe.

Future bike trails are proposed to connect to an existing Sioux Falls Trail outside of the RPZ.

### **Wildlife Hazards**

Existing wildlife elements in and around the airport were reviewed. A Wildlife Hazard Assessment (WHA) was completed from 2013-2014. The associated Wildlife Hazard Management Plan (WHMP) is scheduled to be completed in 2015.

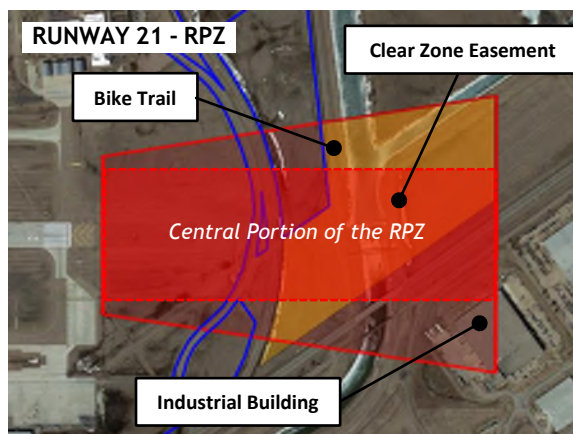
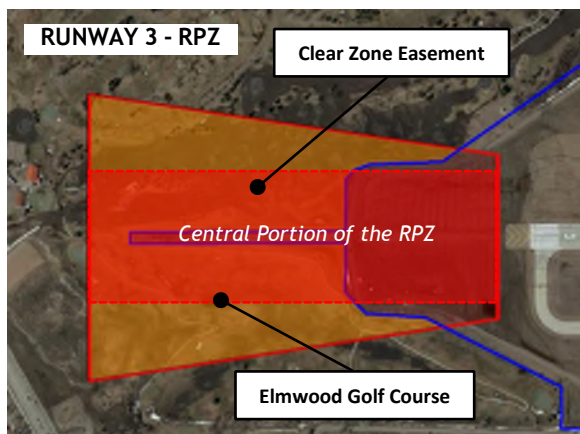
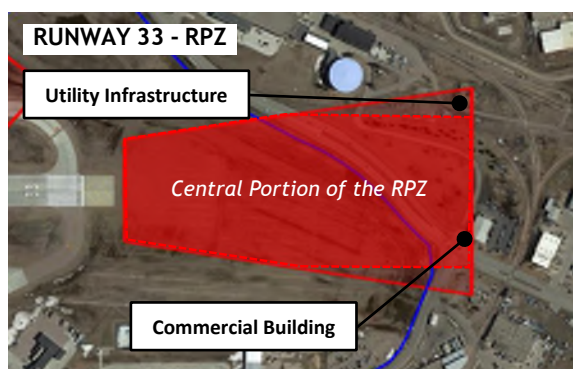
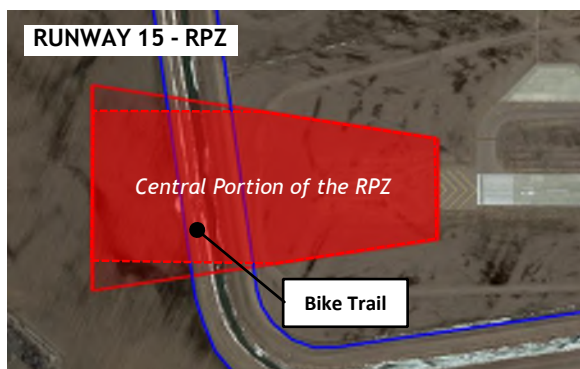
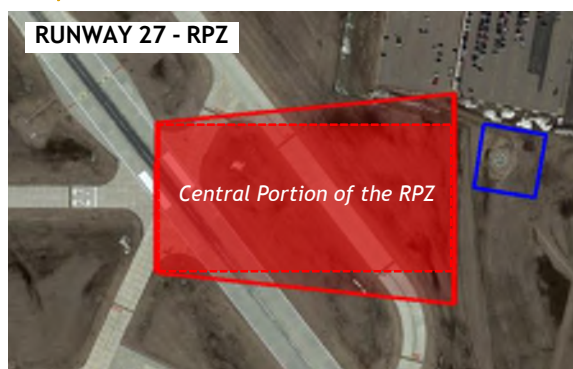
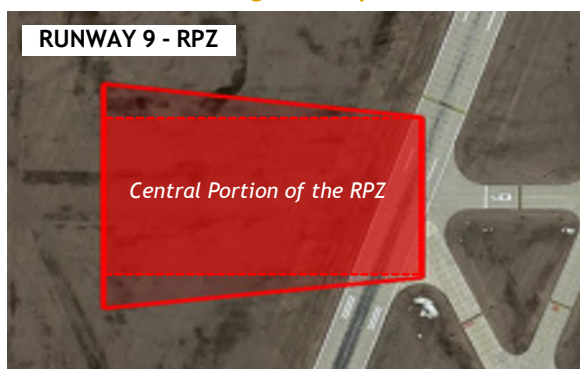
The airport has been pro-active in addressing wildlife issues by eliminating airfield crops, replacing the perimeter fence and removing on-airport trees. Waterfowl, including Canada geese have been the most significant wildlife hazard at the airport due to the presence of surrounding off-airport cropland and open water. Larger bodies of open water includes the Big Sioux River and Diversion Channel as well as Sweetman's Quarry within the Runway 3 approach approximately 7,500 feet from the end of the runway. There are a few wetlands or drainage areas within airport property that attract wildlife including ducks. The airport will continue to address on-airport hazards, and off-airport hazards within their control.

The Sioux Falls Regional Sanitary Landfill (SFRSL), the largest in South Dakota began operations in 1979 and is located 5 miles west of Sioux Falls, or 8 miles southwest of the airport. The Sioux Falls Stockyards closed in 2009. Any remaining stockyards within the City of Sioux Falls are largely or entirely enclosed with a roof, located 1 mile southeast of Runway 33 end. These land uses are compatible.





### Exhibit 7-9 – Existing Runway Protection Zones (Approach)



Runway End	RPZ Size	Existing Land Uses	Off-Airport Control
Runway 9	500' x 700' x 1,000'	Aeronautical, Agricultural	N/A - Entire RPZ On-Airport
Runway 27	500' x 700' x 1,000'	Aeronautical, Agricultural	N/A - Entire RPZ On-Airport
Runway 15	500' x 1,010' x 1,700'	Agricultural, Bike Trail	Public Right-of-Way
Runway 33	500' x 1,010' x 1,700'	Agricultural, Roads, Above-Ground Utility Infrastructure, Commercial Building (partial)	Public Right-of-Way
Runway 3	1,000' x 1,750' x 2,500'	Road, Golf Course	Clear Zone Easement, Public Right-of-Way
Runway 21	1,000' x 1,750' x 2,500'	Agricultural, Roads, Railroad, Bike Trail, Industrial Building (partial)	Clear Zone Easement

Source: KLJ Analysis





## LAND USE CONTROLS

There is limited local land use controls help control the creation of new land use incompatibilities beyond airport property boundary. Land use safety controls exist within the City of Sioux Falls only.

