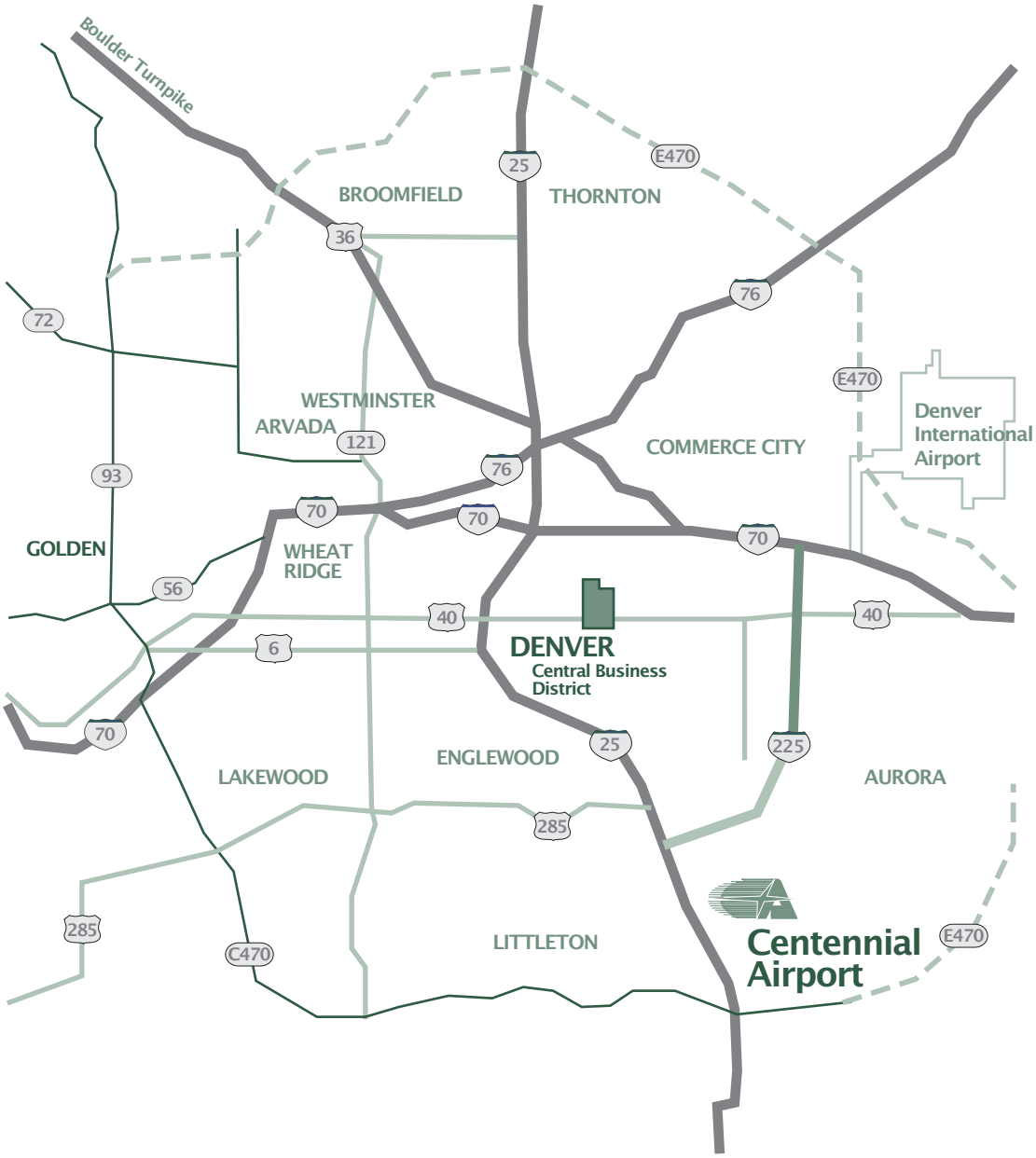
Inventory

Introduction

Centennial Airport (APA) is a reliever airport to Denver International Airport and is located in the southern portion of the Denver Metropolitan Area, approximately thirteen miles south of Downtown Denver, in the southern portion of Arapahoe County and the northern portion of Douglas County. The airport accommodated approximately 466,000 operations in 1998, making it the second busiest general aviation airport in the United States. The Airport has no scheduled commercial service operations, although there are charter service operators based on the airport. There are two full service Fixed Base Operators on the airport; Denver jetCenter and Signature. The generalized airport location is illustrated on Figure A1, *AIRPORT LOCATION MAP.*

Centennial Airport is a public airport, owned and operated by the Arapahoe County Public Airport Authority. There is a full time airport manager and staff that run the airport on a day-to-day basis. The airport consists of three runways; Runway 17L/35R which is 10,001 feet in length, Runway 17R/35L which is 7,003 in length and Runway 10/28 which is 4,903 feet in length. There are associated taxiways, lighting and navigational aids associated with the runways. Runway 10 is equipped with medium intensity runway lights (MIRLs) and visual approach slope indicators (VASI). Runway 28 is equipped with MIRLs, VASIs and Runway End Identifier Lights (REILs) and VOR/DME RNAV. Runway 17R is equipped with MIRLs and Runway End Identifier Lights (REILs), and Runway 35L is equipped with MIRLs, Precision Approach Path Indicators (PAPIs) and REILs. Runway 17L is equipped with MIRLs and VASIs, and Runway 35R is equipped with MIRLs, VASIs, a Non Directional Beacon (NDB), a Medium Intensity Approach Lighting System with RAILs [Runway Alignment Indicator Lights] (MALSR) and an Instrument Landing System (ILS).



Approximate Scale 1"=6 Miles

Figure A1 ***Airport Location Map***

Centennial Airport

FAR Part 150 Noise Exposure & Land Use Compatibility Study Program

Evaluation of Existing Documents

In 1996 the Airport completed and adopted an Airport Master Plan for Centennial Airport. That Master Plan contained many recommendations over a twenty-year planning period. However, there are no recommendations contained in the first phase, the first five years, that would effect this Study. In fact, there are no runway extensions, new runways or other airside facility improvements that would effect aircraft noise. There Airport Layout Plan does show the relocation of the west threshold of Runway 10/28 approximately one hundred feet to the east, resulting in a runway length of 4,800 feet. The Airport Layout Plan is presented in Figure A2.

Also in 1996, the airport prepared the Centennial Airport Noise and Land Use Study. The Study was conducted subsequent to opening of Denver International Airport and was intended to present accurate flight track data, noise contours for an existing (1995) and future (2000) condition. The Study was also intended to update the Land Use Guidelines based on actual aircraft flight tracks from the radar data. That Study utilized the Integrated Noise Model (INM) Version 4.11 to prepare the noise modeling. Using radar data, aircraft fleet mix data and operations numbers, the two contours were generated. The existing (1995) 65 DNL contour contained approximately 222 dwellings and 670 people. The future (2000) 65 DNL noise contour contained approximately 1,010 dwellings and 3,046 people. For both contours, there were no dwellings within the 70 or greater DNL contours.

The Study evaluated several alternatives, most of which would require an FAR Part 161 Study. There were procedure recommendations as well as land use recommendations. The airport currently has Land Use Guidelines which defines and identifies an Airport Influence Area (AIA), FAR Part 77 surfaces and a Traffic Pattern Area. The Land Use Guideline is depicted on Figure A3, *LAND USE PLAN*. The AIA is defined as an area that is subject to frequent overflight by low flying aircraft. The boundaries of the AIA generally correspond to several of the major roads near the airport and is an area where all projects are recommended to be reviewed for land use compatibility and compliance with FAR Part 77 criteria. Residential and other noise sensitive development should be limited. Permitted development requires public disclosure to prospective buyers, residential noise test evaluation, plat notes regarding airport activity and an avigation easement. The Study recommended no changes to the AIA as defined.

