Duluth Airport Land Use Plan

December 2001

Prepared by the
Duluth-Superior Metropolitan Interstate Committee

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"Guiding the Future of Transportation and Planning for the Twin Ports Area"
## Acronym Guide

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>ALP</td>
<td>Airport Layout Plan</td>
</tr>
<tr>
<td>AOZ</td>
<td>Airport Overlay Zone</td>
</tr>
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<td>ARDC</td>
<td>Arrowhead Regional Development Commission</td>
</tr>
<tr>
<td>ASR</td>
<td>Airport Surveillance Radar</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Drafting</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CSAH</td>
<td>County State Aid Highway</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>DAA</td>
<td>Duluth Airport Authority</td>
</tr>
<tr>
<td>DLH</td>
<td>Duluth International Airport</td>
</tr>
<tr>
<td>DNL</td>
<td>Day-Night average sound Level</td>
</tr>
<tr>
<td>DOQ</td>
<td>Digital Ortho Quad</td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
</tr>
<tr>
<td>FAR</td>
<td>Federal Aviation Regulation</td>
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<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning Systems</td>
</tr>
<tr>
<td>INM</td>
<td>Integrated Noise Model</td>
</tr>
<tr>
<td>IRC</td>
<td>Interregional Corridor</td>
</tr>
<tr>
<td>ITE</td>
<td>Institute of Transportation Engineers</td>
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<tr>
<td>Ldn</td>
<td>symbol for DNL</td>
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<tr>
<td>LOS</td>
<td>Level of Service</td>
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<td>MIC</td>
<td>Metropolitan Interstate Committee</td>
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<tr>
<td>MMF</td>
<td>Munitions Maintenance Facility</td>
</tr>
<tr>
<td>MNANG</td>
<td>Minnesota Air National Guard</td>
</tr>
<tr>
<td>MnDOT</td>
<td>Minnesota Department of Transportation</td>
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<tr>
<td>NCP</td>
<td>Noise Compatibility Program</td>
</tr>
<tr>
<td>NEM</td>
<td>Noise Exposure Map</td>
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<tr>
<td>NRRI</td>
<td>Natural Resources Research Institute</td>
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<tr>
<td>SAW</td>
<td>Single Additive Weighting model</td>
</tr>
<tr>
<td>TCE</td>
<td>Trichloryll ethylene</td>
</tr>
<tr>
<td>TH</td>
<td>Trunk Highway</td>
</tr>
<tr>
<td>TRANPLAN</td>
<td>Computer model that simulates traffic circulation</td>
</tr>
<tr>
<td>USAF</td>
<td>United States Air Force</td>
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CHAPTER 1: INTRODUCTION

The Duluth International Airport is a regional resource that provides our area with access to air travel anywhere in the world, as well as jobs for the region. The airport, located in the northwest area of Duluth, is surrounded by three jurisdictions: the City of Hermantown, Canosia Township, and Rice Lake Township, which in turn have significant stakes in how land is developed in and around the airport. Therefore, a regional approach to airport development is needed, as well as an effective system for the four jurisdictions, along with St. Louis County, to communicate information about all new developments that may impact the airport. This regional approach to airport planning and development will allow the four jurisdictions to grow without adversely impacting the airport.

The public has an interest in protecting airports to allow them to function in an efficient manner. Airports generate a large amount of economic activity in addition to providing for the movement of people, goods, and services. It would be difficult and expensive to replace or relocate an existing airport on a comparable site within proximity to an urban area. For this reason, it is extremely important to achieve long-term compatibility between the airport operations and nearby land uses. Planning for compatible land uses is an attempt to make the best use of limited community resources.
According to the *Duluth International Airport Master Plan* of July 2000, the airport and its surrounding businesses employ roughly 1200 people full time. Add to this another 1370 people working in a variety of positions at the Minnesota Air National Guard (MNANG) base, and the economic importance of the airport becomes evident to the local and regional economy. Other large employers in the airport area include Northwest Airlines Maintenance Facility and Cirrus Manufacturing. In total, the Duluth Airport generates over $100 million in indirect impacts to the local economy and employs almost 2,900 people at the airport and its related activities.

The Duluth Airport Land Use Study has three primary functions. The first is to describe and examine the regulations in place that protect public health, safety, and welfare. These land use standards minimize the public's exposure to safety hazards and excessive noise from the airport. Related to this function is preventing the encroachment of incompatible land uses around the airport, thereby preserving its utility into the future. The second function of this plan is to identify developable land in the airport area. A number of factors need to be considered when deciding the best locations for development in the airport area. No-build zones, height restrictions, safety zones, wetlands and brownfields are some of the factors that impact where development can occur. The third and final function of the Airport Land Use Plan is to examine the airport-area roadways to ensure proper connectivity to the airport and area business and access to the Duluth area roadway system.

This plan closely examines a number of previous plans conducted for the Duluth Airport. These plans were invaluable in providing much of the future development ideas as well as current land use restrictions on airport area lands. The following list of plans were examined in compiling this report:

- Duluth International Airport Master Plan – July 2000 Update
- Master Plan Update for Minnesota Air National Guard – Duluth International Airport – March 2000
- Duluth International Airport – Airport Overlay Zone Study – June 1999
- Phase II Remedial Investigation for the Former City of Duluth Dump No. 2 Site and Rice Lake Residue Waste Disposal Facility (SW-232) – December 1996
CHAPTER 2: DATA COLLECTION

This plan contains numerous Geographical Information System (GIS) data layers, which were used for analysis throughout the plan. The data originated from a variety of formats, including hard copy maps, computer aided drafting (CAD) files, data created by other agencies and consultants, and global positioning system (GPS) data. The final edited, digital form was incorporated into ArcView GIS for analysis. This chapter briefly describes the central data layers used in the plan. A more detailed description of the data layers is presented within each chapter.

A full metadata record has been created for all of the following data and will be stored with the electronic files for this project. Metadata is a written record that describes the most important facts about a data set. It is critical for data creators to record vital information about the data set in order to organize and maintain the data. Metadata is equally important to those who share data and need clear and complete information about data they are considering using. Contact MIC staff for access to the metadata records for this plan.

**Parcels**

Parcel information for the study area was gathered from engineering parcel maps. Each parcel was converted into digital format following strict accuracy standards. The final layers were edge-matched and compiled into one seamless parcel map.

**Land Use**

The land use data layer was comprised of three different layers: the City of Duluth (1995-2000), the City of Hermantown (1997), and Arrowhead Regional Development Commission (1992) land use classifications. The layers were combined to form one seamless layer to identify land use and/or zoning conflicts, as well as uses suitable for development.

**Zoning**

Four zoning maps were compiled into a final zoning map for the plan. Maps were obtained from Hermantown (1992), Rice Lake Township (1998), City of Duluth, and Canosia Township (1998).

**Wetlands**

The Natural Resource Research Institute (NRRI) completed a detailed wetland delineation study using photography from 1997 and 1995. The color infrared photos were utilized in delineating wetlands in the airport area. Wetland classifications followed the U.S. Fish and Wildlife Service conventions for the National Wetlands Inventory.

**Imaginary Surfaces**

The Federal Aviation Administration (FAA) has developed standards for the allowable heights of objects near airports in the Code of Federal Regulations (CFR) “Objects Affecting Navigable Airspace.” This regulation is defined by a series of imaginary
surfaces: the primary surface, the approach surface, the horizontal surface, the conical surface, and the transitional surface. These surfaces are also the basis for the Land Use Safety Zones and are described in the Minnesota Rules Chapter 8800.1200 Subpart 5 – Obstructions to Public Airports

**Land Use Safety Zones**

These zones are described in Minnesota Rules Chapter 8800.2400 Subpart 5 – Land Use Safety Zones. The zones were created to establish zoning standards for all airports across Minnesota. Zones A, B, and C were derived from Computer Aided Drawing (CAD) files. The Safety Zones are geometrically based on the Imaginary Surfaces and have land use restrictions associated with them.

**Other Runway Safety Zones**

The following zones are described in the Federal Aviation Administration (FAA) Advisory Circular 150/5300-13 – Airport Design. These zones are created to allow safe operation of aircraft on runways.

- Runway Visibility Zone
- Runway Safety Area
- Runway Protection Zone
- Building Restriction Line

All zones were extracted from CAD files in the Airport Layout Plan and converted into ArcView GIS format.

**Noise Contours**

These are lines that describe averaged noise value around an airport as determined by noise modeling software. The FAA’s Integrated Noise Model (INM) Version 5.0, was used to generate these contours. These noise contours were created for the 1999 FAR Part 150 Noise Compatibility Program Submittal.

**Roads**

The roadway data used in this plan originates from the Minnesota Department of Transportation 1999 basemap. A GPS was used to attach additional roads in the study area that were not represented on the MnDOT basemap. The roads contain descriptive information such as average daily traffic, vehicle to capacity ratios, and functional classification.
CHAPTER 3: COMPATIBLE LAND USE PLANNING

Compatible land use planning near airports requires examining a number of issues, including object height restrictions, potential for aircraft accidents and areas of frequent aircraft overflight. Airport land use regulations allow for the safe operation of aircraft to and from the airport and to protect people living and working near airports. This chapter will examine current land use in the Duluth Airport area, airport-related land use zones and regulations, future airport changes that may impact land use, and potential changes in airport land use regulations in Minnesota.

Current Land Use

A number of factors influence how land is used in any given area. Land use controls, economic markets, proximity to other land uses, availability of access, location of utilities, and environmental conditions affect how land is developed or not developed. Currently the areas adjacent to the airport are experiencing vastly different levels of development. The Trunk Highway 53 area south of the airport is experiencing dense highway related developments, whereas the areas north of the airport are mostly open space. The following discussion illustrates the current land use in the airport area (see Map 2) and attempts to identify some of the forces that may have influenced particular uses.

The area north of the airport is mostly open space with some industrial and residential uses. This area contains the North Development Area (see Chapter 8), the location of Northwest Airlines Maintenance Facility, which has been identified as an area for future industrial/manufacturing development. This area has a new access road, North Stebner Road, which extends approximately 1.3 miles south of Martin Road through Canosia Township to the Northwest facility site. The utilities to the Northwest facility extend from the south, therefore, any new development along North Stebner Road would require utility extensions.

Along Martin Road between Lavaque Road and Rice Lake Road, a number single-family homes are located there along with one small area of light industry. The land on the south side of the road falls within Duluth, Rice Lake, and Canosia. The land on the north side of the road is Rice Lake and Canosia. Currently, this area has seen little growth because of the lack of utilities and the presence of numerous wetlands.

At the intersection of Rice Lake Road and Martin Road, a variety of commercial and residential uses exist. This area may see additional development pressure, as plans call for a sewer extension to this area. The land in the southeast quadrant of the intersection has been cleared to ready the site for development. Other property at this intersection has recently changed hands with plans for more intensive use publicized.