Chapter 160.418 of the City's Code of Ordinances acknowledges that when a zoning district changes or zoning permit within the airport influence overlay district shall abide by the following safety standards:

- Residentially platted lots as of June 28, 2007 are allowed to remain and apply for residential zoning permits.
- Office, Institutional and Live/Work zoning districts shall be developed with three conditions:
  1. The parcel contains three acres of land or less;
  2. The building contains 50,000 square feet of area or less; and
  3. Signed acknowledgement of the airport influence overlay district
- Commercial and Industrial zoning districts shall provide written documentation from the Airport that occupancy standards meet FAA regulations.
- Agricultural, Recreational and Conservation zoning districts must provide a mitigation plan approved by the Airport which addresses wildlife attractants per FAA AC 150/5200-33B.

Chapter 160.423 provides the option for the Airport to receive conveyance of an aviation easement. According to the zoning ordinance: "within the airport influence overlay district, an aviation easement may be conveyed to the Airport by property owners subdividing lands, initiating substantial construction of any habitable structure on already divided lands, or changing zones within the airport influence overlay district. The Airport shall be the grantees of the easement, and shall be able to facilitate an agreed upon easement between the two parties." To date this provision has not been enforced by the City of Sioux Falls.

There are limited provisions to prevent the creation of new wildlife hazards.

## RPZ ALTERNATIVES ANALYSIS

### **RPZ Alternative Analysis Process**

The existing Runway 3 and 21 RPZs for the Sioux Falls Regional Airport are not being modified by the planned development. The RPZs for Runway 9 and 27 are proposed to reduce in size in the future within the footprint of the existing RPZ. Therefore, the FAA's Interim Guidance is not triggered by the development and no additional analysis is required for these runway ends.

The Runway 15 RPZ is proposed to increase in size in the long-term because of an upgrade to  $\frac{3}{4}$  mile visibility minimums. The airport owns the land within the modified RPZ and there are no incompatible land uses, as identified in the FAA's Interim Guidance, within the modified Runway 15 RPZ. Therefore, no alternative analysis is required.

The RPZ land use alternative analysis is required by the FAA for Runway 33 to upgrade visibility minimums to  $\frac{3}{4}$  mile. This would increase the size of the RPZ. The project is proposed beyond the initial planning period of 0-5 years as identified in **Chapter 6: Implementation Plan**. Therefore, a simple planning-level alternatives review was completed in **Chapter 5: Alternatives Analysis**. A formal FAA RPZ analysis will be completed at a later time when the project is in the planning stage and within five years of implementing.

### **Runway 33 RPZ Alternatives Review**

#### **Existing RPZ**

The "project" is to upgrade the Runway 33 approach to lower visibility minimums from 1 mile to  $\frac{3}{4}$  mile. The project triggers an expanded RPZ from 500' x 1,010' x 1,700 to 1,000' x 1,510' x 1,700'



approach RPZ. There are several land uses within the proposed expanded Runway 33 RPZ that trigger FAA coordination and may be incompatible. They include:

1. Minnesota Avenue
2. Mark Juhl Auto Sports & Services (portion)
3. Algonquin Street
4. Electrical sub-station (portion)

#### *Proposed RPZ*

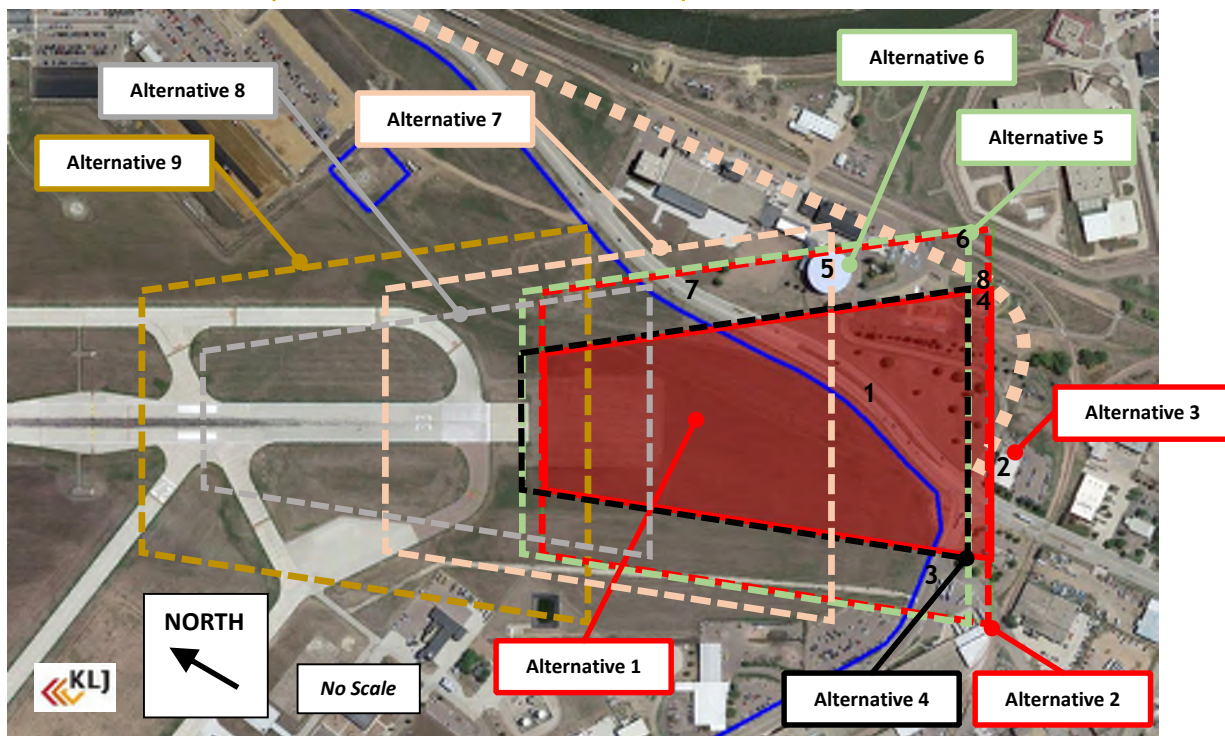
The “project” is to upgrade the Runway 33 approach to lower visibility minimums from 1 mile to  $\frac{3}{4}$  mile. The project triggers an expanded approach RPZ of 1,000' x 1,510' x 1,700' in size. There are several land uses that are introduced into the proposed RPZ that trigger FAA coordination and may be incompatible. They include:

5. Sioux Falls Water Tank
6. Railroad
7. Minnesota Avenue - additional roadway length
8. Electrical sub-station - additional area

#### *Alternatives Analysis*

This section identifies the available alternatives that are being considered to address potential incompatible land uses in the RPZs. Each alternative is broadly analyzed to determine the feasibility, cost, and practicability of implementation. **Exhibit 7-10 and 7-11** graphically illustrate the alternatives and **Table 7-12** summarizes the alternatives review.