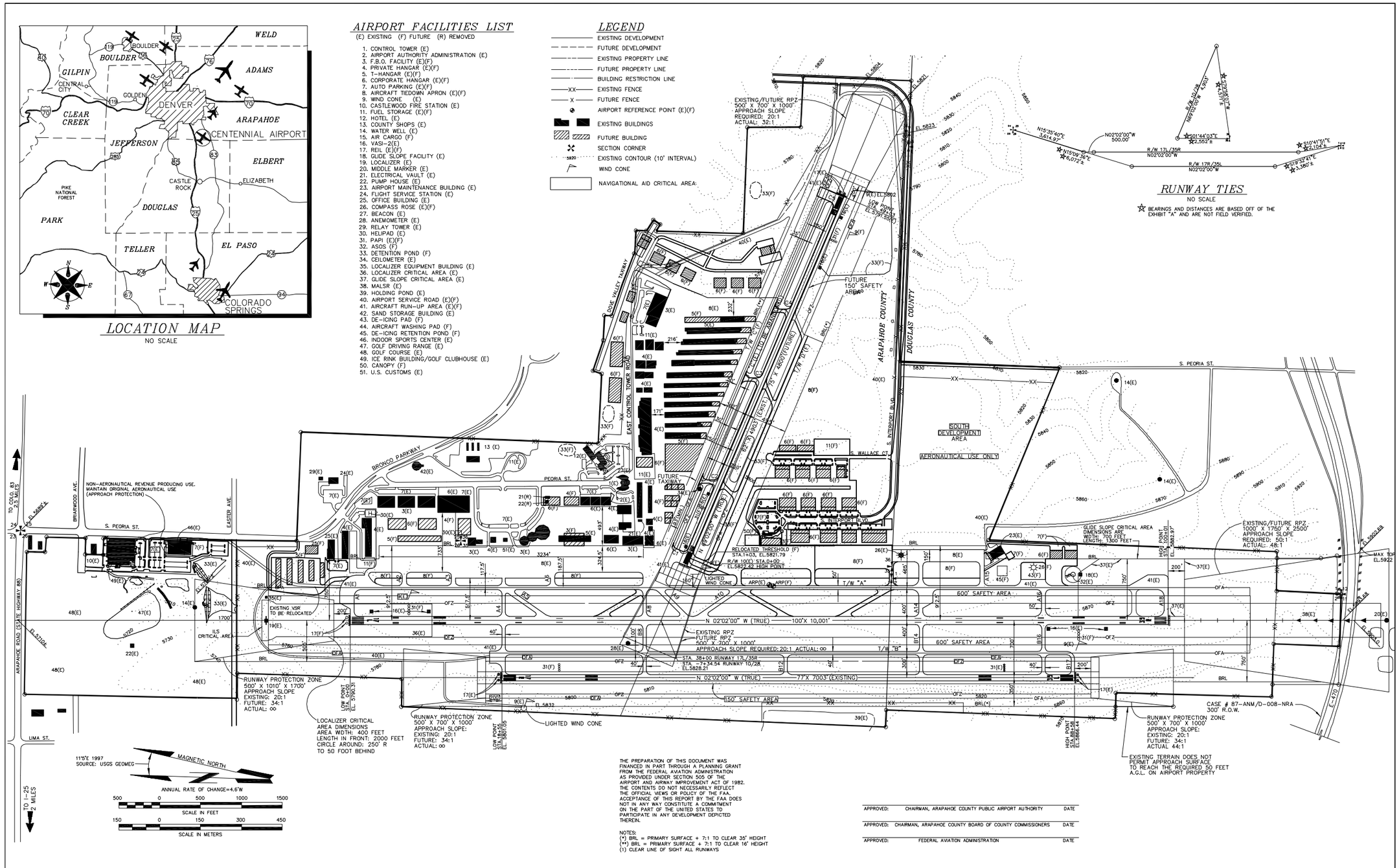


Figure A.2 **Airport Layout Plan by Isbill Associates**

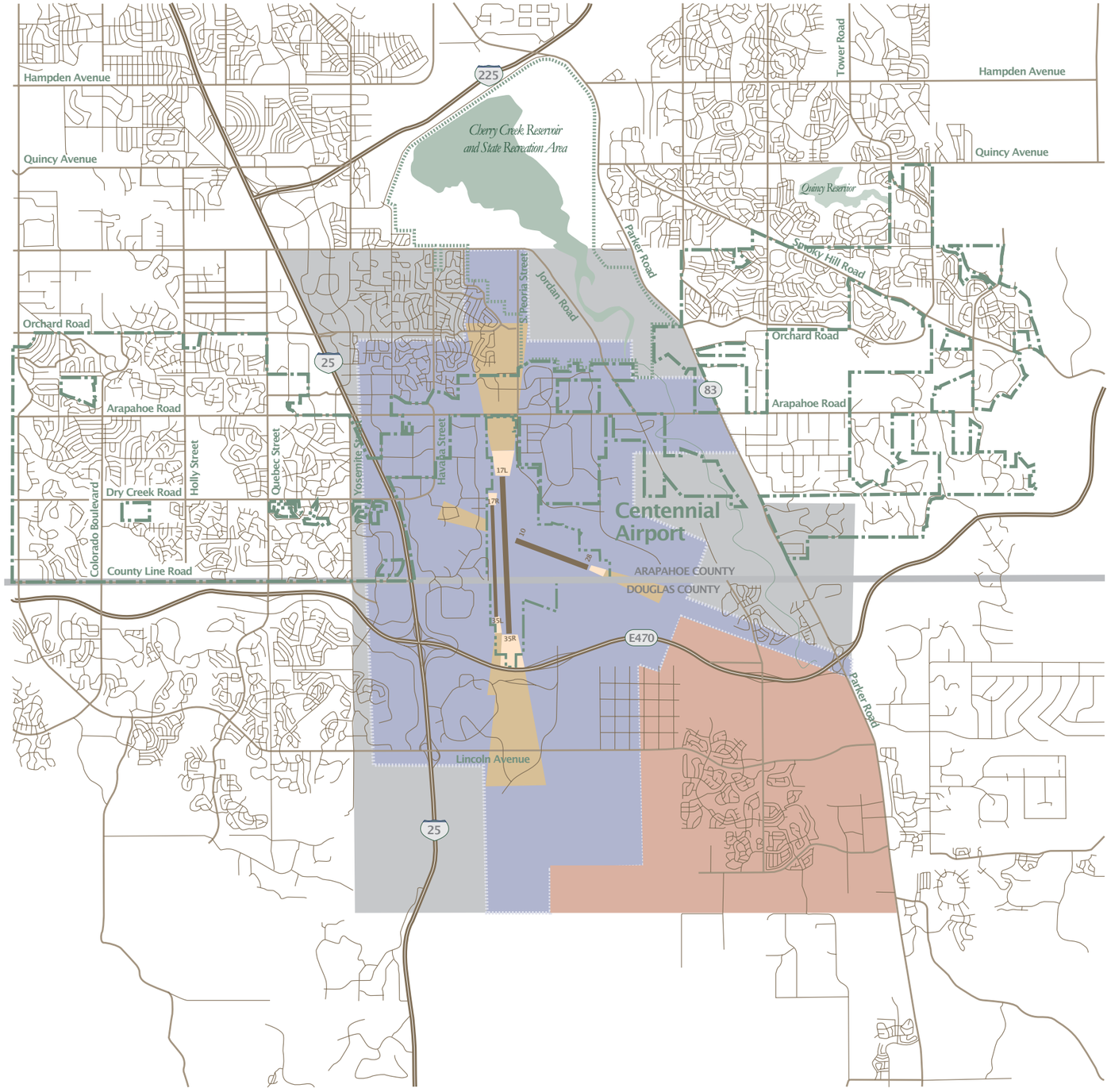


Figure A3 ***Recommended Land Use Plan***

- *Airport Boundary*
- *Approach Zones*
- *Traffic Pattern Area*
- *Clear Zones*
- *Airport Influence Area*
- *Southeast Egress/Ingress Zone*

Approximate Scale 1"=8,000'

Centennial Airport

FAR Part 150 Noise Exposure & Land Use Compatibility Study Program

Source: *Base Map, Landiscor Aerial Information - 1998.*

The Airport has also established a Traffic Pattern Area which indicates areas that are subject to very frequent, low-flying aircraft. The recommendations of the Land Use Guideline prohibit new residential and other noise sensitive development within the traffic Pattern Area and restricts building height to comply with FAR Part 77. This area was recommended for expansion in the Study based on more definitive flight track information obtained from radar.