South of Martin Road along Rice Lake Road, there is a mix of uses with some residential, commercial, and industrial. The land along the east side of the road is relatively undeveloped with scattered residential areas and a former auto salvage yard. The WLSSD Industrial Landfill and the former Duluth Dump Site #2 are located west of Rice
Lake Road and accessed by Ridgeview Road. A number of environmental issues have been connected to the former uses of these sites and monitoring wells are currently located in this area to monitor ground water contamination. The area directly east of Runway 9-27 along Rice Lake Road is mostly open space due to its proximity to the runway.

Southeast of the airport terminal area, along Haines Road and Airport Road, Airpark Industrial Park serves a mix of commercial and industrial uses. Airpark is an approximately 200 acre site which currently has 36 businesses and over 400 employees. Directly south of the airport terminal area is mostly open space with some industrial and residential land uses along Swan Lake Road.

Trunk Highway 53 is the location of intensive commercial development in the airport area. This mostly auto-related development consists of a wide variety of uses from bar/restaurants to theaters to mobile home/recreational vehicle sales. The majority of these uses developed because of their proximity to the highway. Development has spread northwest up the highway after development of the Miller Hill area in the 1970s and 1980s. Development is more compact along Trunk Highway 53 until Lavaque Road. From Lavaque Road to the west and north along the highway development thins out.

The South Redevelopment Area, as identified in the [Aviation Economic Development Plan](#), is located directly south of Runway 9-27. This area is a preferred location of aviation-related businesses and the redevelopment of buildings from the former U.S. Air Force Base. The Airport Road/Airport Approach Road/Stebner Road loop serves the South Redevelopment area and also bounds the Federal Prison Camp. The prison also utilizes a large number of former airbase buildings for their facility. This area is also the location of Cirrus Designs, an aircraft manufacturer specializing in smaller private aircraft. The recent connection of Airport Road with Airport Approach Road and the removal of some of the former airbase buildings have opened up this area for more light industrial and manufacturing development.

The area to the west of the airport property north of Trunk Highway 53 is mostly open space and residential. Much of this area falls within the runway safety area, with associated development restrictions.

**Runway Safety Areas**

All airports in Minnesota are required to designate areas around their runways as safety zones. The location and size of the zones depend on the length of the runway and the aircraft that are operating on the runways. Airport safety zone areas serve two primary purposes; they provide a safe environment for aircraft operating in the vicinity of an airport and also provide a safe environment for community members living and working near airports. Rules defining these safety areas have been developed nationally by the Federal Aviation Administration and statewide by the Minnesota Department of Transportation – Office of Aeronautics.
Airport Land Use

Legend

- Single Family Residential
- Multiple Family
- Light Industry
- Heavy Industry
- Commercial
- Public, Semi-Public
- Transportation
- Agriculture
- Open Water
- Park & Rec
- Undeveloped
- Roads
- Northwest Maint. Facility

Land use data was derived from the following sources:

- City of Duluth
- Hermantown
- Rice Lake Township
- USGS DOQs
Airspace Protection
The Federal Aviation Administration (FAA) has set standards to maintain aircraft safety in areas around airports. These standards limit the height of objects near airports to minimize safety hazards for aircraft. The Code of Federal Regulations (CFR) Title 14 Part 77 “Objects Affecting Navigable Airspace” defines a system of imaginary surfaces around an airport through which no fixed object or structure should penetrate. These surfaces are designed to allow safe operation of aircraft in and around airports.

An object is considered a general obstruction to air navigation if it is greater than 500 ft above ground level at its location. Also considered an obstruction is an object 200 ft. above ground level or airport elevation within three nautical miles of the recognized reference point at the airport and that height increases 100 feet for every nautical mile from the airport to a maximum of 500 ft. An object is considered an obstruction to a public airport if it penetrates one of the imaginary surfaces described in the Code of Federal Regulations (CFR) Title 14 Part 77 (see Figure 1 – Imaginary Surfaces). MnDOT – Department of Aeronautics has adopted these imaginary surfaces and describes them in Minnesota Rules Chapter 8800.1200 Subpart 5. These surfaces differ in size depending on the type of runway landing instrumentation that is available at an airport. The following descriptions of the imaginary surfaces include what is currently present at the Duluth Airport.

The **primary surface** is a rectangular surface at runway elevation and centered longitudinally on the runways. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The primary surface at the Duluth Airport is 1,000 ft. wide and extends 200 ft. past the end of each runway.

The **approach surface** is trapezoidal in shape and slopes upward and outward from either end of the primary surface. It begins at the end of each primary surface and climbs at a slope of 50:1 for the first 10,000 ft and 40:1 for the next 40,000 ft.

The **horizontal surface** is a geometric plane 150 ft. above the runway that is defined by arcs swung 10,000 ft. from the end point of each runway and connected by tangent lines.

The **conical surface** slopes up and away from the perimeter of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 ft.

The **transitional surface** extends laterally up and away from the lateral edges of the primary and approach surfaces at a slope of 7:1.

**Airport Land Use Safety Zones**
According to Minnesota Rules 8800.2400, use restrictions are placed on certain zones to protect operational safety of aircraft and life and property of the general public. These safety zones create sufficient open space in case of an accident to protect the community. **General restrictions** that apply to the safety zones include: no land use shall create electronic interference for aircraft or the airport, produce lights that make it difficult for
pilots to see airport lights, or otherwise endanger aircraft landings, takeoffs and maneuvering. The following Land Use Safety Zones (see Map 3) are based on the imaginary surfaces explained earlier in this section and have land use restrictions associated with them.

**Safety Zone A** is the most restrictive of the zones and is located in the approach zones of a runway, extending outward from the end of the primary surface a distance equal to two-thirds the runway length or planned runway length.

Safety Zone A shall contain no buildings, temporary structures, exposed transmission lines, or other similar land use structural hazards, and shall be restricted to those uses which will not create, attract, or bring together an assembly of persons thereon. Permitted uses may include, but are not limited to, such uses as agriculture (seasonal crops), horticulture, raising of livestock, animal husbandry, wildlife habitat, light outdoor recreation (nonspectator), cemeteries, and auto parking.

This zone is primarily a clear zone as it basically includes an extended area that covers the runway ends.

**Safety Zone B** is less restrictive than Safety Zone A and is located in the approach zones of a runway, extending outward from Safety Zone A to a distance equal to one-third the runway length or the planned runway length.

Safety Zone B shall be restricted in use as follows. Each use shall be on a site whose area shall not be less than three acres. Each use shall not create, attract, or bring together a site population that would exceed 15 times that of the site acreage. Each site shall have no more than one building plot upon which any number of structures may be erected.

A building plot shall be single, uniform, and noncontrived area, whose shape is uncomplicated and whose area shall not exceed the following minimum ratios with respect to the total site area:

<table>
<thead>
<tr>
<th>Site Area at Least (Acres)</th>
<th>But Less Than (Acres)</th>
<th>Ratio of Site Area to Building Plot Area</th>
<th>Building Plot Area Square Feet</th>
<th>Maximum Site Population (15 Persons/Acre)</th>
</tr>
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<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>12:1</td>
<td>10,900</td>
<td>45</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>10:1</td>
<td>17,400</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>8:1</td>
<td>32,600</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>6:1</td>
<td>72,500</td>
<td>150</td>
</tr>
<tr>
<td>20 and up</td>
<td></td>
<td>4:1</td>
<td>218,000</td>
<td>300</td>
</tr>
</tbody>
</table>

The following uses are specifically prohibited in zone B: churches, hospitals, schools, theaters, stadiums, hotels and motels, trailer courts, camp grounds, and other places of public or semipublic assembly.
Imaginary Surfaces

Top View

Three Dimensional View

Primary Surface
Approach Surface
Horizontal Surface
Conical Surface
Transitional Surface

Runway Centerline

Figure 1
Land Use Safety Zones
Safety Zone C is the least restrictive of the three Safety Zones and is described as the land, which is enclosed within the perimeter of the horizontal zone. Safety Zone C is subject only to the general restriction described above.

Potential Changes in Safety Zones in Minnesota

MnDOT has proposed changes in the airport zoning language in the Minnesota Rules. The proposed changes include changes in the lengths of Safety Zones A and B. Currently these zones, when combined, are equal in length to the runway they are associated with. The proposed rule changes would establish safety zones that are generally less restrictive than current standards. The table below outlines the proposed changes in the total lengths of Safety Zones A and B combined. If implemented, these changes would not take place until 2002.

Table 2: Proposed Changes in Safety Zone A & B Total Length

<table>
<thead>
<tr>
<th>Runway Length(L)</th>
<th>Safety Zone A and B Combined Length</th>
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<tbody>
<tr>
<td>Up to 5,000 feet</td>
<td>Runway Length (L)</td>
</tr>
<tr>
<td>5,000 feet to 9,000 feet</td>
<td>5,000 feet + 50% (L - 5,000 feet)</td>
</tr>
<tr>
<td>Greater than 9,000 feet</td>
<td>7,000 feet</td>
</tr>
</tbody>
</table>

Based on the combined lengths of Safety Zones A and B, Safety Zone A would be 2/3 of the total runway length and Safety Zone B would be 1/3 of the total runway length. For example, any runway over 9,000 feet in length will have a Safety Zone A that is 4,669 feet in length and a Safety Zone B that is 2,331 feet in length. At the Duluth International Airport, these proposed changes would not impact the current runway 3-21 but would shorten Safety Zones A and B for Runway 9-27 to 7,000 feet in length (from their current lengths of 9,520 feet for Runway End 9 and 10,240 for Runway End 27 (see Map 4)). Future expansion of Runway 3-21 would be impacted by these changes if the expanded length is greater than 5,000 feet.

Other Duluth International Airport Buffer Zones

There are currently two facilities located on the airport property that also require safety buffers (see Map 5). The Minnesota Air National Guard (MNANG) Munitions Maintenance Facility (MMF) and the Airport Surveillance Radar (ASR) require buffers to ensure their safe operation. The MMF, operated by the MNANG, requires a 1,250 foot no-build buffer. This buffer has been established to provide a safe zone for the storage of munitions on the site. Future plans call for a relocation of this facility to the east of the Munitions Maintenance Facility & Radar Tower Buffers

Map 5
Potential Runway Expansion Projects

The Duluth International Airport Master Plan determined that the existing runway system could accommodate projected aviation demand through 2020. However, improvements to the existing runways should be considered. These improvements include an extension to the main runway (9-27) to accommodate future large aircraft operations as well as an extension to the crosswind runway (3-21) to satisfy crosswind runway requirements. The Master Plan identifies a number of alternatives for expanding the length of these runways. The plan illustrates three alternatives for extending Runway 9-27 and six alternatives for extending Runway 3-21. The following text describes the preferred alternative as stated in the Master Plan and highlights some of the potential impacts to surrounding land uses and future land uses in the area.

Runway 9-27

Runway 9-27, the east-west runway, is the main runway at the Duluth Airport and handles most of its air traffic. The preferred short-term alternative as identified in the Duluth International Airport Master Plan would use the Declared Distance Concept* to gain use of 1,000-foot of overrun pavement east of the relocated threshold on Runway 27 for 11,152 foot takeoffs to the west. Declared distances for airport design is an option that can be used where it is impracticable to provide the runway safety areas. This option would require a number of improvements to the east end of the runway. These improvements include relocating existing landing area lighting, reconstruction of existing taxiways and construction of a 400’ X 220’ blast pad which would force the relocation of Haines Road to the east.