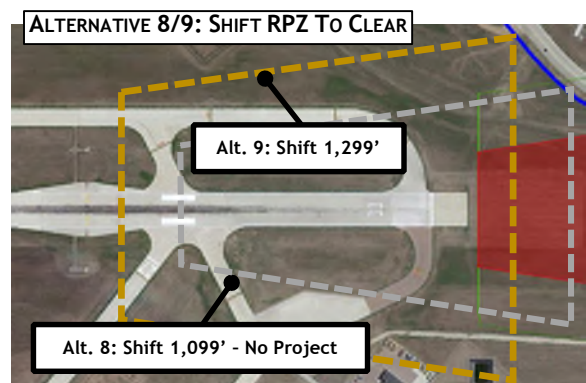
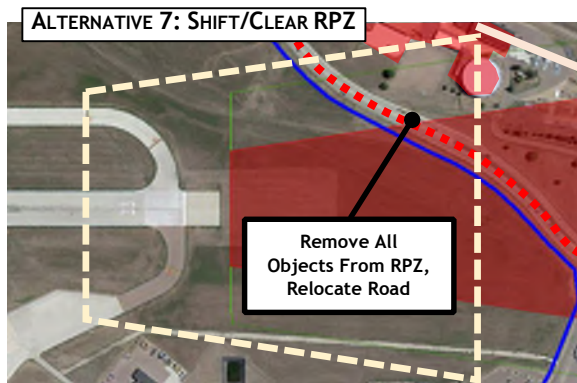
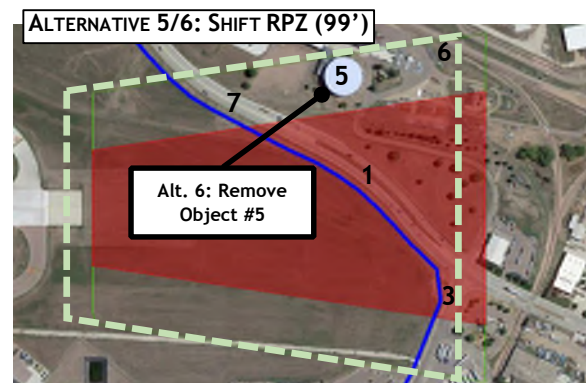
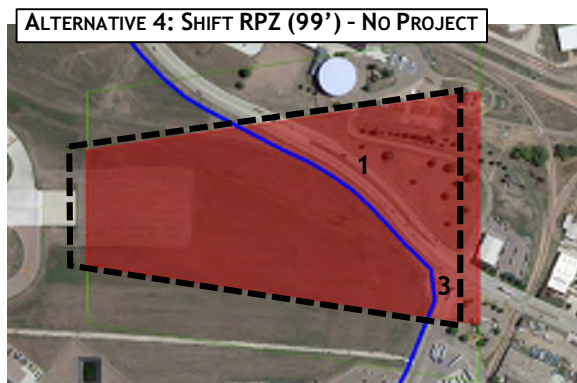
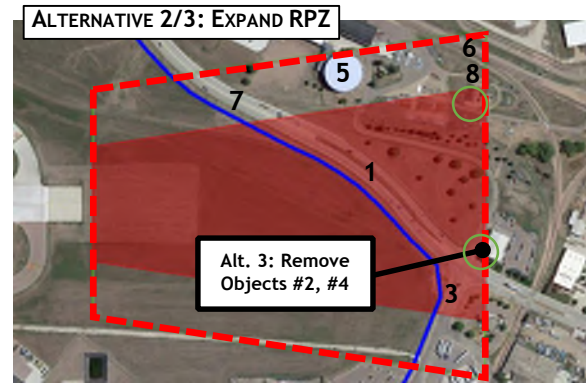
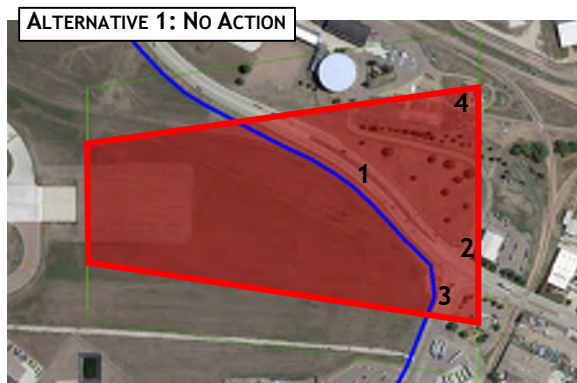
#### *Exhibit 7-10 – Runway 33 RPZ Overall Alternatives Map*



Source: KLJ Analysis, Google Earth



### Exhibit 7-11 – Runway 33 RPZ Alternatives



Source: KLJ Analysis

No preferred alternative is recommended in this analysis as the proposed project is not identified in the near-term. For a preferred alternative to be recommended the overall benefit of the proposed project needs to be evaluated against the operational and financial costs of mitigating land uses from the RPZ. This should be evaluated as the project is within five years of implementing. This may require an update to the Airport Master Plan/Airport Layout Plan at that time.



**Table 7-12 – Runway RPZ Alternatives Review**

Alt	Actions*	RPZ Objects	Factors			Runway Design		
			Cost	Feasibility	Practicality	Rwy 33 LDA	Rwy 15 TORA	Visib. Mins.
1	Do Nothing - <b>No Project</b>	1 - 4	1	5	4	7,999'	7,999'	1 mile
2	Implement Project	1 - 8	1	5	5	7,999'	7,999'	¾ mile
3	Remove Object #2, #4	1, 3, 5-8	3	3	3	7,999'	7,999'	¾ mile
4	Shift Runway 33 End (99') - <b>No Project</b>	1, 3	2	5	3	7,900'	7,900'	1 mile
5	Shift Runway 33 End (99')	1, 3, 5, 7	2	5	3	7,900'	7,900'	¾ mile
6	Alt. 5 + Relocate Water Tank (#5)	1, 3, 7	4	3	2	7,900'	7,900'	¾ mile
7	Shift Runway 33 End (399'), Relocate Minnesota Ave. & Water Facility	None	5	1	1	7,600'	7,600'	¾ mile
8	Shift Runway 33 End (1,099') - <b>No Project</b>	None	3	5	1	6,900'	6,900'	1 mile
9	Shift Runway 33 End (1,299')	None	3	5	2	6,700'	6,900'	¾ mile

Source: KLJ Analysis

Note: Cost, Feasibility and Practicality Factor based on 1 (low) through 5 (high), TORA = Takeoff Run Available, LDA = Landing Distance Available, \*Project assumed to be implemented unless otherwise stated.