Airport Physical Facilities

As stated earlier, the Airport currently consists of two parallel runways, Runway 17L/35R and Runway 17R/35L and a crosswind runway, Runway 10/28. Runway 17L/35R is the longest runway, 10,001 feet in length and 100 feet in width. Runway 17R/35L is 700 feet to the west and is 7,003 feet in length and 75 feet in width. Runway 10/28 is 4,903 feet in length and 62 feet in width. The west threshold is approximately 750 feet east of Runway 17L/35R, at about the midpoint of that runway. All of the runways have a parallel taxiway associated with them, although aircraft using Runway 17R/35L must cross Runway 17L/35R on one of the connecting taxiways to get to or from the hangar area. The majority of the landside facilities are located in the northeast quadrant of the airport, north of Runway 10/28 and east of Runway 17L/35R. These consist of T-hangars, corporate hangars, FBO hangars and other aviation related structures. The airport has a twenty-four hour Air Traffic Control Tower, which is also located in the northeast quadrant of the airport. Major ground access is provided by South Peoria Street off of Arapahoe Road (State Highway 88), which is just to the north of the airport. Access from the south is provided by Peoria and E470.

Air Traffic Operations Activity

Centennial Airport has shown steady growth in operations, as a trend and considering normal fluctuations, over the past several years. As shown in the following table, overall operations (an operation is either a take-off or a landing) have increased from approximately 365,000 in 1990 to approximately 466,000 in 1998.

Table A1
SUMMARY OF HISTORICAL OPERATIONS, 1992-1998
Centennial Airport FAR Part 150 Study

Year	Operations
1987-91 Average	364,999
1992	376,417
1993	415,453
1994	422,463
1995	402,325
1996	359,704
1997	408,602
1998	466,267
1999	157,510*

* Through May, 1999
Source: Airport Activity Reports

There are no historical records of aircraft operations by type of aircraft for the airport. However, the *Centennial Airport Noise and Land Use Study* discussed above presented a breakdown of aircraft operations by aircraft type for the period July 1, 1994 to June 30, 1995. Combining both itinerant and local aircraft operations, the report presented the following breakdown. Stage 3 business jets accounted for approximately four (4) percent of the total operations, Stage 2 business jets approximately two (2) percent, turboprop piston aircraft approximately five (5) percent, piston aircraft approximately eighty-eight (88) percent and helicopters approximately one (1) percent

Airspace/Air Traffic Control

The Federal Aviation Administration is responsible for the safe and efficient use of the national air space. This airspace is divided into three specific types; enroute, terminal and tower. When an aircraft departs an airport it is located in the airspace being handled by air traffic controllers working in an air traffic control tower. When the aircraft is approximately five miles away from the Airport, the aircraft is handed off to controllers working the Terminal Radar Approach Control Facility (TRACON). These controllers are responsible for the airspace extending out twenty-five to thirty miles from the Airport in all directions. The aircraft then enters the third type of airspace and becomes the responsibility of enroute controllers working in an Air Route Traffic Control Center (ARTCC). The enroute controllers retain control until the aircraft nears it intended destination. The process is then reversed for landings.

Airspace

Local airspace surrounding Centennial Airport is designated as Class D airspace. The configuration of each Class D airspace is tailored to the individual airport. Generally, Class D airspace consists of the immediate airspace within a horizontal radius of five statute miles from the geographic center of airports with control towers and extends from the surface up to an altitude of approximately 2,500 feet above ground level. The ceiling of the Class D airspace at Centennial Airport extends up to but not including 8,000 feet AMSL. Class D airspace is in effect whenever the ATCT at an airport is operational (24 hours a day at Centennial Airport). In order to operate on the airport or within Class D airspace, pilots must establish two-way radio communications with air traffic control personnel.

There is an area of Class E airspace defined as *that airspace extending upward from the surface within 2.5 miles each side of the 178 degree bearing from the Centennial Airport extending form the 4.4 mile radius to 14 miles south of the airport and within two miles each side of the 111 degree bearing from the Centennial Airport extending from the 4.4 mile radius to 4.8 miles southeast of the airport. This Class E airspace area is effective during the specific dates and time established in advance by a Notice to Airmen. The effective dates and times will thereafter be continuously published in the Airport/Facility Directory*. FAA Order 7400.9F

The primary airspace influence in the vicinity of Centennial Airport is the Denver Class B Airspace, which is irregularly shaped and extends in concentric circles around Denver International Airport. The Denver Class B Airspace consists of controlled airspace extending upward from various floor elevations to a ceiling of 12,000 feet AMSL, within which all aircraft are subject to specific operating rules (an ATC clearance must be obtained to enter the airspace) and specified requirements on pilot qualifications (a pilot must have a private pilot certificate or better) and aircraft equipment (a transponder with automatic altitude reporting and a two-way radio). Centennial Airport is beneath the Denver Class B Airspace in an area where the Class B Airspace has a floor of 8,000 feet.

Military airports, military operations areas, and restricted areas can also impact airspace use in the vicinity of a civil airport. There is only one military airport within a 30-nautical mile (NM) radius of Centennial Airport, Buckley Air National Guard Base (ANGB). Buckley ANGB is located approximately 9-NM northeast of Centennial Airport. There are no Military Operations Areas (MOAs) or Restricted Areas in the vicinity of Centennial Airport.

According to FAA personnel, there are no static routes used when routing aircraft into and out of Centennial Airport. Air traffic controllers use random vectors depending upon existing traffic, wind and weather conditions at the time, which is know as dynamic routing. When conditions permit, IFR aircraft are cleared direct to their approved flight plan as soon as possible. During periods of heavy traffic around Denver International, aircraft into and out of Centennial may be routed around Denver before being cleared to their final destination. Due to terrain constraints to the west and south of Centennial Airport, aircraft are not directly routed in these directions until they attain sufficient altitude to clear the mountains. IFR flights into and out of Centennial Airport are, by agreement, controlled by Denver TRACON for departure and arrival control from a distance of approximately four nautical miles (NM) from the end of the runways out to a distance of fifteen NM from the airport. Beyond the fifteen mile radius, IFR aircraft above 12,000 feet mean sea level (MSL) are controlled from Denver Center for routing to their final destination.

Navigational Aids

A variety of navigational facilities are currently available to pilots around Centennial Airport, whether located at the airport or at other locations in the region. Many of these navigational aids are available to enroute air traffic as well. In addition, there is a compliment of navigational aids (NAVAIDS) that allow a variety of instrument approaches to the airport.

Airport and regional navigational and landing aids available for Centennial Airport include an Instrument Landing System (ILS), a VHF Omnidirectional Range/with Distance Measuring Equipment (VOR/DME), and Area Navigation (RNAV).

Presently, there are three published instrument approach procedures at Centennial Airport. These are listed in the following table, Table A2, entitled *INSTRUMENT APPROACH PROCEDURES*.

Table A2
INSTRUMENT APPROACH PROCEDURES
Centennial Airport FAR Part 150 Study

Approach	Designated Runway(s)	**Ceiling** Minimum	**Visibility** Minimums[1]
ILS	Runway 35R	200 Feet (AGL)	½ Mile
VOR/DME	Runway 28	610 Feet (AGL)	1 - 2 Miles
RNAV or GPS			
NDB or GPS	Runway 35R	997 Feet (AGL)	¾ -2 ¾ Miles

Source: U.S. Terminal Procedures, Southwest (SW) Vol. 1 of 2.
1 Depending on category of aircraft.

As stated above, Centennial Airport has a twenty-four hour, continuously operating Air Traffic Control Tower (ATCT) that has a designated Airport Traffic Area (ATA). Aircraft which operate within an ATA must be in contact, at all times, with the tower controllers, especially to receive approval for take-offs and landings. Standard ATA's are designated to include all airspace within five miles of the Airport from the surface of the ground up to (but not including) 3,000 feet.