Runway 3-21

Runway 3-21 is the northeast-southwest crosswind runway. FAA rules state that crosswind runways should be 80% of the main runway length. The preferred extension alternative identified in the Duluth International Airport Master Plan proposes to construct a 3,259 foot runway extension on the northeast end of Runway 21 bringing the total length to 8,122 feet. Due to the existence of residential and commercial development along both sides of Miller Trunk Highway at the southwest end of Runway 3-21, runway extension options are planned to the northeast. This alternative would also relocate the threshold on Runway 3 to 1,106 feet northeastward. Again, relocating this

*Declared Distance is used in existing constrained airports where it is impractical to provide the runway safety area, the runway object free area, or the runway protection zone. The declared distances are takeoff run available (TORA), takeoff distance available (TODA), accelerate-stop distance available (ASDA), and landing distance available (LDA). By treating the airplane’s runway performance distances independently the airport can provide for different design methodologies by declaring distances to satisfy the airplane’s takeoff and landing requirements. When taking into consideration the actual needs of the aircraft, the runway design can change and will affect the beginning and ending of the runway safety area, runway object free area, and the runway protection zone.
Proposed Changes in Safety Zones A&B for Runway 9-27

Legend

Proposed Safety Zone Changes

- A
- B

Existing Land Use Safety Zones

- A
- B

Runway

Rice Lake Road

Airport Road

Ugstad Road

La Vaug Road

Arrowhead Road

Martin Road

Map 4

* Safety Zone C not shown
Proposed Runway 3-21 Extension

Legend

Proposed Safety Zone Changes
- A
- B

Existing Land Use Safety Zones
- A
- B

- Present Runway
- Runway 3-21 Extension
- Roads

North end of runway 3-21

South end of runway 3-21

*Safety Zone C not shown
threshold is necessary so Safety Zones A and B would not impact businesses along Trunk Highway 53. The proposed runway extension would provide an 8,122 foot runway while not affecting the location of Runway 3 Safety Zones A & B to the southwest. This alternative also utilizes the proposed changes in MnDOT’s length requirements for Safety Zones A and B (see Map 6).

Extension of Runway 3-21 would also mean moving Safety Zones A & B to the northeast, which would impact existing land uses and potential development in Rice Lake Township. Under this proposal, Safety Zone A would cross Martin Road and extend to the northeast. The newly located Safety Zone A would encompass an existing residential area along the south side of Martin Road. Safety Zone B would extend beyond Safety Zone A to the northeast and partially cross Rice Lake Road. This land is currently zoned residential, non-shoreland commercial, and multiple-use non-shoreland. The 1998 Rice Lake Township Comprehensive Plan identifies land along Martin Road for future use as industrial and land along Rice Lake Road as commercial and industrial uses.

CONCLUSION

Land use can be a potentially controversial issue when jurisdictions are being told what they can and can’t do with their land. However, given the economic importance of the Duluth airport to this region and the cost that other airports have incurred to deal with land use compatibility issues, all area jurisdictions should make every attempt to prevent incompatible land use in the airport vicinity. A particular goal of this study is to encourage compatible land uses in the airport area in order to protect the community, its taxpayers, and the economic viability of the area, while minimizing any burden to current property owners.

Local comprehensive plans and zoning ordinances for those communities located near the airport should be reviewed, and, if necessary, amended to incorporate recommendations addressing compatible land uses and developments. In areas adjacent to the airport, land uses should be compatible with the role and function of the airport while maintaining existing compatible community uses.
CHAPTER 4: NOISE IMPACTS

Most complaints concerning airports are related to noises generated by aircraft operations. At low levels, noise in the area around an airport is normally tolerated; however, as exposure to noise increases, it begins to interfere with sleep, conversation, school, business, and recreational activities. The effect of noise interference on normal activities is most often described in terms of annoyance.

Given that airports represent a substantial investment of public funds, cooperative efforts to mitigate noise impacts are extremely important. All airports are required by the FAA to plan for noise impacts. The Duluth International Airport has undertaken two recent planning efforts in an attempt to decrease the impact to adjacent communities from aircraft noise. The Federal Aviation Regulation Part 150 Study conducted by ACGS of Naperville, IL and adopted in June of 1999 and the Airport Overlay Zone Study conducted by ACGS and the MIC and adopted by the MIC in June of 1999 provide the Duluth Airport with guides on how to plan for noise compatible land uses.

Federal Aviation Regulation (FAR) Part 150 Study

The purpose of the FAR Part 150 Study was to develop a Noise Compatibility Program (NCP) for the Duluth Airport which will review and recommend various noise abatement and mitigation measures based upon the Noise Exposure Map (NEM). The goal of this study is to “identify areas of noise land use incompatibility around DLH, develop noise abatement alternatives to mitigate existing incompatibilities, and recommend actions to prevent future incompatibilities, while taking under consideration the costs and effectiveness associated with various alternatives proposed.”

FAR Part 150 guidelines dictate how the NEM was created. On-site noise measurements, runway and flight track geometry, approach and departure profiles, operational activity and complaints from neighbors were used as inputs to generate noise contours for 1996 and a five year forecast at 2001. Development of this map has produced a model of where different levels of noise are present. Using these contours and local land use, the NEM identifies areas of incompatible land use that are of concern. The NEM developed for the Duluth Airport area specifically identified areas of incompatible land uses in the 65 DNL and higher noise levels.

DNL is defined as a level of noise derived by measuring average sound levels in a 24 hour day, in decibels. Nighttime noise, between the hours of 10:00 p.m. and 7:00 a.m. is weighted; that is, given an additional 10 decibels to compensate for sleep interference and other disruptions caused by loud nighttime noise. For airport noise exposure purposes, an annual average sound level is used. 65 DNL is the noise threshold at which the FAA defines an area “compatible with residential use; areas at or above 65 DNL are designated as “incompatible with residential use.”
The Noise Compatibility Program, in turn, seeks to address these areas that were identified by the Noise Exposure Map by providing an overview of operational noise abatement measures that may be implemented by the airport sponsor, as well as preventative land use measures that may be introduced by local planning and zoning jurisdictions. These options include immediate and long-term measures. Examples of airport sponsor noise mitigation measures include takeoff and approach procedures, noise barriers, acquisition of land, curfews, landing fees based on noise levels, and denial of aircraft not meeting federal noise levels. Strategies that local governments can use to lessen noise impacts include acquisition of impacted land, sound insulation, development control, zoning, easements, and transfer of development rights.

FAR Part 150 requires that the NCP is developed in coordination with local planning officials, aviation and airport officials, along with other interested parties. This should insure that mitigation measures that are brought forth are realistic and acceptable to the affected jurisdictions.

The NCP recommended measures for implementation, which included both noise abatement procedures and land use alternatives. The recommended noise abatement procedures included creating a noise abatement committee, efforts by MNANG and the air traffic control to route flights away from dense residential areas, and a feasibility study into extending runway 3-21. Recommended land use alternatives included a voluntary land acquisition strategy for properties inside the 65 DNL contour with emphasis on those inside the 75 DNL contour and strong proactive position toward future non-compatible land uses.

**Airport Overlay Zone (AOZ) Study**

One option identified by the FAR Part 150 Study to prevent future noise impact areas is the development of a new special zoning district called an airport overlay zone. These zones are normally created as an alternative to attempting to change existing zoning. The overlay zone is superimposed on existing zoning districts and is intended to supplement the noise regulations of the general purpose zoning districts. Even if existing zoning is changed in noise-impacted areas from residential to include manufacturing or industrial uses, it does not prohibit residential uses in those areas. The overlay zone can adopt more performance driven standards, which may help lessen the impact of incompatible uses or prevent future incompatible uses. The overlay zone technique can also be more sensitive to established communities and neighborhoods by not forcing a land use change from residential to commercial or industrial.

The Airport Overlay Zone Study conducted by the MIC and ACSG adopts the methodology and conclusions from the FAR Part 150 Study and examines the land use issues in greater detail. It detailed land use in the airport area on a parcel level and provided an accurate picture of development issues. Five zones were examined: the entire study area, and the 60, 65, 70, 75 DNL contours (see Map7). Each of these zones was examined to identify current land uses and how much vacant land is available for future development.
This study described a number of possible alternatives, which attempt to identify measures to mitigate noise impacts. The alternatives examined included rezoning, disclosure notices, residential density, dedicated avigation easements, building codes, and fair disclosure regulations. Given the large number of potential alternatives and the difficulty of integrating these suggestions into existing zoning and land use regulations of four jurisdictions, an advisory committee was organized to create a workable plan from the identified alternatives. The Airport Overlay Zone Advisory Committee was created with representation of the planning commissions of Duluth, Hermantown, Canosia Township, and Rice Lake Township. The role of the AOZ Committee was to examine the noise mitigation alternatives and to provide connections to each individual planning commission. The committee developed a matrix, which examined each alternative and provided a description of the benefits, requirements, and issues or problems that might arise. The final recommendations were put forth as a layered plan that would provide an adequate level of protection while allowing for maximum growth and use within given areas. Table 3 is a summary of the AOZ Advisory Committee’s recommendations. Shaded cells in the table indicate which measures apply to which noise zones.

### Table 3: AOZ Advisory Committee Recommendations

<table>
<thead>
<tr>
<th>Measures</th>
<th>75-60</th>
<th>60-AOZ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airport Noise Impacts</strong></td>
<td>+75</td>
<td>75-70</td>
</tr>
<tr>
<td>Special Overlay Zone: Area or zone overlapping existing zoning with stipulations or requirements for varying degrees of impact.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Disclosure Regulations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal Measures</td>
<td>Notice on Plats of New Subdivisions</td>
<td>Disclosure through regulations on seller or representative at time of sale</td>
</tr>
<tr>
<td>Informal Measures</td>
<td>Advertising or mailings</td>
<td>Community brochures</td>
</tr>
<tr>
<td>Avigation Easements: Allows right to direct airport over property resulting in noise, emissions and possible disturbance to property.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Dedicated for public properties (i.e., tax-forfeited properties).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• DAA/DIA purchase program for current private properties (voluntary sale based on funding availability with high impact area prioritization).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements for new residential subdivisions: Standards for subdividing parcels for residential development.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Require a minimum sound insulation building code criteria and/or performance measure for construction of new subdivisions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Require consideration of aircraft noise during review of plat by public entities and encourage site plans designed to minimize noise impacts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Notification of airport management for proposed subdivision within 65 DNL impact zone or greater.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rezone impacted areas to preclude residential and other incompatible uses.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Airport.png](attachment://Airport.png)
CHAPTER 5: ZONING COMPATIBILITY

Zoning ordinances and comprehensive plans (where available) were examined for the cities of Duluth and Hermantown and the townships of Rice Lake and Canosia to see how these communities control land use and plan future development near the Duluth Airport. A short description of each community’s zoning ordinance and zoning maps as they pertain to the airport area is contained in this section. A description of the Airport Zoning Board zoning ordinance is also included. Comprehensive plan information from each community is included if there is specific language or vision for areas adjacent to the airport.