Assuming the project has strong justification & need, it does appear shifting the runway by approximately 100 feet identified in Alternative 4 would remove an existing structure and above-ground utility infrastructure for the existing and ultimate Runway 33 RPZ configuration. This associated runway modification is not anticipated to have a significant impact to operational capability of the airport, but would require reconfiguration of runway infrastructure including runway and taxiway pavement and lighting to implement.

## RECOMMENDATIONS

Recommendations to promote safety compatibility include:

### Overall

- Update the Airport Overlay Zoning Ordinance to help maintain land use compatibility and promote consistent enforcement between the City of Sioux Falls, Minnehaha County and Lincoln County jurisdictions.

### Runway Protection Zones

- Obtain land use compatibility concurrence from FAA on structures within the existing Runway 21 and 33 RPZs.
- Acquire a clear zone avigation easement within off-airport areas of the existing Runway 21 RPZ, and the existing-future Runway 33 RPZ area. This will prevent the creation of new hazards. It is not feasible for the airport to purchase these areas in fee simple because of existing development.
- Consider protecting land uses in the next Airport Overlay Zoning Ordinance update within the existing and future Runway Protection Zones. This is especially critical if a clear zone avigation easement cannot be acquired by the airport. Any development proposal in an existing of future RPZ should require Airport and subsequent FAA review to meet FAA guidelines.





- Complete a Runway Protection Zone Alternatives Analysis for the expansion of Runway 33 RPZ within five years of when the visibility minimums are proposed to be lowered to  $\frac{3}{4}$  mile.

#### Other Safety Zones

- Consider protecting land uses in the next Airport Overlay Zoning Ordinance update beyond the Runway Protection Zones. Any zones should be established risk-based standards such as from the California Land Use Compatibility Guidebook. Land uses may be restricted based on use and density as to not create new aviation hazards.

#### Wildlife Hazards

- Implement the recommendations of the WHA/WHMP completed for the Sioux Falls Regional Airport for specific areas of concern for wildlife hazards.
- Land uses should be restricted through the local zoning, plan review and permitting process to reduce the risk of wildlife strikes. Elements should be identified in a future Airport Overlay Zoning Ordinance. The zoning should allow for the prevention of new wildlife hazards and allow for reasonable mitigation techniques to be implemented for existing identified hazards.

#### Noise

##### COMPATIBILITY GUIDELINES

The Sioux Falls Regional Airport currently has zoning regulations addressing airport noise impacts from year 2005 and 2025 based on the 2007 Airport Master Plan. This zoning helps mitigate the impact of new incompatible land uses by acknowledging airport noise impacts through an aviation easement on residential structures.

In this 2013 Airport Master Plan, a planning-level noise impact study was completed using the FAA's Integrated Noise Model (INM) software. This was completed because airport noise analysis are typically needed for environmental impact purposes at airports with 700 or more annual jet operations or 90,000 annual propeller operations. The review will assist with land use compatibility planning.

Land use compatibility standards for noise are identified in FAA AC 150/5020-1, *Noise Control and Compatibility Planning for Airports*. **Table 7-13** on the following page identifies the land use compatibility standards relative to different calculated DNL sound levels.





**Table 7-13 – Land Use Compatibility Recommendations for Noise**

Land Use	Yearly Day-Night Average Sound Level (Ldn) in decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
<b>Residential</b>						
Residential, other than mobile homes and transient lodgings	YES	NO (1)	NO (1)	NO	NO	NO
Mobile home parks	YES	NO	NO	NO	NO	NO
Transient lodgings	YES	NO (1)	NO (1)	NO (1)	NO	NO
<b>Public Use</b>						
Schools	YES	NO (1)	NO (1)	NO	NO	NO
Hospitals and nursing homes	YES	25	30	NO	NO	NO
Churches, auditoriums, and concert halls	YES	25	30	NO	NO	NO
Government Services	YES	YES	25	30	NO	NO
Transportation	YES	YES	YES (2)	YES (3)	YES (4)	YES (4)
Parking	YES	YES	YES (2)	YES (3)	YES (4)	NO
<b>Commercial Use</b>						
Offices, business and professional	YES	YES	25	30	NO	NO
Wholesale and retail- building materials, hardware and farm equipment	YES	YES	YES (2)	YES (3)	YES (4)	NO
Retail trade-general	YES	YES	25	30	NO	NO
Utilities	YES	YES	YES (2)	YES (3)	YES (4)	NO
Communication	YES	YES	25	30	NO	NO
<b>Manufacturing and Production</b>						
Manufacturing, general	YES	YES	YES (2)	YES (3)	YES (4)	NO
Photographic and optical	YES	YES	25	30	NO	NO
Agriculture (except livestock) and forestry	YES	YES (6)	YES (7)	YES (8)	YES (8)	YES (8)
Livestock farming and breeding	YES	YES (6)	YES (7)	NO	NO	NO
Mining and fishing, resource production and extraction	YES	YES	YES	YES	YES	YES
<b>Recreational</b>						
Outdoor sports arenas and spectator sports	YES	YES (5)	YES (5)	NO	NO	NO
Outdoor music shells, amphitheaters	YES	NO	NO	NO	NO	NO
Nature exhibits and zoos	YES	YES	NO	NO	NO	NO
Amusements, parks, resorts, and camps	YES	YES	YES	NO	NO	NO
Golf courses, riding stables and water recreation	YES	YES	25	30	NO	NO

Source: [FAA Environmental Desk Reference – Compatible Land Use](#) derived from [FAA AC 150/5020-1](#)



Table 7-12 Notes: *Green shaded cells within 65 DNL and above are compatible land uses for the study airport, Red shaded cells are not compatible without acceptable mitigation. YES = Land Use and related structures compatible without restrictions, NO = Land Use and related structures 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.*

*(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 of 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 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.*

*(4) Measures to achieve NLR of 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 noise 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.*

## **NOISE ANALYSIS**

### **Introduction**

The Sioux Falls Regional Airport Authority as the airport owner has elected to complete an airport noise analysis as part of this Airport Master Plan to determine the existing and future impacts of aircraft noise upon land uses surrounding FSD. A technical airport noise analysis was completed for airport planning purposes to determine the existing and proposed noise exposure levels for surrounding land use compatibility. These noise exposure contours utilized the Master Plan for the future airport runway configuration and activity at the Sioux Falls Regional Airport.

The airport noise analysis was prepared using the FAA's approved computer model, the Integrated Noise Model (INM) version 7.0d software program, for developing noise exposure contours. The FAA-approved activity forecasts were used for this study along with existing and future runway configuration and use patterns.

### **Methodology**

Noise is most commonly defined as any unwanted sound. Noise is measured as sound pressure level expressed in decibels (dB). The number of pressure waves per second of a sound is the frequency of sound. Noise measurements of point sources are adjusted to approximate the normal human perception of noise. Measurements made with this weighing system are known as "A-weighted" defined as "dBA". The FAA evaluates noise based on converting the equivalent sound energy from fluctuating noise to a constant level of sound over a defined period of time. The metric is called the equivalent sound level (Leq).