ANOMS© Radar Data

Denver International Airport has a flight track data collection and analysis program called ANOMS© (Airport Noise and Operational Monitoring System). This program collects and processes radar data from the FAA's ARTS (Aircraft Radar Tracking System). Once collected, the ANOMS© program performs a number of processes, including determining if the track is a departure or arrival and assigning a runway to the track. Operations from Centennial Airport are generally collected by this system. These are classified as overflights.

The ANOMS© program exports a file that consists of flight information about the aircraft that is operating on each track and position information as to the location of the flight. The flight information includes data such as the ARTS aircraft type, ARTS airline code, flight number, and type of operation and runway. The position information includes the X and Y position of each radar strike for the flight track for every four seconds of the flight as well as the altitude of the aircraft at each point and the time that the aircraft was at that point. The position information is given in distance relative to the ARTS radar antenna that is on the Airport property.

These files can be exported to the Consultants Bridge Reports programs for analysis on the Centennial Airport. The software will then reassign the operation as a departure or arrival as well as the runway. Note that the data used is based upon the information from ANOMS©, which is derived from the FAA's radar system. It does not get radar data for all aircraft. Generally this is for the larger aircraft that are flying in instrument flight rules. Aircraft in the local pattern are not available in this data. The Consultant will collect radar data for the period of time of the noise measurement survey, as well as other random periods throughout the year.

Current Noise Abatement Program

Centennial Airport has a long history of addressing noise abatement programs. These programs include voluntary IFR noise abatement procedures, voluntary VFR noise abatement procedures, helicopter noise abatement procedures, nighttime preferential runway use, land use development guidelines, and a pilot awareness program.

The voluntary IFR noise abatement procedures are as follows:

- For aircraft departing Runway 17L continue to fly 150 degrees, runway heading or 190 degrees for 4 DME, then turn on course. Due to antennae placement , 4 DME places the aircraft approximately two miles south of the airport.
- Aircraft arriving from the north are kept higher for longer periods of time. Aircraft are kept at or above 8,000 MSL as they turn to the airport. When aircraft turn to the airport, they are generally around the Cherry Creek Reservoir.

VFR pilots operating at Centennial Airport are asked to avoid the following long-standing residential areas: Cherry Creek Area, just north of the airport, Grandview Estates area to the southeast of the airport, and the Cottonwood area east of the airport.

There are four arrival and departure routes for helicopters. These routes are intended to separate rotor aircraft and fixed wing aircraft from flying the same routes and places helicopters away from residential areas. The four main routes are; the Reservoir Route, the Arapahoe Route, the Bronco Bubble Route and the Lincoln Route.

The nighttime preferential runway use program is designed to minimize overflights over the populated area just north of the airport. The procedure states: between 10:00 pm (2200L) and 6:00 am (0600L) aircraft are requested to use Runway 35 for arrivals and Runway 17 for departures, but only if there is a tailwind component less than 6 knots and a crosswind component less than 20 knots.

The airport has established a set of Land Use Guidelines that define the Airport Influence Area, Restricted Development Area, Buffer Aones, Approach Zones and Runway Protection Zones for each of the three runways. It must be remembered that these are just guidelines and the Airport Authority has no land use control authority. It is up to the local jurisdictions to adopt and implement the same or similar guidelines.

- Airport Influence Area: Refers all plats and development plans to the Airport Authority for review. Comply with FAR Part 77. Requires an Avigation Easement by landowner and Public Disclosure to prospective buyers and tenants. Residential and other noise sensitive development requires a 7-day noise test and development is prohibited/not recommended in areas at DNL 65 or above.

- Restricted Development Area: Prohibit new residential and other noise sensitive development. Building height must comply with FAR Part 77 surface criteria, existing or future, whichever is more restrictive.
- Buffer Zone: Recommend no new residential or other noise sensitive development. Governmental entity with zoning and building permit authority to develop specific restrictions.
- Approach Zone: Prohibit new residential and other noise sensitive development. Building height must comply with FAR Part 77 surface criteria, existing or future, which ever is more restrictive.
- Runway Protection Zone: No structures permitted.

Noise Complaint History

The Centennial Airport Operations Department operates a noise complaint hotline. The purpose of the complaint hotline is to provide the public with a means of contacting the airport concerning aircraft noise and giving airport staff insight into the issues that are important to the community. Citizens may call concerning particular incidents.

A recent sampling of the noise complaint data, which has been collected since 1995, has been reviewed in order to help identify current issues that are important to citizens that have contacted the hotline. The noise complaint calls received between January 2nd, 1998 and April 22nd, 1999 were obtained from the airport in electronic format. The complaint data were then processed in order to GEO code each complaint address for mapping purposes, to categorize the complaints and to correlate the complaint data with flight track data during the time period that flight track data is being analyzed.

The complaint data have been analyzed according to several variables: hour of the day, the day of week, daytime-nighttime split, and location for each call. The hotline calls received between January 2nd, 1998 and April 22nd, 1999 are summarized in the following tables and figure.

Table A3 presents the number of calls by hour of the day during this 16-month time frame. The hour with the highest number of calls is at 6 a.m. and the next highest hours are 7 a.m. and 4 p.m. These hours correspond to times that most people are at home.

For that same period, Figure A4 presents a plot of the location of the noise complaints. Please note that not all callers provide an address, or sufficient

information for which an exact position can be determined. This map displays only those calls for which the location can be determined.

Table A3
TOTAL HOTLINE CALLS, per hour of the day
Centennial Airport FAR Part 150 Study

Hour of Day	Total Calls	Percent of Total
12:00 AM	112	1.1%
1:00 AM	35	0.4%
2:00 AM	49	0.5%
3:00 AM	104	1.0%
4:00 AM	170	1.7%
5:00 AM	161	1.6%
6:00 AM	759	7.6%
7:00 AM	670	6.7%
8:00 AM	641	6.4%
9:00 AM	608	6.1%
10:00 AM	627	6.3%
11:00 AM	578	5.8%
12:00 PM	559	5.6%
1:00 PM	529	5.3%
2:00 PM	583	5.8%
3:00 PM	551	5.5%
4:00 PM	642	6.4%
5:00 PM	549	5.5%
6:00 PM	548	5.5%
7:00 PM	384	3.8%
8:00 PM	312	3.1%
9:00 PM	338	3.4%
10:00 PM	270	2.7%
11:00 PM	212	2.1%
Total	9,991	100.0%