All zoning from the jurisdictions was mapped to analyze the composite Duluth Airport area. The Airport Zoning Board’s zoning was also mapped and overlaid onto the base zoning layer (see Map 8). A brief description of the zoning categories from each jurisdiction that fall into the Land Use Safety Zones is also included.

**Canosia Township**

The majority of land within Canosia Township that is in proximity to the airport is zoned Multiple Use Non-Shoreland. This category allows a wide range of uses, some of which require performance standards and other uses which require conditional use permits. There is also a small commercial district near Lavaque Bypass and Samuelson Road and a residential zone south of Wild Rice Lake. The land uses allowed in these zoning districts are compatible with those that are allowed in Safety Zone C. However, large scale residential development is not encouraged within Safety Zone C.

In 1995, Canosia Township updated its Comprehensive Plan in anticipation of new impacts from the development of the Northwest Airlines Maintenance Facility and a potential extension of a sewer line to the Pike Lake area. One of the development goals calls for consolidating similar land uses for economic reasons such as provision of services. To accomplish this goal, the township identified the newly built access road, North Stebner Road, as a location for commercial and industrial development. Another policy set forth in this plan is to “participate as a member of the Joint Airport Zoning Board” to allow input from Canosia residents on airport related issues. The Comprehensive Plan states that the airport is an important facility to the residents of the township. Canosia Township is currently in the process of updating its Comprehensive Plan.

**Rice Lake Township**

Rice Lake Township has zoned much of the area around Rice Lake Road as commercial or industrial. Other zoning districts in the airport area include Multiple Use Non-Shoreland and Residential. Although Rice Lake’s zoning is compatible with the current Land Use Safety Zones, this area may soon be experiencing pressure to develop.

In its 1995 Comprehensive Plan, the township identified future commercial and industrial land uses for the Martin Road and Rice Lake Road corridors. Recent news reports suggest that the township is interested in extending water and sewer to the intersection of Martin
and Rice Lake Roads. If these utility extensions take place, it will bring development pressure to this area.

Comparing the current zoning and future land use goals of Rice Lake Township to the future plans of the Airport Authority to expand Runway 3-21 to the northeast, potential inconsistencies may exist. The extension of this runway may push Safety Zone A across Martin Road to include part of the northwest quadrant of the intersection of Martin and Rice Lake Roads. The new Safety Zone A would also encompass current residential dwellings along the south side of Martin Road. The new Safety Zone B would extend across Rice Lake Road, potentially affecting areas identified for commercial and industrial development.

**City of Duluth**

The large area of open space to the east of the airport within the city limits of Duluth is zoned Suburban. Much of this land lies directly to the east of Runway 9-27 and falls within Safety Zones A, B, and C. A number of uses normally allowed in Suburban zones would not be allowed in this area because of the proximity of some of this land to the airport. No buildings or structures are allowed in Safety Zone A and schools, churches, and hospitals would not be allowed in Safety Zone B.

Airpark Industrial Park, located along Haines and Airport Roads, is zoned as a Manufacturing District. Airpark lies within Safety Zone C, which has general restrictions preventing interference with airport operations. These restrictions do not affect the operations currently taking place there.

Airport property located within the city limits of Duluth is zoned Commercial, Manufacturing and Suburban. A small section of the airport within the city limits of Duluth also extends into Canosia Township and is zoned as Suburban. Currently this area has been identified as the location of long-term aviation related development. Presently the MNANG Munitions Maintenance Facility and the ASR Tower are located on or adjacent to this property. This area may need to have the zoning changed to a classification of Manufacturing or Industrial to become more compatible with future planned uses.

The City of Duluth is currently updating its Comprehensive Plan and preliminary goals identify the Duluth Airport as an area for future industrial development, along with the Airpark Industrial Park and the land adjacent to North Stebner Road. The current zoning of this area is compatible with future development plans.

**Hermantown**

The majority of land in Hermantown adjacent to the airport is zoned Commercial, Light Industrial, and Residential. A large area south of the airport terminal bordered by Haines and Swan Lake Roads is also zoned Light Industrial. This area falls almost entirely within Safety Zone C and the uses allowed in a Light Industrial zoning category are compatible.
A large amount of the land adjacent to Trunk Highway 53 is zoned as Commercial and falls into Safety Zones A, B, & C. Almost all commercial uses are disallowed in Safety Zone A, while Safety Zone B specifically prohibits theaters, stadiums, hotels, and motels. Commercial uses along this corridor are compatible with Safety Zone C.

Residential zoning districts within Hermantown fall into Safety Zones B and C. Residential uses incompatible with Safety Zone B include trailer parks and other dense residential developments.

**Duluth International Airport Zoning Ordinance**

The jurisdictions surrounding the Duluth Airport have created a Joint Zoning Board to regulate the use of property in the vicinity of the Duluth Airport. The jurisdictions forming the Duluth International Airport Joint Zoning Board are Duluth, Hermantown, Canosia Township, Rice Lake Township, and St. Louis County. The Duluth International Airport Zoning Ordinance, created by the Joint Zoning Board, was adopted in June 1988 and revised in May 1996.

The Airport Zoning Ordinance restricts the height of buildings and objects and regulates the use of property in the vicinity of the Duluth Airport. Airspace obstruction zoning is accomplished through the use of the Airspace Zones that are associated with the Imaginary Surfaces described Chapter 3. No tree shall be allowed to grow or structure built that would penetrate any of the Imaginary Surfaces.

Land use regulation is accomplished through the creation of the airport Safety Zones. Safety Zones A, B, and C, described in Chapter 3, were created to protect the general public on the ground and provide space for emergency landings for aircraft. Use restrictions are associated with each zone and are more restrictive near areas of aircraft operation (such as the ends of each runway). A study of civil aircraft accident patterns by the University of California at Berkley has shown that most aircraft accidents near airports happen on or near the extended runway centerline. Limitations to the types of land uses and the density of structures in these areas provide for safer airport operation. The Airport Zoning Ordinance describes the location of each Safety Zone and the types of uses and densities that are allowed. The Duluth International Airport Zoning Ordinance takes precedence over the zoning ordinances of the four adjacent jurisdictions.

The Airport Zoning Ordinance contains six maps that make up the official Airport Zoning Map and include the Imaginary Surfaces Plan, the Imaginary Surfaces Sections, Height Limitation Zoning Plan, Land Use Safety Zones, Detailed Land Use Safety Zones, and Land Ownership – Safety Zones A & B of Runway 3.

In addition, the Airport Zoning Ordinance includes information on non-conforming uses, permits, variances, and administration. A Board of Adjustment is also established by the ordinance and is comprised of one member from the cities of Duluth and Hermantown, the Duluth Airport Authority, and the Townships of Rice Lake and Canosia. The Board of Adjustments hears and decides appeals and grant variances, with decisions made by majority vote.
CHAPTER 6: STRATEGIES TO PROMOTE COMPATIBLE LAND USE

Most airports were developed outside of urbanized areas on flat land that was usually surrounded by agricultural or undeveloped land. As cities grew outward, the land surrounding airports began to be developed, which, combined with increased air traffic, led to incompatible land uses. Whether due to noise or safety issues, encroaching development is forcing communities to make choices about balancing airport operations with development location decisions. A number of strategies exist to help communities develop compatible land uses on land adjacent to airports. Some of the following strategies are also outlined in the Duluth International Airport Overlay Zone Study.

**Land Acquisition**

If incompatible land uses exist or result from an airport expansion, the airport operator may attempt to obtain the incompatible properties. Normally, land acquisition is used for properties that fall into present or future runway protection zones or primary approach surfaces. The State of Minnesota also allows the use of eminent domain by municipalities to purchase property for airport uses.

**Advanced Property Acquisition**

Purchasing land in advance of development may be a method to acquire properties before development pressures inflate the cost of the land. Public acquisition before land costs increase represents potential savings in future purchase costs, which should offset the long-term interests of the purchase. Once in public ownership, the airport can lease the land for compatible uses. Land needed only for airport protection, not for future expansion, can be resold to the public with deed restrictions that would prohibit incompatible land uses.

**Easements**

An easement is a right of another party to part of the benefits of the ownership of real property. Easements are purchased from a property owner and allow the purchaser property rights for the special purposes stated in the purchase agreement.

An avigation easement is the purchase of the rights to the airspace above a piece of property. This right allows the airport operator to direct flights over the property and prohibits the property owner from using the land for structures higher than a specified height. It also addresses dust, noise, vibration, and light and radio wave restrictions. The restrictions will vary in accordance with the airspace necessary for the safe use of the airport’s runways.

As a preventative measure, an avigation easement may be obtained as a condition of development approval. This would require a developer to dedicate an easement before their development application could be approved. This also allows the avigation easement to act as a fair disclosure notice, since the easement becomes a permanent deed restriction and a part of the legal record.
**Fair Disclosure Notice**

A fair disclosure notice is an informative notice implemented in either a formal or informal manner, which conveys to interested parties the potential for noise or safety impacts on properties in proximity to the airport. Formal measures may include the recording of a notice on plats of new subdivisions or a requirement that fair disclosure be implemented which require the seller to provide notice of safety or noise impacts at the time of the property sale. Informal measures may include mailings of disclosure notices or distribution of brochures to a community.

**Land Use Regulations**

Land use regulation is a power allowed by federal and state laws to promote and protect the public health, safety and welfare. Community plans are partially implemented through the enforcement of land use regulations. The regulations used in airport planning normally include zoning, plat and subdivision review, and building codes.

**Land Use Zoning**

Zoning is the most common form of land use control. It designates areas of the community most suitable for certain land uses. A couple of strategies exist within the context of zoning. An area can be rezoned to preclude incompatible uses or performance measures can be introduced into zoning codes to reduce potential incompatible uses. Rezoning impacted areas to eliminate residential uses will promote compatible land uses such as commercial, industrial, agricultural, or recreational uses. Performance standards such as minimum lot sizes and reduced housing densities may reduce the number potentially impacted residences but does not provide for a true compatible use.

An Airport Overlay Zone is another method of zoning that promotes compatible land uses around an airport. This method mostly addresses the issue of noise impacts on surrounding land uses. The zone is determined by noise exposure contours, which are developed by recording noise levels and modeling the results to form lines of equal noise levels. Land use restrictions are tied to each different noise level zone. The MIC, in conjunction with ACSG, Inc. prepared the Airport Overlay Zone Study for the Duluth Airport Authority in June 1999.

**Building Codes**

Building codes are one strategy to alleviate noise impacts. After noise impact areas are defined, municipal building codes should be amended to require soundproofing of new structures built in these areas. These can be incorporated into local zoning codes.