The noise level metric used to determine the airport operational noise levels is the day-night average sound level (DNL). The DNL provides a single noise level that represents a full 24-hour day, 365-day annual period. This takes into account a greater sensitivity to nighttime occurring noise between 10 p.m. and 7 a.m. The DNL metric is recognized by FAA as the appropriate measure of cumulative noise exposure.



As a frame of reference, normal human conversation ranges between 45 and 65 dBA. The California Department of Health Sciences has determined that residential low density sound levels that are normally acceptable are up to 60 dBA, with levels up to 70 dBA identified as conditionally acceptable where the outdoor environment would seem noisy.

The INM develops a set of grid points at the ground level around the airport. The program then determines slant distance from the point to each flight track, and determines the noise exposure based on aircraft type, operational, and engine characteristics. The INM aircraft database includes noise, thrust settings, and flight profile data used for noise modeling based on years of research and field measurements by FAA. The noise exposures levels are summed and the cumulative noise exposure contours are developed using the DNL metric.

### Inputs

Various user input data is required to run a successful noise study through INM. This includes physical and metrological data about the airport, ground track data, aircraft operational data, and the assignment of these aircraft to the flight tracks. Approved aviation activity estimates and forecasts from the Master Plan were utilized. Consultant staff worked closely with FSD Airport Management and Airport Traffic Control Tower staff to develop airport operational modeling inputs.

### Operations and Fleet Mix

The selection of aircraft types is a critical step in the INM process. The airport's existing and future DNL were calculated from FAA-approved aviation forecasts derived from this Airport Master Plan. Operations were split into local and itinerant based on operation counts and activity forecasts. The existing 2013 and forecast 2033 FSD aircraft activity from the Airport Master Plan with operational fleet mix estimates is summarized in Table 7-14.

**Table 7-14 – INM Aircraft Activity Levels**

Aircraft Type	INM Code	Operations		Percent of Total	
		2013	2033	2013	2023
ITINERANT OPERATIONS					
Air Carrier/Air Taxi (Airlines)					
Airbus A320-200	A320-232	1,599	1,226	10.0%	6.0%
Boeing 717-200	717200	0	3,066	0.0%	15.0%
Boeing 737-800	737800	0	204	0.0%	1.0%
Boeing MD-83	MD83	1,039	1,124	6.5%	5.5%
Boeing 757-200	757PW	40	51	0.25%	0.25%
Boeing 767-200	767CF6	40	51	0.25%	0.25%
Bombardier CRJ-200	CRJ9-ER	5,116	2,862	32.0%	14.0%
Bombardier CRJ-700/900	CRJ9-ER	1,119	2,862	7.0%	14.0%
Embraer EMB-145	EMB145	6,715	4,088	42.0%	20.0%
Embraer ERJ-175	ERJ170	320	4,088	2.0%	20.0%
Embraer ERJ-190	ERJ190	0	818	0.0%	4.0%
Subtotal		15,989	20,441	100.0%	100.0%



Aircraft Type	INM Code	Operations		Percent of Total	
		2013	2033	2013	2023
Air Carrier/Air Taxi (Cargo)					
Airbus A300-600F	A300-622R	334	0	2.3%	0.0%
Aerospatiale ATR-42/72	DHC8	610	1,472	4.2%	7.4%
Beechcraft B1900	1900D	3,965	6,542	27.2%	32.9%
Boeing 767-300F	767CF6	672	1,239	4.6%	6.2%
Boeing 757-200F	757PW	1,376	2,302	9.4%	11.6%
Boeing 727-200F	727EM2	16	0	0.1%	0.0%
Bombardier CRJ-200	CRJ9-ER	0	654	0.0%	3.3%
Cessna Caravan 208	CNA208	1,220	1,636	8.4%	8.2%
Embraer EMB-120	EMB120	0	1,636	0.0%	8.2%
Fairchild Metroliner III	DHC6	3,965	2,453	27.2%	12.3%
Multi-Engine Piston	BEC58P	2,440	1,953	16.7%	9.9%
Subtotal		14,598	19,987	100.0%	100.0%
Air Taxi (Other Commercial)					
Single-Engine Piston Variable	GASEPV	96	156	2.0%	2.0%
Single-Engine Piston Fixed	GASEPF	96	156	2.0%	2.0%
Multi-Engine Piston	BEC58P	964	1,563	20.0%	20.0%
Turboprop (Cessna 441)	CNA441	2,650	4,299	55.0%	55.0%
Turbojet (Cessna 525)	CNA525C	675	1,094	14.0%	14.0%
Turbojet (Cessna 560XL)	CNA560XL	241	391	5.0%	5.0%
Turbojet (Falcon 200)	FAL200	48	78	1.0%	1.0%
Helicopter (Eurocopter 130)	EC130	48	78	1.0%	1.0%
Subtotal		4,819	7,817	100.0%	100.0%
General Aviation					
Single-Engine Piston Variable	GASEPV	1,223	1,983	6.0%	6.0%
Single-Engine Piston Fixed	GASEPF	1,233	1,983	6.0%	6.0%
Multi-Engine Piston	BEC58P	2,445	3,305	12.0%	10.0%
Turboprop	CNA441	11,004	17,847	54.0%	54.0%
Turbojet (Cessna 525)	CNA525C	1,426	2,644	7.0%	8.0%
Turbojet (Cessna 560XL)	CNA560XL	1,426	2,479	7.0%	7.5%
Turbojet (Cessna Citation X)	CNA750	306	496	1.5%	1.5%
Turbojet (Learjet 35)	LEAR35	245	331	1.2%	1.0%
Turbojet (Falcon 200)	FAL200	265	496	1.3%	1.5%
Turbojet (Gulfstream G-IV)	GIV	204	496	1.0%	1.5%
Helicopter (Eurocopter 130)	EC130	611	992	3.0%	3.0%
Subtotal		20,378	33,050	100.0%	100.0%
Military					
General Dynamics F-16	F16GE	2,564	2,564	80.0%	80.0%
Turboprop	CNA441	481	481	15.0%	15.0%
Lockheed C-130	C130	160	160	5.0%	5.0%
Subtotal		3,205	3,205	100.0%	100.0%
ITINERANT TOTAL		58,989	84,110	-	-



Aircraft Type	INM Code	Operations		Percent of Total	
		2013	2033	2013	2023
<u>LOCAL OPERATIONS</u>					
<u>Civil</u>					
Single-Engine Piston Variable	GASEPV	2,070	4,022	36.5%	36.5%
Single-Engine Piston Fixed	GASEPF	2,070	4,022	36.5%	36.5%
Multi-Engine Piston	BEC58P	1,134	1,672	20.0%	20.0%
Turboprop	CNA441	227	418	4.0%	4.0%
Turbojet	CNA55B	57	104	1.0%	1.0%
Helicopter	EC130	113	209	2.0%	2.0%
Subtotal		5,670	10,447	100.0%	100.0%
<u>Military</u>					
Single-Engine Piston Fixed	GASEPF	276	276	10.0%	10.0%
Turboprop	CNA441	276	276	10.0%	10.0%
General Dynamics F-16	F16GE	2,207	2,207	80.0%	80.0%
Subtotal		2,759	2,759	100.0%	100.0%
LOCAL TOTAL		8,429	13,206	-	-
FINAL TOTAL		67,418	97,616	-	-

Source: 2013-2033 FSD Aviation Forecasts, KLJ Analysis

### Aircraft Database Selection

Selection of the proper aircraft types allows the proper aircraft noise characteristics to be used to model noise for various aircraft types through INM. In many cases, one singular aircraft was used to represent the general sound characteristics of multiple aircraft types in the same category. FAA's pre-approved substitution list was utilized to select the INM noise profile that was determined to best model noise of a singular or family of aircraft types.