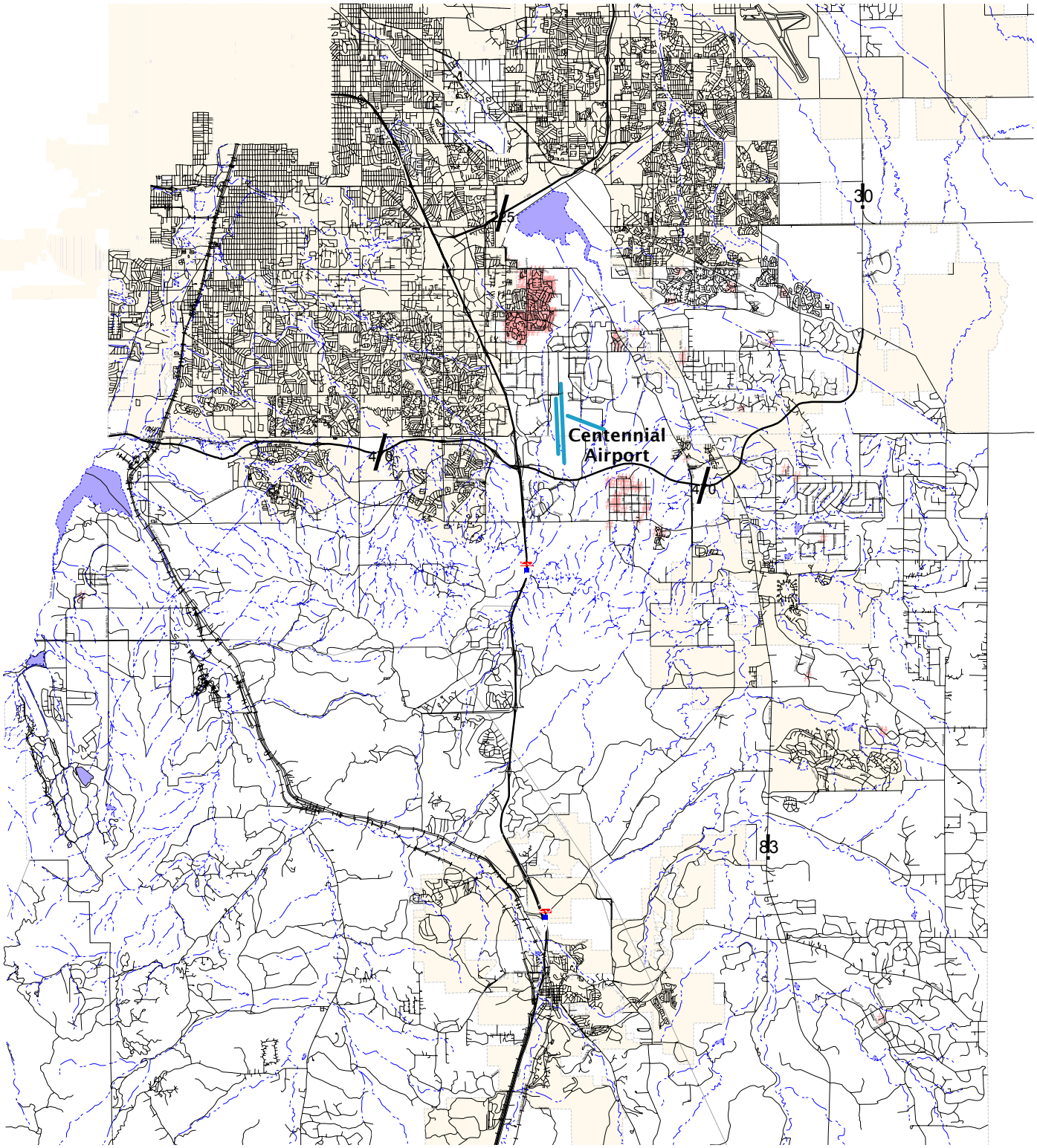


Figure A4 **Noise Complaint Map**

● Noise Complaint Locations

Centennial Airport

FAR Part 150 Noise Exposure
& Land Use Compatibility
Study Program

Table A4 presents the number of calls per day of the week. Typically one expects more calls during weekends, but that is not the case for Centennial. All days are about equal, with Thursday having the highest number of calls and Saturday the lowest. This is most likely due to lower corporate jet operations on the weekends.

Table A4
TOTAL HOTLINE CALLS per day of the week
Centennial Airport FAR Part 150 Study

Day of Week	Total Calls	Percent of Total
Sunday	1,149	11.5%
Monday	1,390	13.9%
Tuesday	1,701	17.0%
Wednesday	1,765	17.7%
Thursday	1,956	19.6%
Friday	1,265	12.7%
Saturday	765	7.7%
Total	9,991	100.0%

Table A5 lists the number of noise complaints by the month received. The data is further broken down by the number of complaints that were received during the daytime hours (6:00 a.m. to 10:00 p.m.) and the number received during the nighttime hours (10:00 p.m. to 6:00 a.m.). The data shows that the number of complaints rise noticeably during the spring and summer months. This rise is normally due to fact that during warmer weather, windows are kept open more often and more time is spent outdoors. These factors cause people to notice more flight operations then when spending time inside the home with the windows closed.

Table A6 lists the total number of noise complaints received between January 1998 and April 1999 by the community from which they came. As would be expected, the greatest number of complaints originate from the communities located closest to the airport. The greatest number came from the neighborhoods located to the northwest of the airport (3,614), the second greatest number came from the neighborhoods directly to the north (2,837), while the third greatest number came from the neighborhoods to the southeast (1,037).

Table A5
NOISE COMPLAINTS BY MONTH (1998)
Centennial Airport FAR Part 150 Study

Month	Daytime Complaints	Nighttime Complaints	Total Complaints
January	130	13	143
February	303	30	333
March	660	53	713
April	1,090	93	1,183
May	797	152	949
June	503	72	575
July	1,285	125	1,410
August	1,085	114	1,199
September	613	124	737
October	326	48	374
November	302	53	355
December	300	8	308
Totals	**7,394**	**885**	**8,279**

Table A6
NOISE COMPLAINTS BY COMMUNITY (1998)
Centennial Airport FAR Part 150 Study

Zone	Subdivision	Complaints
East	Antelope	2
	Chapparal	1
	Chennango	1
	Cottonwood	3
North	Cherry Creek Hills	187
	Cherry Creek Village	194
	Cherry Creek Vista	1,881
	Greenwood Gardens	74
	Hills East	460
	Village on the Lake	1
	Vintage	40
Northeast	Algonquine Acres	4
	Piney Creek	26
	Smokey Hill	6
	Villas at Valley	52
Northwest	Arapahoe Lakes	200
	Cherry Creek Farms	43
	Orchard Gate	528
	Sundance Hills	2,843
Southeast	Grandview Estates	601
	Pinewood Knoll	280
	Stonegate	156
Southwest	Acres Green	43
	Lone Tree	7
West	Foxridge	9
	Hillcrest	1
	Hunters Hill	25
	Walnut Hills	157
	Willow Creek	152

Table A6 (cont.)
NOISE COMPLAINTS BY COMMUNITY
Centennial Airport FAR Part 150 Study

Zone	Subdivision	Complaints
Zone 2	Pinery	12
	Ponderosa Hills	20
	Unknown Aurora	26
	Unknown Castle Rock	2
	Unknown Denver	39
	Unknown Englewood	61
	Unknown Greenwood	13
	Unknown Littleton	83
	Unknown Parker	39
	Wild Cat Ridge	8
Total		8,280

Airport Environs

Centennial Airport is not within the city limits of any incorporated community. Several incorporated communities are, or could be, influenced by noise associated with aircraft operations at Centennial Airport. These include Greenwood Village, Aurora, Parker and Lone Tree, along with portions of unincorporated Arapahoe and Douglas Counties.

Existing Land Use. Centennial Airport is located in Arapahoe and Douglas Counties, in the southern portion of the Denver Metropolitan Area. The airport is surrounded by unincorporated and incorporated communities. Within the airport environs, there are several incorporated communities that are influenced by the airport and aircraft operations. These communities are indicated on Figure A5, *GENERALIZED EXISTING LAND USE,* along with generalized existing land use. A more detailed land use analysis will be presented for the area within each of the noise contours that will be generated in subsequent chapters.