**Plat and Subdivision Review**

The purpose of plat review is to regulate the subdivision of land to promote public health, safety, and general welfare. Plat review can sometimes be limited to ensuring proper subdivision and design engineering of land while not examining nearby land uses. Plat and subdivision review is not as effective as zoning to insure land use compatibility, however, it does provide an opportunity to prevent incompatible land uses. Plat and subdivision review should establish standards for site planning, lot layout, infrastructure
location, and public improvements. This review process would be an opportune time to consider other measures to ensure compatible land use near the airport, such as avigation easements or disclosure notifications.

Plat review is most useful if noise impacted areas and safety zones are identified on the plat map. This can provide official notice that the property is subject to use restrictions and noise impacts.

**Land Use Compatibility Guidelines**

A number of sources were considered in developing basic guidelines for compatible land uses in airport areas. The Denver Regional Council of Governments developed an *Airport Compatible Land Use Design Handbook* that provides guidance for compatible land use planning around airports. WisDOT has developed *A Guide for Land Use Planning Around Airports* to provide planners, policy makers, and airport administrators a tool to improve land use compatibility between airports and neighboring communities. Information contained within these documents and the Minnesota Rules Chapter 8800.2400 and the FAA Advisory Circular 150/5300-13 were combined to develop a compatibility matrix. This matrix (see Table 4) lists Safety Zones A, B, & C and identifies the acceptability level of specific land uses (see Map 3 for the locations of the Safety Zones).

**CONCLUSION**

The strategies listed above are not exhaustive, but provide a list of commonly used and effective tools to prevent incompatible land uses near airports. Each community adjacent to an airport can decide which strategies would work best for them to ensure safe coexistence with the airport. The key to mitigating existing compatibility issues and planning compatible land uses in the future will most likely be found in cooperative efforts by the airport operator and surrounding communities.
### Table 4: Land Use Compatibility Guidelines

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Safety Zone</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-family</td>
<td>--</td>
<td>-</td>
<td>0²</td>
</tr>
<tr>
<td>Multi-family, apartments, condominiums</td>
<td>--</td>
<td>-</td>
<td>0²</td>
</tr>
<tr>
<td>Public</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schools, libraries, hospitals</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Churches, auditoriums, concert halls</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Transportation, parking, cemeteries</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Commercial and Industrial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offices, retail trade</td>
<td>--</td>
<td>O¹</td>
<td></td>
</tr>
<tr>
<td>Service commercial, wholesale trade, warehousing, light industrial</td>
<td>--</td>
<td>+¹</td>
<td>++²</td>
</tr>
<tr>
<td>General manufacturing, utilities, extractive industry</td>
<td>--</td>
<td>+¹</td>
<td>++²</td>
</tr>
<tr>
<td>Agricultural and Recreational</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cropland</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Livestock breeding</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Parks, playgrounds, zoos</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Golf courses, riding stables, water recreation</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Outdoor spectator sports</td>
<td>--</td>
<td>--</td>
<td>O²</td>
</tr>
<tr>
<td>Amphitheaters</td>
<td>--</td>
<td>--</td>
<td>O²</td>
</tr>
<tr>
<td>Open space</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

**++ Clearly Acceptable:** The activities associated with the specified land use will experience little or no impact due to airport operations. Disclosure of airport proximity should be required as a condition of development.

**+ Normally Acceptable:** The specified land use is acceptable in this zone or area. Some residents may perceive impact. Disclosure of airport proximity should be required as a condition of development. Dedication of avigation easements may be advisable.

**O Marginally Acceptable:** An impact will be perceived as a result of allowing the specified use in this zone or area. Disclosure of airport proximity and avigation easements should be required as a condition of development.

**- Normally Unacceptable:** Specified use should be allowed only if no reasonable alternative exists. Disclosure of airport proximity and avigation easements should be required as a condition of development.

**-- Clearly Unacceptable:** Specified use must not be allowed. Potential safety or overflight nuisance impacts are likely in this area.

---

¹ Acreage, building size and site population must meet regulations of item C, Subp. 6 (Use Restrictions-Zone B), Minnesota Rules-chapter 8800.2400.

² Must meet general restrictions contained in item A, Subp. 6 (Use Restrictions), Minnesota Rules-chapter 8800.2400.
CHAPTER 7: AIRPORT ROADWAY NETWORK

The roads in the airport area provide access to the main airport terminal and to the businesses that are located on airport property. This system of roads provides access to and from the Duluth Airport and surrounding businesses for customers, employees, and deliveries of goods and services. Maintaining the integrity of this road system is important. This section examines the elements of the local road system. Circulation, access, capacity, functional classification, connectivity, and future roadway needs are the elements of the airport area road network that are examined in this section.

Local Circulation

The Duluth Airport area roadway network consists of system of functionally classified roads that provide access and connection to the U.S. Interstate system (see Map 9). Even though different areas of the airport are not connected by internal roads (excluding taxiways), the adjacent roads provide timely access. The functionally classified roads in the Duluth Airport area include Trunk Highway 53 (Principal Arterial), Lavaque Bypass (Major Collector), Martin Road (Minor Arterial), Rice Lake Road (Minor Arterial), Airport Road (east section – Minor Arterial), Haines Road (Minor Arterial), and Arrowhead Road (Minor Arterial). A recent addition to the functionally classed system is the Stebner-Airport Approach-Airport Road loop that begins at Stebner Road and Trunk Highway 53 and loops back to Trunk Highway 53 at Airport Road. This loop, recently classified as a Major Collector, includes a newly completed gravel section of Airport Road, which connects to Airport Approach Road.

Access and Connectivity

Access and connectivity to major highways for airport businesses is important to the economic well-being of the area. Access as it is used here can be defined as the links to the adjacent functionally classified roadway system. Connectivity can be described as the connection to the areas major highways. Access and connectivity are critical for the economic health and competitiveness of the airport--businesses located on the airport property have to be able to send and receive materials by road in a cost efficient and timely manner. Attracting new businesses to locate at the airport also requires high-quality access and connections to major highways.

In general, access is sufficient to most areas of the airport. Access to the general terminal is by the Grinden Drive loop from the intersection of Airport Road and Haines Road. The intersection has a four-way stop sign and experiences little or no congestion. Access to the Minnesota Air National Guard (MNANG) facility is from the same intersection on an extension of Haines Road. MNANG officials would like to change this access to accommodate proposed internal circulation changes and the development of a new main gate. The new access would accommodate future expansion plans for Runway 9-27 and improve security at the MNANG facility.
Functionally Classified Roadways

Legend

Functional Classification

- Interstate Highway
- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- local
- Runway
Access to the North Development Area, where Northwest Airlines Maintenance Facility is located, is by North Stebner Road. This road was built to specifically access Northwest’s facility and connects with Martin Road (CSAH 9). The connection to Martin Road is an uncontrolled T-shaped intersection that has right and left turn lanes on Martin Road to accommodate surges in traffic during shift changes.

The Southern Redevelopment Area (see Chapter 8), until recently, had two separate primary access points off of Trunk Highway 53. With the recent connection of Airport Road to Airport Approach Road via a new gravel connector, a loop road system exists that allows vehicles access to Trunk Highway 53 at two different intersections. Traffic destined for the eastern areas of Duluth do not have to use Trunk Highway 53. From Airport Approach Road, traffic may use Airbase Road to access Arrowhead Road. Recent traffic counts along the gravel section of Airport Road indicate that almost 400 vehicles used this connection over a 24-hour period and over 900 vehicles used the connection over a 48-hour period (see Figure 2).

The three major areas of the airport, (the terminal area, the North Development Area, and the South Redevelopment Area) are all located within proximity to Trunk Highway 53. Trunk Highway 53 provides an excellent connection to the Iron Range of Minnesota as well as Canada to the north. Connections to I-35 and points south are not as clearly defined. Trunk Highway 53 is connected to I-35 via Miller Trunk Highway to the southeast or via Trinity Road/Piedmont Avenue and down the hill to I-35. This route is one of the more congested routes in the Duluth-Superior area, although by urban area standards it still flows fairly well. Truck traffic may wish to avoid this route based on higher amounts of traffic and the general topography of the route. Trucks proceeding to the airport from I-35 south
and southeast of Miller Trunk Highway experience significant grades and changes in elevation. For example, from the Proctor area along I-35 to the Trunk Highway 53 interchange, vehicles drop approximately 600 feet in elevation. From the I-35/Trunk Highway 53 interchange to Haines Road and Trunk Highway 53, vehicles gain just over 700 feet in elevation. An alternate route from I-35 to the airport utilizes Midway Road (CSAH 13) to Maple Grove Road (CSAH 6) to Stebner Road. This route follows two lane roads with lower amounts of traffic and less severe topography.

A better roadway connection from the airport to I-35 would help future development and existing businesses at the Duluth International Airport. However, the costs for a limited access roadway from the airport to I-35 would be extremely expensive. Given the current residential development patterns in Hermantown and Western Duluth neighborhoods, along with the challenging topography, it would be extremely difficult to create a new roadway.

A study currently underway that will improve access and connectivity to Trunk Highway 53 is the Miller Trunk Highway Implementation Plan (see Map 10). This study is part of the Interregional Corridor (IRC) program, a statewide effort designed to maintain the most important state highway corridors. The Miller Trunk project will utilize a number of studies that have been completed over the years. These studies include the 1992 and 1995 Miller Hill Corridor Studies and the 1999 Hermantown Highway 53/194 Access Management Plan. The goal of the IRC program is to maintain or decrease travel times through the corridor. The Miller Trunk Highway Implementation Plan will identify solutions to bottleneck problems throughout the corridor. Possible solutions include frontage roads, lane additions, intersection improvements, local road improvements, signal coordination, and zoning/land use controls. These strategies should help reduce congestion in the Trunk Highway 53 corridor and provide better access between the airport and I-35.
**Capacity Analysis**

In the development of the 2001-2025 Long Range Transportation Plan *Tomorrow’s Transportation 2025*, the MIC examined system level deficiencies throughout the Duluth-Superior roadway system. The travel demand model TRANPLAN was used to simulate regional traffic flows for the base year, in this case 1999, and then it modeled forecasted traffic for the year 2025. Inputs into the model include average daily traffic (ADT), socio-economic data, new housing starts, new businesses, and projected areas of growth. The results help to determine impacts of growth on the future transportation system.

One output of the modeling process is a quantifiable measurement of current and projected roadway capacity deficiencies. Roadway capacity refers to acceptable traffic volume on a roadway given its specific design. A capacity deficiency is defined as a high volume to capacity (v/c) ratio. The volume to capacity ratio is based on capacities that were calculated for a Level of Service (LOS) “C”. A v/c ratio of 1 indicates a roadway operating at LOS C, which is defined in Figure 3 by stable traffic flow with speeds and maneuverability closely controlled due to traffic volumes. However, at LOS C the roadway is still capable of serving more vehicles. Larger urban areas use a LOS of “D or E” when examining volume to capacity ratios. Drivers in larger urban areas are more tolerant of congestion. When a road reaches 100% of its designed capacity, congestion is likely to occur. The TRANPLAN model indicates where congestion is likely to occur based on demographic trends. This information helps in monitoring areas where future road improvements may be needed.