### Time-of-Day

The time-of-day when operations occur is important to the INM input because nighttime flights (10 p.m. to 7 a.m.) carry extra weight. The FAA model weight one nighttime operations to have an extra 10 decibels as a method of quantifying the effects of one specific noise event during sleeping hours. Nighttime activity was determined based on operation types, based on published flight schedules, Airport Traffic Control Tower records and general observations. The day-night operation assumptions are summarized in Table 7-15. Cargo operations were estimated to operate 50 percent of the time at night.

**Table 7-15 – Day/Night Runway Utilization**

Operation Type	Day %	Night %
Airlines	77.9%	22.1%
Air Cargo	50.0%	50.0%
Corporate*	95.0%	5.0%
Piston General Aviation	98.0%	2.0%
Military	99.0%	1.0%
<b>TOTAL</b>	<b>100.0%</b>	<b>100.0%</b>

Source: 2013-2033 FSD Aviation Forecasts, KLJ Analysis

Note: Night is defined as between 10pm and 7am, \*Includes Turboprop and Turbojet aircraft operated as Other Commercial and General Aviation

### Runway Usage

Arrivals and departures were further divided between the six runway ends at FSD. Data from the 2007 Airport Master Plan was used in consultation with the Airport Traffic Control Tower and wind data to develop runway utilization percentages. Usage is presumed to be the same in the existing and future





airport configuration. Runway 33 is best oriented into the prevailing wind. Runway 3-21 is the longest runway on the airport. **Table 7-16** outlines the runway use assumptions. Runway 3-21 is used 54.5% of the time, Runway 15-33 is used 44.53% of the time and Runway 9-27 is used 0.97% of the time.

**Table 7-16 – Runway End Utilization**

Runway End	Airlines	Air Cargo	Corporate*	Piston GA	Military
<b>Departures</b>					
Runway 3	15.0%	20.0%	25.0%	20.0%	15.0%
Runway 21	30.0%	50.0%	35.0%	15.0%	35.0%
Runway 15	15.0%	10.0%	15.0%	20.0%	15.0%
Runway 33	40.0%	20.0%	25.0%	40.0%	35.0%
Runway 9	0.0%	0.0%	0.0%	2.5%	0.0%
Runway 27	0.0%	0.0%	0.0%	2.5%	0.0%
<b>TOTAL</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Arrivals</b>					
Runway 3	15.0%	20.0%	25.0%	20.0%	15.0%
Runway 21	40.0%	50.0%	35.0%	15.0%	35.0%
Runway 15	15.0%	10.0%	15.0%	20.0%	15.0%
Runway 33	30.0%	20.0%	25.0%	40.0%	35.0%
Runway 9	0.0%	0.0%	0.0%	2.5%	0.0%
Runway 27	0.0%	0.0%	0.0%	2.5%	0.0%
<b>TOTAL</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Source: 2013-2033 FSD Aviation Forecasts, FSD ATCT, KLJ Analysis

Note: Night is defined as between 10pm and 7am, \*Includes Turboprop and Turbojet aircraft operated as Other Commercial and General Aviation

### Flight Tracks

For purposes of this planning-level study all flight tracks assumed straight-in approaches and straight-out departures. This models a typical itinerant instrument arrival or departure flight path conducted by the majority of the aircraft, and those that have the largest single event noise levels. Diverging arrivals, departures or traffic patterns were not modeled as aircraft were assumed to remain along centerline for the duration of the impact zone, the 65 DNL contour. For FSD, this extends up to 4,000 feet from each runway end.

### Flight Profiles

The standard arrival glidepath of three degrees was used to model operations at INM. Other aircraft flight profiles are modeled in INM after airport elevation and metrological and elevation data. At FSD, the airport elevation is 1,429 feet above mean sea level (MSL). The average annual temperature is 53.9 degrees Fahrenheit. User defaults for average atmospheric pressure and relative humidity were used. Data was derived from the Sioux Falls Regional Airport.

The output data includes annual average noise contours in DNL developed by INM. The cumulative areas of noise exposure for the existing and future years are summarized in **Table 7-16**.



**Table 7-17 – Areas of Noise Exposure**

DNL Contour	2013	2033	Difference
55 DNL	6.29 sq. mi.	7.54 sq. mi.	+1.25 sq. mi.
60 DNL	2.40 sq. mi.	2.82 sq. mi.	+0.42 sq. mi.
65 DNL	1.12 sq. mi.	1.25 sq. mi.	+0.13 sq. mi.
70 DNL	0.64 sq. mi.	0.68 sq. mi.	+0.04 sq. mi.

Source: INM 7.0d, KLJ Analysis

**Exhibit 7-2** illustrates the Day-Night Level (DNL) noise impact contours identified for the existing and future airport operations.

## **COMPATIBILITY REVIEW**

The underlying land uses within the 65 DNL critical noise exposure contours illustrated in **Exhibit 7-2**. In Sioux Falls, the 65 DNL contour for existing (2013) and future (2033) noise impacts does not cross over residential properties using the inputs and assumptions from the study inputs. Land uses within the 65 DNL contour include Industrial, Commercial, Conservation, Recreational and Agricultural. The 70 DNL contour is entirely contained within airport property. Off-airport properties within the 65 DNL meet FAA land use compatibility requirements.

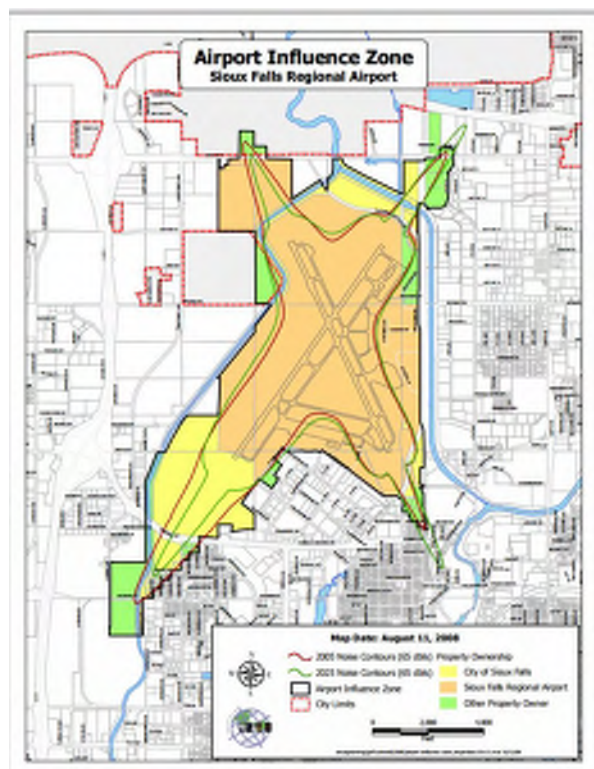
Surrounding land use is compatible with airport noise levels according to compatibility requirements in **Table 7-6**.