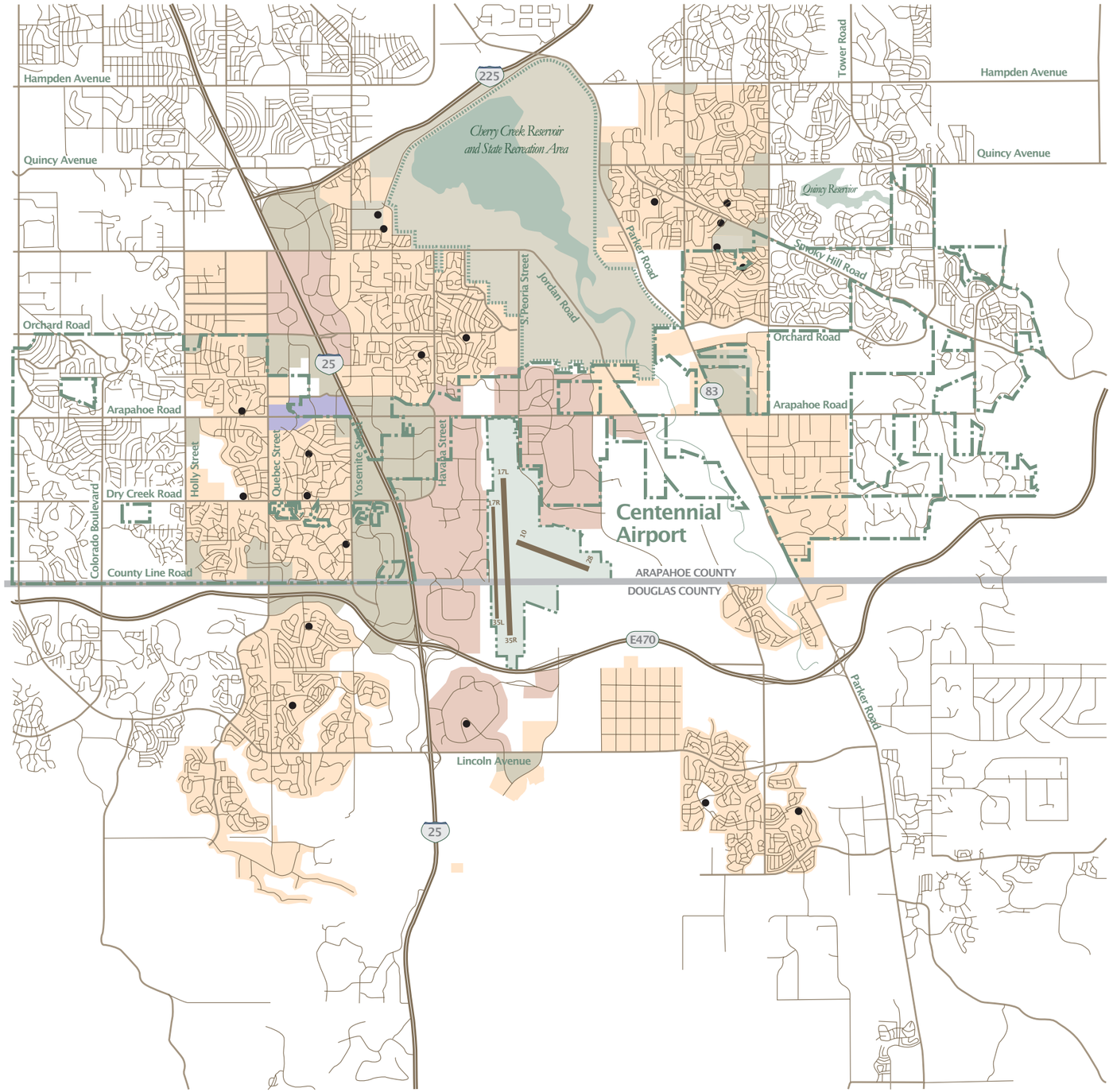


Figure A5 ***Generalized Existing Land Use***

- *Airport Boundary*
- *Airport*
- *Residential*
- *Mixed Non-Residential*
- *Commercial Retail*
- *Business/Office Park*
- *Public Use*
- *Schools*
- *With Stage 2 Ban*
- *Without Stage 2 Ban*

Approximate Scale 1"=8,000'

Centennial Airport

FAR Part 150 Noise Exposure & Land Use Compatibility Study Program

Source: *Base Map, Aerial Information, June - 2001.*

Interstate 25 is approximately one mile west of the airport and E-470 is on the southern boundary of the airport. Arapahoe Road is on the northern boundary of the airport. Generally speaking, the area north of the airport presently is more densely developed than the area south of the airport, although development is rapidly occurring in all directions. Existing land use to the north of the airport is a mixture of commercial/retail/office development along Arapahoe Road and higher density similar uses along I-25. East of I-25 and north of Arapahoe Road are several medium to high density residential developments, with associated schools and churches. Directly north/northeast of the airport beyond the residential development is Cherry Creek Reservoir and it's associated recreation area. Northeast of the airport south of Arapahoe Road is mostly business park development to the intersection with Parker Road. North of Arapahoe Road closest to the airport is business/industrial development, with residential development farther east to the intersection of Parker Road. Extensive residential development occurs northeast and southeast of the intersection of Arapahoe Road and Parker Road.

The area immediately east and southeast of the airport is relatively undeveloped up to both E-470 and Parker Road except for an area of relatively dense residential development just beyond the northwest intersection of Parker Road and E-470. The southeast intersection of Parker Road and E-470, and beyond, is composed mostly of both large lot and small lot residential development with associated ancillary development. South of E-470 and west of Parker Road, to the southeast of the airport, is dense residential development and large lot residential development, with associated schools and churches. Directly south of the airport and south of E-470 is undeveloped except for office park development on the southeast interchange of I-25 and E-470. To the southwest of the airport, west of I-25 and south of E-470 are areas of large lot residential development, although dense residential development is occurring west of the interstate between E-470 and approximately Lincoln Avenue.

West and northwest of the airport, along the I-25 corridor are intense business, commercial and retail developments from E-470 on the south to I-225 on the north. The Denver Technological Center is located in this corridor. West of the interstate are predominantly residentially developed areas with ancillary commercial and retail support uses.

In summary, there are significant areas of existing, and some potential, residential non-compatible land uses within the immediate airport environs. The vast majority of these residential units are single family homes, with some multi-family structures. There are no known mobile homes parks within the immediate airport environs. However, close-in to the airport and immediately adjacent

airport boundary is compatible business/industrial/office type development. Cherry Creek Reservoir and the adjacent recreation area may present future Section 4(f) issues concerning significant flight track changes.

Future Land Use. Each of the jurisdictions within the vicinity of Centennial Airport have adopted future land use plans or guidelines to help guide land use development within their respective jurisdictions.

City of Greenwood Village

Greenwood Village is generally located north and northwest of the Airport The majority of the community is located west of Interstate 25. The city limits are generally defined as Belleview Avenue to I-255 on the north, Havana Street to Orchard Road on the east, then Dayton Street to Arapahoe Road on the southeast to Quebec Street then north to Orchard Road, then west to approximately one mile west of University. The City of Greenwood Village adopted a Comprehensive Plan in 1991. The Plan is generally a policy driven plan to guide future development.

The focus of the Plan is mainly oriented toward the preservation and encouragement of quality residential development. The Future Land Use Section states:

> "Greenwood Village resolves to accept reasonable growth in an orderly manner consistent with the low density, open space concept that is supported by its citizens. Sound principles of urban design are embraced by the City when reviewing development. That is, the form of the City, aesthetic considerations, functional inter-relationships of land uses, and community identity all should be considered when reviewing the merits of growth proposals."

In addition to this general statement concerning future land use development, there are several development goals;

1. Promote a compatible and functional system of land uses.
2. Promote superior site utilization through regulation and site plan review.
3. The neighborhood is recognized as the basic social and service unit of the City.
4. Promote the creation of a unique City identity by encouraging such features as coordinated City boundary markers on streets and trails, and distinctive street lighting.

The Plan does not contain any direct policy statements or goals addressing the airport or development within the airport environs.

City of Aurora

Aurora is generally located north/northeast of the airport, with the southwest boundary of the City generally being Parker Road to Belleview Avenue. In addition, there is an unattached area of the City directly east of the airport south of Arapahoe Road between Jordan Road and Parker Road. The City of Aurora adopted the City of Aurora Comprehensive Plan in January, 1998. The Plan is both a policy and physical plan. The Plan does address airports, compatible land use and noise issues, as the City is affected by Denver International Airport, Buckley Air National Guard, Front Range Airport and Centennial Airport.

Included in the Environmental Quality Section of the Plan, Noise is addressed as follows;

> "Noise is an important environmental and land use issue. Airport and automobile noise can negatively impact land use and, in particular, residential area. Note Map 4 in Chapter 5 for areas impact by aviation noise.
>
> Opportunities
>
> - The city has taken a proactive approach to protecting residential land uses from excessive airport noise by using zoning controls which prohibit this development in high noise areas. In locations of moderate noise, additional building code regulations for noise insulation apply to new construction."

The Plan also addresses Noise Sensitive Areas in conjunction with Map 4 in Chapter 5.