**Figure 3: Levels of Service Descriptions**

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>FREE FLOW. Low volumes and no delays.</td>
</tr>
<tr>
<td>B</td>
<td>STABLE FLOW. Speeds restricted by travel conditions, minor delays.</td>
</tr>
<tr>
<td>C</td>
<td>STABLE FLOW. Speeds and maneuverability closely controlled due to traffic volumes.</td>
</tr>
<tr>
<td>D</td>
<td>STABLE FLOW. Speeds considerably affected by change in operating conditions. High-density traffic restricts maneuverability, volume near capacity.</td>
</tr>
<tr>
<td>E</td>
<td>UNSTABLE FLOW. Low speeds, considerable delay, volume slightly over capacity.</td>
</tr>
<tr>
<td>F</td>
<td>FORCED FLOW. Very low speeds, volumes exceed capacity, long delays with stop-and-go traffic.</td>
</tr>
</tbody>
</table>
The following LOS characteristics correspond to v/c ratios:

- LOS A-C corresponds to v/c ratios from 0.0 to 1.0
- LOS D corresponds to v/c ratios from 1.0 to 1.15
- LOS E corresponds to v/c ratios from 1.15 to 1.25
- LOS F corresponds to v/c ratios greater than 1.25

This analysis focuses on the model results in the Duluth Airport area. The model results (see Map 11) indicate that capacity deficiencies may occur in 2025 on Haines Road from Trunk Highway 53 to Airport Road. This may be the result of projected growth at Airpark Industrial Park and potential growth at MNANG. Capacity deficiencies are also forecast for Rice Lake Road from Airport Road to Martin Road, due to the projected growth in the airport area as well as in the townships north of Duluth. A short section of Trunk Highway 53 from Stebner Road to Arrowhead Road is also projected to experience capacity deficiencies. Projected growth in this area, combined with continued growth in the townships to the north, may produce these results. The model results should be viewed with caution as the TRANPLAN model uses a number of inputs and assumptions and any change in growth patterns can impact the model results. Roadways with capacity deficiencies identified for 2025 should be monitored and patterns of growth observed to provide a proactive plan to maintain good traffic circulation in the airport area.

**Trip Generation**

Economic development efforts for the airport property have identified specific areas where certain types of development should take place. Given this outline of identified future land uses, development scenarios can be generated to examine the impact on the adjacent roadway network. One tool that can be used is trip generation rate predictions. Trip generation is defined as the number of vehicles generated by a unit of land use. Scenarios can be created that would predict the number of employees or square footage of identified land uses and trip generation rates applied to get an idea of the amount of traffic each type of development can generate.

The generation rates used in this section were taken from the *Trip Generation, 6th Edition* published by the Institute of Transportation Engineers (ITE). This document was designed specifically to assist transportation professionals in predicting how many trips may be generated by a particular land use.

The following land uses were used in this analysis (land use code numbers from the *ITE Trip Generation Manual* are also shown):

- General Light Industrial (110)
- Industrial Park (120)
- Manufacturing (140)

Most of the aviation-related development and non-aviation related development identified as desirable for the airport property fall within the above land uses. Cirrus Designs falls into the Manufacturing land use category and the Northwest Airlines Maintenance Facility falls into the General Light Industrial category. Expansion of current business could also use these land use categories to predict future traffic impacts.
Travel Demand Model Results 1999 & 2025

1999 Volume/Capacity Ratios

2025 Volume/Capacity Ratios

Legend

V/C Ratios  
0-0.99  A-C
1-1.15  D
1.16-1.25 E
1.26-2.22 F

A V/C ratio indicates what the level of service (LOS) is within a model network. In general, it indicates what the roadway's traffic or projected traffic is or would be operating at.
Development plans at the airport also identify the possibility of locating a small industrial park in the North Stebner Road area. Although it is difficult to predict exactly what business activities will locate at a particular location, trip generation rates can give an idea of the impact that certain land uses will have on the adjacent roadway network. The following tables apply trip generation rates to the number of employees per land use:

Table 5

Industrial Park: Average Vehicle Trip Ends vs Employees on a Weekday

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>Vehicle Trip Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>167</td>
</tr>
<tr>
<td>100</td>
<td>334</td>
</tr>
<tr>
<td>200</td>
<td>668</td>
</tr>
<tr>
<td>300</td>
<td>1002</td>
</tr>
<tr>
<td>500</td>
<td>1670</td>
</tr>
</tbody>
</table>

Fitted Curve Equation: \( \ln(T) = 0.796 \ln(X) + 2.572 \)

\( T = \text{Average Vehicle Trip Ends} \)

\( X = \text{Number of Employees} \)

\( R^2 = 0.81 \)

Table 6

Manufacturing: Average Vehicle Trip Ends vs Employees on a Weekday

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>Vehicle Trip Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>105</td>
</tr>
<tr>
<td>100</td>
<td>210</td>
</tr>
<tr>
<td>200</td>
<td>420</td>
</tr>
<tr>
<td>300</td>
<td>630</td>
</tr>
<tr>
<td>500</td>
<td>1050</td>
</tr>
</tbody>
</table>

Fitted Curve Equation: \( T = 1.740(X) + 229.975 \)

\( T = \text{Average Vehicle Trip Ends} \)

\( X = \text{Number of Employees} \)

\( R^2 = 0.94 \)

Table 7

General Light Industrial: Average Vehicle Trip Ends vs Employees on a Weekday

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>Vehicle Trip Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>178</td>
</tr>
<tr>
<td>100</td>
<td>326</td>
</tr>
<tr>
<td>200</td>
<td>621</td>
</tr>
<tr>
<td>300</td>
<td>916</td>
</tr>
<tr>
<td>500</td>
<td>1506</td>
</tr>
</tbody>
</table>

Fitted Curve Equation: \( T = 2.951(X) + 30.572 \)

\( T = \text{Average Vehicle Trip Ends} \)

\( X = \text{Number of Employees} \)

\( R^2 = 0.98 \)

Access Management

The term “access management” is defined for purposes of this plan as “the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed.” Access management strives to preserve the integrity of the roadway while serving land uses such as commercial and retail areas, along with residential areas. As discussed earlier in this
section, access to the airport is important for economic reasons. Also, access management is critical to maintaining connectivity to major highways from the airport. Preserving the integrity of roads in the airport area will maintain connectivity to the area’s major highways. Access management on area highways and arterials is essential because it can lead to improved safety, preservation of roadway capacity, and a reduction in the need for future system expansion.

Access management strategies for Trunk Highway 53 in the Duluth Airport area are outlined in the *Trunk Highway 53/194 Hermantown Access Management Plan* completed in January 1999. This plan presents a number of ideas and techniques that would protect the integrity of Trunk Highway 53 in the Duluth-Hermantown urbanized area. Further access management strategies will be outlined in the *Miller Trunk Highway Implementation Plan*.

**Future Roads**

A number of planned improvements to the Duluth Airport facilities, along with future growth of current airport area businesses and potential new developments, reveal a need for new roadways (see Map 12) to provide access to these new developments. The need for future road connections range from current needs to long term needs. A number of planning documents utilized for this study also identify the need for future roadways to accommodate long-term future growth in the airport area. These documents include *Duluth International Airport Master Plan*, *the Minnesota Air National Guard Master Plan Update*, *the Aviation Economic Development Plan*, and the *1999 Hermantown Highway 53/194 Access Management Plan*.

**A. New Airport Road Connection to Trunk Highway 53**

The current intersection of Airport Road with Highway 53/194 has limited sight distance and insufficient space for cars waiting in the median crossover for traffic to clear. Cars sitting in the median crossover also conflict with southbound traffic turning left on Airport Road. This intersection serves Cirrus, the Federal Prison Camp and the Natural Resources Research Institute (NRRI), along with a number of businesses and other land uses in this area.

Because the current location of the intersection would not accommodate a traffic signal, other locations were examined for a potential new intersection. One location identified in the *1999 Hermantown Highway 53/194 Access Management Plan* would move the intersection southeast to a point between Curtis Oil/Food & Fuel and Northern Hydraulics. A new access road would connect the new Airport Road with TH 53.

**B. Relocation of Airport Road near Cirrus**

The lack of space to accommodate expansion plans at Cirrus has revealed a need to relocate the current alignment of Airport Road. Plans call for moving the road south and reconnecting either with the current Airport Road alignment or connecting with the new proposed connection to Trunk Highway 53. This alignment change would allow Cirrus to locate its expanded facility on the land that is now the current roadway.
C. MNANG Access Roads
The MNANG base on the eastern side of the airport has two potential new roads planned to accommodate future growth. Haines Road at its northern terminus currently serves as the main entrance to the facility. Both short- and long-term plans call for a new main entrance by relocating the Haines Road entrance to the east to divert vehicles entering the facility away from the aircraft parking apron. Other short term plans at the MNANG include a number of internal circulation improvements. Long range plans include the development of a secondary access road and gate off of Ridgeview Road to provide access for fuel and munitions deliveries. Another long term option identified in the MNANG Master Plan Update calls for creating a new access road and main gate to the eastern edge of the MNANG facility and connecting with Airport Road to the east of the intersection of Haines and Airport Roads.

D. Future Air Cargo Area Access Road
According to the Duluth International Airport Master Plan, a new roadway will be needed to serve the proposed cargo facility to be located south and east of Runway 3. This road would be an extension of Grinden Drive and possibly connect with Airbase Road or Swan Lake Road to the south to provide access to Trunk Highway 53.

E. North Development Area Aviation Expansion Connector
In the north development area, long range plans call for a connection of North Stebner Road with Lavaque Road. This new road would provide access to accommodate future aviation related development. According to the North Area Conceptual Development Map 12
Plan in the Aviation Economic Development Plan, the new road connection along with new taxiways would open a large area for aviation related development. The ASR Tower and the MNANG Munitions Maintenance Facility would have to be relocated prior to development of this road. A new connection from North Stebner Road to Lavaque Road would also require upgrading to Lavaque Road to accommodate increased traffic.

Currently Programmed Roadway Improvement Projects

The following airport area roadway projects have been programmed and will be completed in the next few years:

Airport Road/Airport Approach Road/Stebner Road Loop

A recently completed gravel connection to Airport Approach Road has provided some relief to the uncontrolled intersection at Trunk Highway 53 and Airport Road. This new gravel connection allows traffic to access Stebner Road, which has a signalized intersection at Highway 53/194. This connected loop provides a connection from Trunk Highway 53 at Airport Road to Trunk Highway 53 at Stebner Road. This route also provides access to Airbase Road and Arrowhead Road, which offers an alternate route for traffic destined for East Duluth neighborhoods.

The recently completed gravel road connector will be upgraded to State-Aid standards in 2002 or 2003. This federally funded project will also improve the connection with Airport Approach Road, reconfigure areas of Stebner Road and provide some intersection improvements at Stebner Road and Highway 53/194.

Trunk Highway 53/194 from Anderson Road to Midway Road

This project is a mill and overlay of the driving lanes and shoulders. The project does not include any changes to roadway geometrics and is scheduled to take place in 2003.