## **LAND USE CONTROLS**

Local land use controls help control the development of land uses incompatible with airport noise exposure levels beyond the airport property boundary. No Part 150 noise study has been completed for Sioux Falls Regional Airport. Local land use controls provide methods to acknowledge and minimize noise exposure.

Chapter 160.418 of the City's Code of Ordinances acknowledges an airport influence overlay district from the 2007 Airport Master Plan as the currently adopted district. Chapter 160.422 discusses the Noise Exposure Zone:

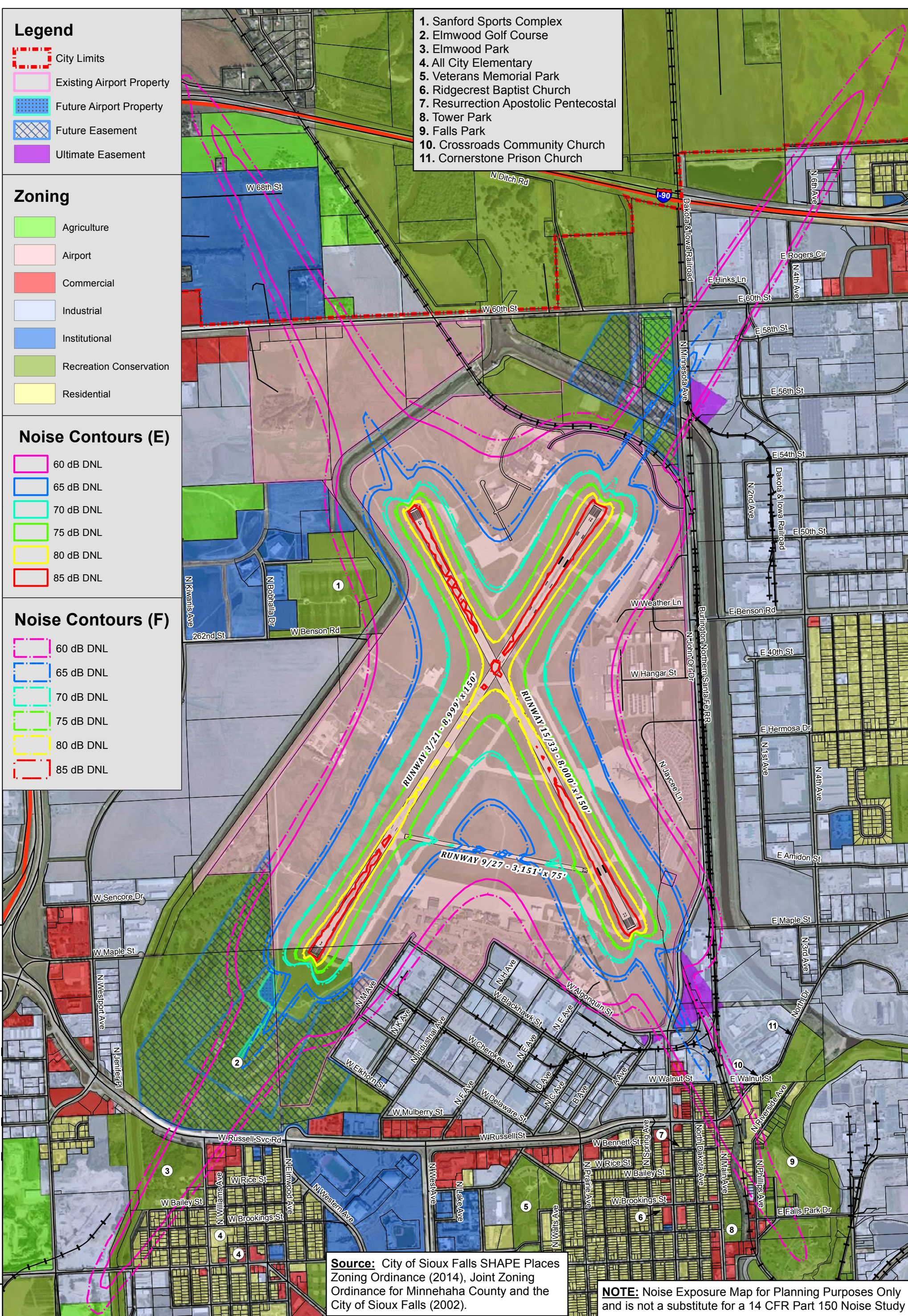
- Noise exposure zone reflects the 65 DNL as regulated by FAA as shown in the June 28, 2007 Airport Master Plan.
- An aviation easement shall be placed on property inside the noise exposure zone when a building permit for substantial improvements to a habitable residential structure is being requested.
- Zoning permits for any school, hospital or place of worship shall provide a Noise Reduction Level of at least 10 decibels over standard construction practices (from 55 decibels to 45 decibels). This is recommended for residential properties.
- Property owners within the airport overlay district may sign an acknowledgement notice.



**CITY OF SIOUX FALLS  
2007 AIRPORT NOISE EXPOSURE ZONE**



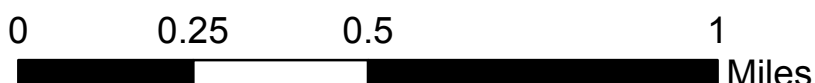
J:\airport\14513104\GIS MP\ Maps\7-2 NoiseExposureMap.mxd TLG 4/30/2015



\*Intended for Planning Purposes Only



PRELIMINARY



**Sioux Falls Regional Airport  
Joe Foss Field  
Noise Exposure Map  
Exhibit 7-2**





The 2007 Airport Master Plan identified the 65 DNL contour used the Airport Noise Exposure Zone. This 2013 Airport Master Plan Update identifies a smaller noise exposure contour. The existing 2007 contour is larger and encompasses single-family residential properties south of Walnut Street within the Runway 33 approach.

There is no land use control for noise exposure outside of the City of Sioux Falls jurisdiction.

## **RECOMMENDATIONS**

Based on the noise analysis results and impacts identified in this Airport Master Plan study, a Part 150 study for future noise mitigation is not required for Sioux Falls Regional Airport. No noise mitigation measures for surrounding land uses are required. As a general rule however, new residential development should be minimized adjacent to the airport. Real estate disclosures should be required as part of residential transactions acknowledging overflight within the Airport Overlay Zoning Ordinance District, and addressed in a future zoning ordinance update.