> "The zoning ordinance defines various areas that are subject to development restrictions because of their proximity to airport noise flight corridors. Map 4 on the following page illustrates the Airport Noise Sectors.
>
> As development encroaches around airports, including DIA, Buckley Air National Guard (ANG), Front Range Airport, and Centennial Airport, concerns about noise impacts on land use increase.

Recommendations

Aurora needs to continue to proactively work with airports in and adjacent to the city to effectively plan for the location of noise corridors so that prime development areas are not impacted.
Procedures for designing neighborhoods and streets should include methods for mitigating the noise impacts of traffic on streets and highways."

Town of Parker

The Town of Parker is located east/southeast of the airport generally south of the Arapahoe/Douglas County line, on both sides of Parker Road, west to approximately half the distance between Parker Road and I-25. The Town adopted a Master Plan in 1997. The Plan is both a policy and physical plan for future development.

Under the Land Use and Development Chapter of the Plan, it states;

> "Parker is fortunate today that a majority of the Town has not been developed. There currently exists the opportunity to guide and direct quality growth, reinforcing this area as a desirable place to live, work and play…… Parker should take full advantage of this opportunity to start with a clean slate in terms of land use and development, and take the initiative to guide and direct growth to achieve all of the goals and objectives set forth by this community."

The Plan graphically illustrates the intended land use pattern for the community for the next twenty years. The Plan addresses Centennial Airport in the Transportation Chapter and makes the following statement;

> "An area surrounding Centennial Airport has been defined within which major impacts of airport operations will occur. The Airport Influence Area (AIA) in the Parker area includes the area two miles south of Lincoln Avenue and west of Parker Road. Land-Use Guidelines have been prepared which recommend certain limitations to development in this area. These guidelines generally discourage or prohibit residential uses and restrict building heights within further defined areas of the AIA for noise and safety reasons. Avigation easements are requested on any development with the AIA."

The Plan contains Goals and Policies that address the airport and compatibility issues;

Goal:

- Ensure compatibility among transportation systems, surrounding land uses, and environmental conditions.

Centennial Airport Policies

1. The Town will be involved in airport planing, flight paths, and noise abatement procedures.
2. The Town will continue to monitor expansion plans and activities at Centennial Airport. Appropriate action will be taken when the Town's residents and businesses may be adversely affected by proposed expansion.
3. Development proposals within the AIA of Centennial Airport shall be consistent with the land use guidelines established for the AIA. The Town will work with the Airport Authority to ensure consistency with these guidelines.
4. The Town shall require avigation easements for development within the AIA and easements will be required as part of the platting process.

City of Lone Tree

The City of Lone Tree is located southwest of the Airport, in Douglas County. The city limits generally coincide with the Arapahoe/Douglas County line on the north, Yosemite Street on the east, Lincoln Avenue on the south and Quebec Street on the west. It appears that the City adopted the City of Lone Tree Comprehensive Plan in 1997. The Plan is a policy and physical plan, with Transportation/Centennial Airport policies very similar to the Town of Parker.

The Transportation Chapter contains the following statement;

> "Land surrounding Centennial Airport is an area within which major impacts of airport operations may occur. The Airport Influence Area (AIA) in the Lone Tree vicinity includes an area south of Lincoln Avenue and east of I-25. New Land-Use Guidelines are being prepared that will recommend certain limitations to development in this area. These guidelines are apt to discourage or prohibit residential uses and restrict building heights within further defined areas of the AIA for noise and safety reasons."

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Goal:

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Centennial Airport Policies

1. The City will be involved in airport planing, flight paths, and noise abatement procedures.
2. The City should monitor expansion plans and activities at Centennial Airport. Appropriate action shall be taken when the City's residents and businesses will be adversely affected by proposed expansion.
3. Development proposals within the AIA of Centennial Airport shall be consistent with the land use guidelines established for the AIA. The City should work with the Airport Authority to ensure consistency with these guidelines.

Arapahoe County

Arapahoe County is located in the northern half of the airport, with unincorporated portions of the county surrounding the airport to the north, east and west. The southern half of the airport and the unincorporated area to the south is within the jurisdiction of Douglas County. Arapahoe County adopted the Arapahoe County Comprehensive Plan in 1985 with amendments through 1994. The Plan is generally a policy plan, which identifies goals and policies to guide future land use development.

The Plan addresses airports and airport noise in two chapters, Transportation and Environmental Quality. In the Transportation Chapter, the following statement concerning Centennial Airport can be found;

> "Centennial Airport is recognized as one of the largest and busiest general aviation airports in the northwest Rocky Mountain region. It is now acquiring additional land and expanding its facilities in conformance with its 1981 Master Plan.

All airports affect surrounding land uses because of their need for large areas of land, adequate ground access, plus the problems of plane noises and potential crash hazards. Residential uses and tall buildings are discouraged within each airport's influence area. As a result, office, commercial, and industrial uses are usually recommended for avigation impact areas, as determined by an airport's day/night average sound levels (Ldn) contours, accident potential zones (APZ), and runway configuration."

Long Term Objective

"To ensure compatibility between airport operations and vicinity land uses."

Policy

"**The County should continue to work with each individual airport to establish and support airport influence area land use guidelines.** Each airport listed above {Centennial, Front Range and Buckley ANG Base} has a unique set of facility users, runway patterns, and noise contours. These differences should be recognized and planned for. As further plans are finalized for each airport, the Comprehensive Plan should be reviewed for compatibility and amended as appropriate."

The Environmental Quality Chapter contains the following objective and policies concerning aircraft noise;

Long Term Objective

"To protect, preserve, and promote peace and quiet for its citizens through the reduction control, and prevention of noise.

Policies

1. **The County should investigate maximum noise levels, land use standards, and mitigation methods to guide land use decisions in reducing noise impacts.** Noise abatement and mitigation techniques, including the use of noise barriers such as landscaping and fences, the appropriate modification of the County building and zoning codes, and establishment of noise abatement programs for high-noise generating areas such as the airport and along freeways and arterial streets, should be explored.

2. **Conversions of nonresidential zoning to residential zoning should be strongly discouraged where noise levels equal or exceed Ldn 65**. Particular attention should be paid to the locations relationship between high-noise generating activities (industrial operations and transportation facilities) and noise sensitive uses (housing, schools, parks, and hospitals).
3. **Existing undeveloped residential zoning should be developed only if the planned buildings will demonstrate an interior noise level not to exceed Ldn 45 given maximum forecasted exterior noise levels.** Noise measurement and soundproofing techniques, developed for land uses near airports, are available to help anticipate potential problems before they occur.

Douglas County

Douglas County is located in the southern half of the airport, and has jurisdiction over the unincorporated areas south of the airport. The northern half of the airport and the unincorporated area to the north is within the jurisdiction of Arapahoe County. Douglas County adopted the Douglas County Master Plan in 1992 with amendments through 1998. The Plan is generally a policy plan, which identifies goals and policies to guide future land use development, along with a future land use map.

The Plan addresses airports and airport noise in several chapters, ***Land Use, Transportation and Natural Environment.*** There is a section which addresses Centennial Airport, called the Centennial Airport Review Area, under Land Use which states;

> "An area surrounding Centennial Airport has been identified as a location where impacts of airport operations could occur. The Centennial Airport Review Area (CARA) is bounded roughly by Castle Rock to the south, Lone Tree to the west, Parker to the east, and County Line Road to the north. Within this general area, Land-Use Guidelines have been developed to encourage compatibility of land uses and airport operations. These guidelines generally discourage residential uses in areas closer to the airport, and restrict building height for safety reasons. Avigation easements are required by the County for any development within the CARA."

Policies: Centennial Airport Review Area

1. Development proposals within the CARA shall conform to the Land-Use Guidelines established for the CARA. Through the development-review referral process, the County will work with developers and the FAA to ensure conformance with these guidelines.
2. The County shall require avigation easements for development within the CARA. These easements should be noted on plats.

In the Transportation Chapter, there is a specific reference to Centennial Airport under the heading Airports.