Piedmont Avenue (Trunk Highway 53)

The planned improvement of Piedmont Avenue section of Trunk Highway 53 in 2003-2004 will improve connectivity from the Duluth Airport to I-35. The new roadway will improve traffic flow from I-35 to the Miller Hill Mall area. The project will split the current Six Corners intersection into two separate intersections and move the Trunk Highway to the east of the present intersection. A new bridge will result in Skyline Drive passing over the top of the highway. The total cost of this realignment and reconstruction project will be $22 million.

Signage

The Institute of Transportation Engineers (ITE) developed guidelines for airport roadway signs entitled Airport Roadway Guide Signs: A Proposed Recommended Practice, which offers the following: “Generally, there are one or two major feeder roads to an airport. All of the major roads which intersect these feeders within a radius of 10-25 miles from the airport should carry the airport message as an integral part of their highway destination signs, including overhead signs.”
Another suggestion is to place a highway sign where major highways enter a community and then place “trailblazers” at all major intersections along the route to the airport. In the Duluth-Superior area the major roads which may need airport directional signage include I-35, I-535, TH 2, TH 53, and TH 61. A series of trailblazers (see Figure 4) would then direct airport users to the intersection of TH 53 and Haines Road.

CONCLUSION

The analysis in this chapter highlights a number of areas of concern for the airport area roadway network. A number of intersections and road segments should be improved if development occurs in their vicinity. The following intersections and roadways segments are important to maintaining access and connectivity to the Duluth International Airport and should be closely monitored when airport area development plans are considered (see Map 13).

A. Airport Road & Trunk Highway 53 – Sight distance and stacking problems exist at the current intersection location. Short term plans include moving the intersection to the southeast on Trunk Highway 53 (see Future Roads). Given the potential expansion of Cirrus and the development of other businesses in the South Development Area, the new signalized intersection would improve access and safety for these businesses. The present intersection could be configured as a right-in/right-out with the median crossover closed. Development of the southern airport properties as well as on the southwest side of Trunk Highway 53 may determine when any improvements may take place.

B. Airport Road/Airport Approach Road/Stebner Road Loop – This recently connected roadway has relieved traffic pressure at the intersection of Airport Road and Trunk Highway 53 by providing an alternate route to Trunk Highway 53 via Stebner Road. Construction to formalize this loop is scheduled for 2002 or 2003. This loop roadway provides access for the South Development Area and the air cargo area currently occupied by Federal Express. Future improvements to the road may include relocating a section of the roadway adjacent to Cirrus to provide them with expansion room. The new alignment is located where the access road would connect from the new Airport Road intersection with Trunk Highway 53.

C. Stebner Road & Trunk Highway 53 – Development in the south area of the airport property along with the completion of the Airport Road loop from Trunk Highway 53 near NRRI to Stebner Road will bring more traffic to this intersection. Signal improvements and dedicated turn lanes for the north leg are scheduled for 2002 or 2003.

D. Haines Road & Trunk Highway 53 – This intersection is important to the Airpark Industrial Park as well as the airport terminal area. This intersection will be examined as part of the Miller Trunk Highway Implementation Plan.

E. Trunk Highway 53 from Midway Road to I-35 – This segment of Trunk Highway 53 provides a connection from Duluth International Airport to I-35. The Miller Trunk
Highway Implementation Plan will identify roadway design improvements such as signal coordination, land use/zoning strategies, and access management to protect the integrity of this important segment of roadway.

F. Haines Road from Airport Road to Trunk Highway 53 – This segment of roadway provides a connection to Trunk Highway 53 for the airport terminal area as well as the nearby Airpark Industrial Park. Future long-term improvements may include capacity expansion.

G. Airport Road from Haines Road to Rice Lake Road – This segment is important for access to the airport terminal and Airpark Industrial Park as well as potential future access for MNANG. Improvements to this road segment may include turn lanes and wider shoulders.

H. Rice Lake Road & Martin Road Intersection – Airport area development, along with increasing population and development in the townships north of Duluth, may require upgrades to this intersection. Short term plans call for the extension of a sewer line along Rice Lake Road to Martin Road, which will promote growth in this area. Improvements to this intersection may include dedicated turn lanes and/or signalization.

I. Rice Lake Road & Airport Road – Increasing peak hour traffic is making access onto Rice Lake Road difficult for vehicles eastbound on Airport Road. Future development in this area may warrant traffic signals at this intersection.

J. Rice Lake Road from Arrowhead Road to Martin Road – Airport area development, along with increasing population and development in the townships north of Duluth, may require upgrades to this road segment. The planned sewer extension along this segment will also encourage development in this area. Possible improvements to this segment include bypass lanes at intersections to accommodate left turning traffic. This improvement strategy could be extended farther north of Martin Road along Rice Lake Road. Long term improvements may include additional travel lanes.
Roadways to be Monitored
CHAPTER 8: DEVELOPABLE LAND

A number of factors can influence what airport area land is most suitable for development. Wetlands, safety zones, airspace protection areas, aircraft noise impact areas, and the location of airport support equipment such as radar can have some bearing on where development occurs. Much of the geographic data collected for this study illustrates the location of these factors. With the capabilities of Geographic Information Systems (GIS), all of these factors can be analyzed together. This chapter attempts to illustrate the locations of the most developable land in the airport area and provide a more detailed look at identified development areas.

Working with numerous data layers in a project can be challenging, especially when each of those data layers can impact the final outcome of the analysis. In order to organize the data and assess its relative importance in the final analysis, a ranking model is often used. A ranking model was developed for this project to better illustrate future developable areas.

Ranking involves placing attributes, such as wetlands and land use safety zones, into discrete classes. These classes are assigned numerical values based on their relative importance to developing airport parcels. This type of ranking, called the single additive weighting model (SAW), involves a raw score that is added for all participating attributes. This type of modeling has been used in numerous studies including a multi-attribute model developed by the Kentucky Transportation Center to enhance the identification of routes. By assigning ranks to various geographic and economic features in the GIS database, the Transportation Center was able to provide a single map that stemmed from all contributing attributes involved in the project.

Since the attributes used in this study are discrete in nature, assigning a single score (representing developable vs. non-developable areas) to each attribute was sufficient. In this study, 16 attributes were ranked according to the below score (see Table 8).

- **100** = non-developable areas
- **50** = some building restrictions
- **0** = no building restrictions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500ft Radar Tower Buffer</td>
<td>100</td>
</tr>
<tr>
<td>1/2 mile Radar Tower Buffer</td>
<td>90</td>
</tr>
<tr>
<td>Munitions Maint. Facility 1250ft Buffer</td>
<td>100</td>
</tr>
<tr>
<td>Land Use Zone A</td>
<td>100</td>
</tr>
<tr>
<td>Land Use Zone B</td>
<td></td>
</tr>
<tr>
<td>&lt;3 acres</td>
<td>100</td>
</tr>
<tr>
<td>3-3.99 acres</td>
<td>50</td>
</tr>
<tr>
<td>4-5.99 acres</td>
<td>30</td>
</tr>
<tr>
<td>6-9.99 acres</td>
<td>20</td>
</tr>
<tr>
<td>&gt;10 acres</td>
<td>10</td>
</tr>
<tr>
<td>Land Use Zone C</td>
<td>0</td>
</tr>
<tr>
<td>Parcels with buildings</td>
<td>100</td>
</tr>
<tr>
<td>Runway visibility zone</td>
<td>100</td>
</tr>
<tr>
<td>Runway safety area</td>
<td>100</td>
</tr>
<tr>
<td>Runway protection zone</td>
<td>100</td>
</tr>
<tr>
<td>Building restriction line</td>
<td>100</td>
</tr>
<tr>
<td>Wetland areas</td>
<td>90</td>
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<tr>
<td>Waste facilities</td>
<td>100</td>
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<tr>
<td>Noise Contour 65db</td>
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<tr>
<td>Noise Contour 70db</td>
<td>30</td>
</tr>
<tr>
<td>Noise Contour 75db</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 8: Attribute Inputs for SAW Model
The following section provides a brief explanation of the geographic input data for the Single Additive Weight model.

**Wetland Delineation**

A combination of 1:24,000 color infrared photography taken in September 1997 and 1:2,400 monochrome photography taken in April 1995 were used to prepare updated wetland maps. The intermediate scale color infrared photos provided important information about vegetation types present in the wetlands, and the large scale spring photos allowed visualization of water and saturated soil beneath leafless woody vegetation. The 1997 color infrared photos were digitally scanned, geo-referenced, and rectified to reduce distortion using a GIS warping routine that fits the scanned image to ground coordinate control points obtained from a U.S. Geological Survey Digital Ortho Quad (DOQ). These digitally rectified aerial photos served as a geographically correct base for identifying and delineating wetlands. Wetland classification followed U.S. Fish and Wildlife Service conventions for the National Wetlands Inventory (see Map 14).

**No-Build/Electronic-Free Buffers**

Certain building restrictions exist within the North Development Area. The no-build and electronic-free buffers represent a few of these restricted areas (see Map 5). No-build buffers, surround both the Airport Surveillance Radar (ASR) tower and the Air National Guard Munitions Maintenance Facility (MNANG MMF). The ASR tower has a 1500ft buffer, while the MMF also has a 1250ft buffer. Furthermore, an electronic-free buffer surrounds the ASR radar tower and radiates out half a mile. The buffers were derived using the building boundaries, which were delineated using a Trimble Geoexplorer II GPS.

**Brownfields**

Another concern surrounding development in the airport area is past and present brownfield sites. The Environmental Protection Agency defines brownfields as “abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.” Two major agencies, The Minnesota Air National Guard (MNANG) and the U.S. Air Force (USAF), were contacted to determine what brownfield sites exist at the airport. Twenty-eight sites in the study area were identified as areas of concern, or where mitigation was completed or in process (see Map 19).

**Noise Contours**

The noise contours used in this study were derived from the Noise Exposure Map created for the 1999 FAR Part 150 Study. These noise contours are based on a modeling process which utilized on-site noise measurements, runway and flight track geometry and utilization, approach and departure profiles, operational activity by type and time of day, and noise complaints from airport neighbors. The results of the model generated noise contours for 1996 (existing conditions) and 2001 (future conditions). This study used the 2001 contours, as did the Airport Overlay Zone Study of 1999 (see Map 7).
Parcel Map

This parcel layer (see Map 15) was created using current legal descriptions and digitized parcel maps and was edited for topological and attribute errors using ArcInfo 8. Information was retrieved from the City of Duluth and St. Louis County Assessor's offices. Data was attached using the parcel number. The Parcel map was completed in September 2000 and has not been updated since then. Use constraints apply to this parcel data – please refer to the metadata associated with this geographic data.

Runway Restriction Areas

For the protection of people and property, the FAA has identified areas in close proximity to runways where buildings or structures of any kind are restricted (see Map 15). These areas include:

- Building Restriction Line - 300 feet on either side of the runway centerline.
- Runway Protection Zone – a clear zone at the end of each runway.
- Runway Safety Area – a defined area around runways that reduce risk of aircraft accident.
- Runway Visibility Zone – a defined area near the intersections of runways that allows pilots to see other runways.