## ***Airport Compliance***

### **COMPATIBILITY GUIDELINES**

FAA airport compatibility guidelines are published [Order 5190.6B Airport Compliance Manual](#) to assist FAA personnel and airport sponsors to maintain compliance with grant assurances and land obligations.

#### **Non-Aeronautical Use of Airport Property**

In order for an airport to develop land for non-aeronautical use, the FAA must first approve of the change in airport property use from aeronautical to non-aeronautical. Any property, when described as part of an airport in an agreement with the United States or defined by an Airport Layout Plan (ALP) or listed in the Exhibit “A” property map, is considered to be “dedicated” or obligated property for airport purposes by the terms of the agreement.

#### **Land Releases**

To maintain compatibility, airports may release land to de-obligate land identified on their Exhibit “A”/Airport Property Map from federal requirements. FAA will consider a release, modification, reform, or amendment of any airport agreement to the extent that such action has the potential to protect, advance, or benefit the public interest in civil aviation. Such action may involve only relief from specific limitations or covenants of an agreement or it may involve a complete and total release that authorizes subsequent disposal of federally obligated airport property. Major considerations in granting approval of a release request include:

- The reasonableness and practicality of the sponsor's request,
- The effect of the request on needed aeronautical facilities,
- The net benefit to civil aviation,
- The compatibility of the proposal with the needs of civil aviation.

Common types of release requests include:

- **Concurrent Use:** If aeronautical land is to remain in use for its primary aeronautical purpose but also used for a compatible revenue producing non-aeronautical purpose, no formal release request is required. This is considered a concurrent use of aeronautical property and requires FAA approval. Aeronautical property may be used for a compatible non-aviation purpose while at the same time serving the primary purpose for which it was acquired. An example is the concurrent use of runway clear zone land and low growing crops to generate revenue, or a manufacturing facility under the Part 77 airspace surfaces on airport property.



- **Request for Change in Use:** For releases other than land, such as a request for change in use from aeronautical to non-aeronautical, the sponsor must begin with a formal request signed by an authorized FAA official addressing the major considerations.
- **Sale or Disposal of Airport Property:** If the airport desires to remove property from the land obligated in the ALP and Exhibit “A”/Airport Property Map, they would need to request a total release permitting sale or disposal of federally obligated land. In addition to the requirements of a request for change in use, the airport sponsor must address several elements identified in FAA Order 5190.6B including fair market value, net proceeds, and benefits to the airport. FAA consent shall be granted only if it is determined that the property is not needed for present or foreseeable public airport purposes.

### Through-the-fence Operations

“Through-the-fence” arrangements can encumber the airport property and reduce an airport’s ability to meet its federal obligations. This type of agreement is to be avoided since they can create situations that could lead to violations of the airport’s federal obligations.

The FAA compatibility guidelines on through-the-fence operations depends on whether they are related to off-airport aeronautical businesses or property used as a residence.

#### Off-Airport Aeronautical Businesses

As a general principle, the FAA does not support airport requests to enter into any agreement that grants “through-the-fence” access to the airfield for aeronautical businesses that would compete with an on-airport aeronautical service provider such as a Fixed-Based Operator (FBO). Exceptions may be granted on a case-by-case basis where operating restrictions ensure safety and equitable compensation for use of the airport and subordinate the agreement to grant assurances and grant agreements.<sup>3</sup>

#### Residential Property

The most up-to-date guidance on through-the-fence access to residential property comes from section 136 of the FAA Modernization and Reform Act of 2012 and a July 2013 FAA Policy Statement.<sup>4</sup> Commercial service airports are not permitted to enter into residential through-the-fence arrangements. These standards will be applied, on a case-by-case basis, in FAA’s evaluation of whether each airport with existing residential through-the-fence access meets the above requirements to the fullest extent feasible for that airport.

## EXISTING CONDITIONS

Sioux Falls Regional Airport property is officially identified in Exhibit “A”/Airport Property Map. Airport property is designed for aeronautical use unless otherwise approved by FAA. Airport facilities directly relating to the use of or supporting aviation are considered to be aeronautical. Facilities should be used for available for aeronautical purposes. For this review, facilities directly tied to the South Dakota Air National Guard are considered aeronautical in nature.

Existing non-aeronautical land uses within the Sioux Falls Regional Airport property include:

- City of Sioux Falls Ground Water Wells (pre-date the airport) - Throughout Airport
- National Weather Service (Sioux Falls Weather Forecast Office) - East General Aviation Area
- Cell Phone Tower - Passenger Terminal Complex
- AeroStay Hotel - Passenger Terminal Complex
- City of Sioux Falls Fire Training Facility - West Airfield Area

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<sup>3</sup> FAA Order 5190.6B, *FAA Airport Compliance Manual*

<sup>4</sup> Airport Improvement Program (AIP): Policy Regarding Access to Airports From Residential Property (76 FR 42419; July 16, 2013)





- South Dakota Army National Guard Facility & Storage Area - West General Aviation Complex
- City of Sioux Falls Water Maintenance Facility - South Airfield Area
- Automobile Parking Lots - South Airfield Area
- Elmwood Golf Course - South Airfield Area (pending land release)

There are no residential or commercial “through-the-fence” operations.

## LAND USE CONTROLS

The City of Sioux Falls Code of Ordinances identifies the majority of Sioux Falls Regional Airport property as an Airport (AP) district under Chapter 160.038. This Airport (AP) zoning district was established in 2007 to help ensure airspace and land uses around the airport meet safety requirements for airport operations. The Sioux Falls Regional Airport Authority has the power to adopt and enforce the airport zoning regulations. Land use within airport property is classified as Airport is limited to certain compatible land uses and controlled by the Airport Authority. Examples of land uses that may be compatible in the AP district include warehousing and manufacturing (airport facilities).

Airport property is also identified as a Conservation (CN) land use in areas not directly connected to airport activities. Under Chapter 160.069, CN district is intended to provide the city with open space to add to the aesthetic quality of the community. Allowable land uses include golf courses, cemeteries and other similar uses that are typically compatible with a conservation area. This boundary should be updated to reflect the land exchange between the Airport and the City of Sioux Falls to release the Elmwood Golf Course.

## RECOMMENDATIONS

Recommendations to promote airport compatibility include:

- Work with FAA to develop an action plan to document and address existing non-aeronautical land uses within airport property. This may involve requesting a change in use land release for existing non-aeronautical land uses within airport property.
- Identify potential non-aeronautical land uses in the Airport Layout Plan and Exhibit “A”/Airport Property Map for FAA review and approval.
- As specific requests for non-aeronautical development within identified areas arise, work with FAA to request a change in use agreements for proposed future non-aeronautical land uses.
- Continue to control development that occurs on airport and consult with FAA as needed to verify compliance with FAA rules and regulations.