> "Centennial Airport (formerly the Arapahoe County Airport) is located at the Douglas-Arapahoe County line, approximately one mile east of I-25. The airport provides facilities and services for general aviation aircraft and is a general aviation reliever for Stapleton International Airport in Denver. The airport is owned and operated by the Arapahoe County Public Airport Authority.
>
> General aviation activity in the Denver metro area has steadily increased in recent years and is expected to increase in the future. Centennial Airport is expected to absorb its share of this increased general aviation activity. To meet projected aviation demands in the area, expansion of airport facilities is proposed by the Authority. The service area of Centennial Airport includes Douglas County. The operational and expansion plans of Centennial Airport and the potential impacts of such operations and plans are a concern to County residents and officials. (For policies related to Centennial Airport, see the Centennial Airport Review Area, Section 2, Chapter 3.)"

The Natural Environment Chapter contains specific reference to Noise.

> "As Douglas County's population increases, noise will become a greater problem for all County residents. The effects of noise on health are both physiological and psychological, though primarily psychological. Consequently, governmental agencies have established limits of noise volume and duration. Exposure above these limits can result in hearing damage. The five principal sources of noise affecting Douglas Count residents area as follows:
>
> - Airports or heliports
> - Vehicular noise from highway traffic or off-road recreational vehicles
> - Railroads

- Industrial noise created through the fabrication, manufacturing , or processing of manufactured goods
- Noise generated by large groups of people out-of-doors

Effectively dealing with noise is complicated by the varied character and amount of noise in any particular area. In most cases, noise is a localized problem, requiring specific local land-use regulations or design solutions. Because noise is a threat to the public health, safety and welfare, land-use controls are considered a valid means of combating noise problems.

Measures which can be used to mitigate undesirable noises include:
- Abatement of noise at the source
- Buffering
- Protecting noise-sensitive uses from uses generating excessive, undesirable noise level.

These three measures can be implemented to a great extent by land-use controls or site planning measures allowable through existing Douglas County Regulations. Other areas of source noise abatement, including regulating off-road recreational vehicles or noise from industrial processes or domestic animals, may necessitate the need for other regulatory measures.
Policies: Noise

1. Land uses that generate significantly higher levels of noise than the surrounding areas may be considered incompatible, unless actions are taken that effectively mitigate noise levels. Such noise mitigation measures as adequate right-of-way width, increased setbacks, berms along streets, or solid walls or berms around industrial land uses are encouraged.

2. The use of construction materials and design techniques to reduce outside or inside noise levels are encouraged.

3. The use of existing and manmade topography or vegetation to help reduce noise levels are encouraged.

4. The creation of residential subdivision covenants that limit or prohibit activities producing excessive or annoying noise is encouraged.

5. For land uses or activities generating excessive or annoying noise levels, noise studies that address noise levels and mitigation techniques may be required."

Zoning. All of the jurisdictions in the vicinity of Centennial Airport have adopted traditional land use zoning ordinances to control the types of land uses on specific parcels. The ordinances divide a jurisdiction into districts and prescribe certain requirements for allowable uses within those districts. The various zoning codes pertaining to airport related activities, are presented in the following paragraphs.

City of Greenwood Village

The City of Greenwood Village adopted an ordinance and map in 1995, amended in 1996. The ordinance is a typical type ordinance for a community it's size. It has several residential districts, both single family and multi-family residential along with several business districts. Manufactured (mobile) homes are not permitted by right in any district. There are two Commercial districts along with Open Space and Agricultural districts. The ordinance addresses noise only as it is associated with business or commercial operations. There are no airport specific requirements or conditions contained in the ordinance.

City of Aurora

The City of Aurora adopted an ordinance and map, as amended, in 1998. The ordinance is a typical ordinance, with a variety of zoning districts, including manufactured housing districts. In addition to the base zoning ordinance, the City has adopted a variety of overlay zones that address airports; Buckley ANG Base, Stapleton and "the new international airport", and Centennial and Front Range Airports. The section for Centennial Airport was adopted in 1991. In addition, the code also requires and defines sound attenuation procedures for areas defined in the Airport Influence District.

The Airport Influence District for Centennial Airport is the same as recommended by Centennial Airport. The City refers development plans to the airport for comment. An avigation easement is obtained from the developer and recorded with the County. New residential development is not allowed within the 60 DNL contour. Air conditioning and 25 decibel sound attenuation are required for residential development in the 55 to 60 DNL contour. Any grandfathered residential inside the 60 DNL contour, 30 decibels of noise reduction construction and air conditioning are required. The avigation easement is required at time of sale. Sellers are required to provide a noise notice to property buyers. The City has also adopted FAR Part 77 height hazard restrictions.

Town of Parker

The Town of Parker adopted an ordinance and map in 1998. The ordinance is a typical ordinance with several development districts ranging from residential through industrial, including agricultural. The ordinance does include a Section on Airport Regulations. The Airport regulations are a combination of FAR Part 77 height requirements and land use requirements. The section defines an Airport Influence Area, states that "acceptable land use means those nonresidential land uses by right or special review…… which are with the area of influence and are not noise sensitive; and which Parker or the Airport Authority has been granted an avigation easement", and requires an avigation easement for all areas within the Airport Influence Area. However, the ordinance does not define the boundary of the Airport Influence Area for Centennial Airport.

City of Lone Tree

The City of Lone Tree adopted an ordinance and map in 1997, with subsequent amendments. The ordinance defines land use districts including single and multi-family residential, several business/commercial districts and industrial. Mobile homes are not allowed in any of the residential districts. There is no mention of the airport or any airport related requirements.

Arapahoe County

Arapahoe County adopted an ordinance and map, as revised, in 1996, and is in the process of updating. The ordinance defines many land use districts ranging from various residential districts, business/commercial, industrial, mixed use and agricultural. The ordinance does include a manufactured/mobile home district. It also contains an Airport Influence Area overlay district. The Airport Influence Area requirements pertain to Centennial Airport, Buckley ANG Base and Front Range Airport in Adams County. The Airport Influence Area is defined on the zoning map for Arapahoe County. The requirements for Centennial Airport generally contain the following provisions: within the Airport Influence Area avigation easements are required, with a note of such on all plans and plat and compliance with FAR Part 77 requirements; within the Traffic Pattern Area requires compliance with the above plus new residential and other noise sensitive development is prohibited with building height restricted to 100 feet; within the Approach Zone requires compliance with the above plus requires a minimum 200 foot by 2,500 foot clear strip along the runway centerline extended, and building height is restricted to 50 feet; the Clear Zone is contained on airport property; within the 65 Ldn Noise Zone requires compliance with the above plus prohibits residential and other noise sensitive uses regardless of density.

Douglas County

Douglas County adopted an ordinance and map in 1994 and amended through 1998. The ordinance defines several land use districts including several residential, business/commercial, industrial, open space and agricultural. The ordinance does have a specific mobile home district. The ordinance also contains a special overlay district, the Centennial Airport Review Area. The Centennial Airport Review Area overlay zone contain two safety zones, two noise zones and general height limitations which follow FAR Part 77 criteria. In addition, the overlay zone requires the granting of an avigation easement for all development within the Centennial Airport Review Area as identified on included maps and discourages the use of land which encourages large concentrations of birds or waterfowl from within 10,000 feet of airport runways. It also prohibits landfills from within 10,000 feet of airport runways.

The two safety zones are the Runway Safety Zone (RSZ) and the Fan Safety Zone (FSZ). The Runway Safety Zone is generally along the extended centerline of the runway and generally allows certain non-noise sensitive and open space uses. The Fan Safety Zone is generally associated with the southwest end of the west runway and allows all uses allowed in the RSZ, plus industrial uses. In addition, certain restrictions apply to all uses permitted prior to adopting of this section.

The two noise zones include the Noise Sensitive Zone and the Noise Mitigation Zone. Generally, residential and other noise sensitive uses are not allowed in the Noise Sensitive Zone, and sleeping rooms in other uses shall be sound attenuated. The ordinance contains a table listing permitted and prohibited land uses by zone. The Noise Mitigation Zone allows all uses permitted in the underlying zone except outdoor amphitheaters, and sleeping rooms or other uses must be sound attenuated. Sound attenuation requirements are contained in the County Building Code.