Land Use Safety Zones

As described in Chapter 3, Land Use Safety Zones A, B, & C were created to protect aircraft operational safety and the general public’s life and property. Specific land use restrictions are associated with each zone, with Safety Zone A being the most and Safety Zone C the least restrictive.

Each of these attributes is spatially related to a data layer in the GIS system. GIS Spatial Analyst capabilities allowed the data layers to be individually ranked and overlaid to produce a single data layer. This single layer represents the overall potential for development in the study area based on the 16 attributes. The results of the development ranking are shown in Map 16. The darker colors represent the most suitable areas for development. The lighter colors represent areas least suitable for development.

The results of the SAW model show large areas of developable land north and south of the airport. Of the area south of the airport, a large portion lies south and west of trunk Highway 53 in Hermantown and was not the focus of this study. The other portion south and east of the airport falls near the Airpark Industrial Park and is currently developed or being developed. The small area directly south of and adjacent to Runway 9-27 is currently being redeveloped. This area is the location of Cirrus Designs and the Federal Prison Camp. A large portion of the area to the north of the airport is identified as developable and falls within an area identified for future development.

According to the Aviation Economic Development Plan of January 1998, the Duluth Airport Authority has targeted two primary areas for future development (see Map 17). Located in the South Redevelopment Area are unused buildings from the former Air Force Base, as well as a number of industrial- and office-use buildings. Since utilities
currently exist in this area it is for the most part ready for short-term development. The North Development Area is located along North Stebner Road and is where Northwest Airlines Maintenance Facility is sited. The location along North Stebner Road is targeted for business park development and the area adjacent to and west of the Northwest facility is targeted for aviation-related development. A more detailed examination of developable land was conducted for the North Development Area.

**North Development Area**

As described above, this area is a prime site for new industrial and business development due to the recent addition of North Stebner Road and the extension of utilities to the Northwest Airlines Maintenance Facility. However, wetlands and poor soils predominate in this area *(Airport Master Plan)*. Additional concerns in this area include utility costs, the ASR no-build buffer, the electronic-free buffer and the MNANG Munitions Maintenance Facility no-build buffer, as well as brownfield sites.

Certain building restrictions exist within the North Development Area. The no-build and electronic-free buffers represent a few of these restricted areas *(Map 18)*. No-build buffers, which are found in the *Duluth International Airport Master Plan*, surround both the ASR radar tower and the MNANG MMF. The ASR tower has a 1500ft buffer, while the MMF also has a 1250ft buffer. Furthermore, an electronic-free buffer surrounds the ASR radar tower and radiates out one-half mile.

Another concern surrounding the Northwest Development Area is the presence of old and current brownfield sites. The Environmental Protection Agency defines brownfields as “abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.” Two major agencies, The Minnesota Air National Guard (MNANG) and the U.S. Air Force (USAF), were contacted to determine the location and contents of known brownfield sites at the airport. Twenty-eight sites in the study area were identified as areas of concern, or where mitigation was either completed or in process.

The U.S. Air Force is in the process of cleaning a plume of trichloryll ethylene (TCE) contamination that originated from the primary landfill site. The source of the contamination has been removed and remediation is under way *(Aviation Economic Development Plan)*.
This is an additive model representing 16 layers ranked as follows:
0 = developable,
   no restrictions
50 = some restrictions
100 = non-developable

The map represents the final overlay of the ranked layers. The map combines all layers into one easy to read representation of future development potential.
The remaining sites in the North Development Area are closed or tagged as areas of concern (see Map 19).

A detailed wetland delineation of the Northwest Development area is vital to determine and analyze the future development options of the Duluth International Airport (see Map 20). The Airport Master Plan clearly states that “to accurately determine the proposed on and off airport impacts and mitigation requirements, a detailed field survey is required.”

The North Development Area as defined in the Aviation Economic Development Plan is approximately 962 acres. Over one third of this area has been delineated as wetlands. Due to this large percentage of wetlands, mitigation strategies will have to accompany any future development plans. Mitigation is a system for balancing wetland losses against wetland gains, under Section 404 of the Clean Water Act. Under this act, land owners needing to “mitigate,” or compensate for authorized impacts to wetlands associated with development activities, have the option of in-kind mitigation or mitigation banking approaches. In-kind mitigation refers to replacement of a specific wetland type with the same wetland type in another area. Mitigation banking is when a wetland area that has been restored, created, or enhanced is set aside to compensate for future conversions of wetlands for development activities. Banking can provide more cost effective mitigation and reduce uncertainty and delays for qualified projects. Furthermore, banking saves time in permit processing due to the ability to pre-select a mitigation site. Once the quantity of impacted wetlands is known, mitigation strategies may then be formulated.

A further breakdown of the wetlands shows the specific wetland classes which may aid in developing mitigation strategies. These wetland classes were derived from the National Wetlands Inventory.

If development were to occur in the North Development Area, utility service would need to be extended. At present, the City of Duluth Water and Gas extended a 10” water main and 10” HP gas main to the Northwest Airlines Maintenance Facility. Both utility systems are looped systems and have increased the capacity for service in the proposed development areas. In addition, both utility services are capable of expanding services.
The sanitary sewer system, maintained by the City of Duluth, is adequate to handle future expansion. A new sanitary sewer consisting of a force main, a gravity main, and a sewage lift station has been constructed for the Northwest Airlines Maintenance Facility. This system has capacity for future development in the North Development Area (Aviation Economic Development Plan).

Water, sewer, and gas line extensions were examined to determine rough cost estimates. (see Maps 21 & 22). Since the most likely extensions to these lines will occur at the Northwest Maintenance Facility, 1000ft buffers were placed around the lines closest to Northwest. A series of buffers were completed to encompass the parcels in the North Development Area. Cost information was obtained from the city for extending these utilities and used in conjunction with the buffers to determine general cost estimates of extending the utility lines.

The City of Duluth listed an average cost of $70/foot for either water or sewer extensions with average depth and minimal pavement repair. The cost increases to $85/foot if more pavement was encountered and to $100-125/foot if rock was encountered. Gas line extensions were not included in this analysis because costs may vary for installation depending on the projected volume of gas to be used. A high volume gas customer would most likely have a line extended to their site free of charge. By examining the information on Maps 21 and 22, we can see that developing the parcels nearest to Northwest may be the most cost effective to develop in the short term.

The North Development Area provides opportunities for industrial, manufacturing, and business park development. Parcels exist that are relatively free from wetlands and have good roadway access. However utility extensions would be needed. Given the long-term plans for this area, short-term development is suitable for this area.

**Airport Development**

The Duluth Airport is limited by Federal statutes in the level of economic development activity in which it can participate. There are two key areas the Duluth Airport Authority is responsible for in economic development. One is to continually improve the aviation support infrastructure such as runways, instrument approaches, the airport terminal, aircraft parking areas etc. The other is to provide airport land for aviation related development. This then allows the private or governmental sector to market Duluth and the Duluth International Airport with the best possible advantages.

In order for the Duluth Airport Authority to continually upgrade facilities and infrastructure, it must continually and aggressively pursue federal funding from the Airport Improvement Program funds. The Airport Improvement Program results in all major projects receiving 90% federal funding with the remaining 10% cost coming from local airport funds. The local funds are generated by the airport through parking lot revenue, land leases, passenger services, rental car operation, landing fees etc. Without
Water Line Distance/Cost Analysis

The above table represents the three price brackets for extending water lines. Average cost represents average depth and minimal pavement repair. The mid-cost represents more pavement repair, and if rock is encountered the high cost is used.

The buffers expand at 1000ft increments at the highlighted point on the sewer line. This is the most likely point of expansion.
The above table represents the three price brackets for extending sewer lines. Average cost represents average depth and minimal pavement repair. The mid-cost represents more pavement repair, and if rock is encountered the high cost is used.

The buffers expand at 1000ft increments at the highlighted point on the sewer line. This is the most likely point of expansion.
the 10% local match, the federal government will not provide the 90% share of any project costs. Therefore it is critical that the airport maintains a lease rate structure over the long period of time that allows the necessary reserve of local funds to continually apply for and receive the federal grants.

Local government and private development entities in dealing with airport property and airport development must understand this concept. Any financial economic stimuli such as reduced lease rates, long-term leases not increased by economic indexes, or direct monetary contributions reduce the availability of federal funds due to the inability of the airport to generate the necessary 10% local share. The Federal Airport Improvement Program presents the opportunity to leverage a 9-to-1 share for airport improvement dollars.
CHAPTER 9: CONCLUSION

The general public has a significant stake in protecting the viability of the Duluth International Airport. Access to world-wide air travel along with a significant number of jobs provide incentive from the public’s perspective to preserve the airport and its related functions. A regional approach that considers the needs of all communities involved is necessary to produce a strategy of compatible land uses that everyone can live with.

The Duluth International Airport currently has economic advantages that can lead to the generation of high paying jobs in the aviation industry. The 10,000 ft. main runway can handle the world’s largest aircraft. Lower levels of air traffic create a desirable location for aviation related businesses. The current operations of Cirrus Designs and the Northwest Airlines Maintenance Facilities provide this region with a solid base of aviation businesses. Building upon this strength is an approach that many economic development policies are attempting to take advantage of.

Land use can be a potentially controversial issue when jurisdictions are being told what they can and can’t do with their land. However, given the economic importance of the Duluth airport to this region and the cost that other airports have incurred to solve land use compatibility issues, all area jurisdictions should make every attempt to prevent incompatible land use in the airport vicinity. A particular goal of this study is to encourage compatible land uses in the airport area in order to protect the community, its taxpayers, and the economic viability of the area, while minimizing any burden to airport area property owners.

One step that local jurisdictions can undertake to ensure that land uses are compatible with aircraft noise is to adopt the Airport Overlay Zone Study that was created for the Duluth International Airport. Of the four jurisdictions bordering the airport, Rice Lake and Canosia Townships have adopted the study. To date, the cities of Duluth and Hermantown have not adopted the study. The strategies listed in the study are an example of best practices for noise compatible land uses in airport areas and are currently in place in a number of locations throughout the country. These strategies are designed to protect a significant public investment.

Local comprehensive plans and zoning ordinances for those communities located near the airport should be reviewed, and, if necessary, amended to incorporate recommendations addressing compatible land uses and developments. In areas adjacent to the airport, land uses should be compatible with the role and function of the airport while maintaining existing compatible community uses.

Growth Risk Areas
Analysis of the data collected for this study illustrate that some areas may be more difficult to develop airport compatible land uses. Development pressures can steer incompatible uses toward areas that may not be suitable. These areas are sometimes referred to as “growth risk areas.” Identification of these areas can be helpful to assist in monitoring development proposals that may need review of airport noise and safety
compatibility issues. Factors considered in developing the growth risk areas include the location of noise impacted areas, airport safety zones, future airport expansion plans, and the Duluth Airport Zoning Ordinance. The areas shown on Map 23 encompass the noise contours from 60 DNL and above along with all areas that fall in Safety Zones A, B, & C. These areas are the most susceptible to airport related impacts and should be monitored to ensure development of airport compatible uses.