

CHAPTER 7

AIRPORT LAYOUT PLAN

7.1 INTRODUCTION

This chapter presents the Airport Layout Plan (ALP) drawing set which has been produced as part of this Airport Master Plan process. The components of this chapter include ALP purpose, compliance with FAA design standards, revisions since the previous ALP, and reduced-sized 11x17 inserts of the drawing set as approved by Airport Staff. Additional sheets were added compared to the previous ALP set due to either FAA requirement changes or the direction of the Airport to show additional detail in areas not previously offered.

The ALP drawing set serves as a visual representation of the Airport's existing facilities and planned future development. It is also required by the FAA for Centennial Airport capital projects to be considered for future federal AIP funding, and to be compliant with the Airport's Federal Grant Assurances. The preferred alternatives and the overall development plan, along with any other facility changes that have taken place since the last ALP updated in 2008, were drawn and added to this new set of drawings. The drawing set was prepared using several FAA guidelines and checklists, which included the following:

- » FAA Advisory Circular 150/5300-13A Change 1, *Airport Design*
- » FAA Advisory Circular 150/5070-6B Change 2, *Airport Master Plans*
- » FAA ARP SOP 2.00, *Standard Procedures for FAA Review and Approval of Airport Layout Plans (ALPs)*
- » FAA ARP SOP 3.00, *Standard Procedures for FAA Review of Exhibit 'A' Airport Property Inventory Maps*

The ALP requires FAA approval, independent of the Master Plan. As such, the review of the ALP drawing set is accomplished through several intermediate steps, including reviews by Airport Staff, the FAA Airports District Office (ADO) Community Planner, and several other FAA representatives involved in the associated airspace review.

The ALP drawing set serves several needs for the Airport, Arapahoe County, Douglas County, Colorado Department of Aeronautics, and the FAA. As presented in the FAA Advisory Circular 150/5070-6B, *Airport Master Plans*, there are five primary functions of the ALP that define its purpose:

- » FAA-approved Airport Layout Plans are required to receive financial assistance under the terms of the Airport and Airway Improvement Act of 1982 (AIP). The maintenance of, and conformity to, the plan is a grant assurance requirement upon which Federal funds have been provided to APA under the AIP program and previous programs. Previous programs include the 1970 Airport Development Aid Program (ADAP) and Federal Aid Airports Program (FAAP) of 1946.
- » The Airport Layout Plans creates a blueprint for airport development by depicting proposed facility improvements that are consistent with the strategic vision of the Airport sponsor. They also provide a guideline by which the sponsor can assure that development maintains Airport design standards and safety requirements and is consistent with airport and community land use plans.
- » The Airport Layout Plans serves as a public document that is a record of aeronautical requirements, both present and future, and as a reference for community deliberations on land use proposals and budget resource planning.

- » The approved Airport Layout Plans provides the FAA with a plan for airport development. This will allow compatible planning for FAA-owned facility improvements at the Airport and help the FAA to anticipate budgetary and procedural needs. The approved ALP will also give the FAA the information it needs to ensure airspace is protected for planned facility or approach procedure improvements.
- » The Airport Layout Plans provides a working tool for use by Airport sponsor staff, including planning and development, operations, and maintenance.

7.2 AIRPORT COMPLIANCE WITH FAA DESIGN STANDARDS

The FAA provides airport design standards to ensure safe and efficient airport operations. The primary guidance is contained in FAA Advisory Circular (AC) 150/5300-13A Change 1, *Airport Design*. The master planning process also relies on numerous other FAA and Federal agency documents, including, but not limited to:

- » Code of Federal Regulation Title 14 Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*
- » FAA Advisory Circular 150/5340-30J, *Design and Installation Details for Airport Visual Aids*
- » FAA Advisory Circular 150/5340-1M, *Standards for Airport Markings*
- » FAA Order 8260.3D, *United States Standards for Terminal Instrument Procedures*
- » FAA Order 8260.19I, *Flight Procedures and Airspace*
- » FAA Order 6850.2B, *Visual Guidance Lighting Systems*
- » FAA Order 5200.8, *Runway Safety Area Program*
- » Engineering Brief No. 75, *Incorporation of Runway Incursion Prevention into Taxiway and Apron Design*
- » Engineering Brief No. 99, *Changes to Tables 3-2 and 3-4 of Advisory Circular 150/5300-13A, Airport Design*

7.3 MODIFICATION TO STANDARDS

The previous Airport Master Plan identified no modification to standards. Since the previous master plan, The FAA has implemented FAA Order 5300.1G, *Modifications to Agency Airport Design, Construction and Equipment Standards*, replacing Order 5310.1F. This order establishes the process for the initiation, revision, coordination, and management of MOS applicable to airport design construction and equipment procurement projects. Based on the type of modification to standard being submitted, additional Safety Risk Management panels may be required. In addition, any MOS should be submitted to the FAA prior to review and approval of an ALP. The proposed development within the 20-year planning period meets current FAA design standards and does not require any MOS to be filed.

7.4 AIRPORT LAYOUT PLAN HIGHLIGHTS AND MODIFICATIONS

This section highlights key elements and modifications that have been made since the Airport's last ALP update. The adjustments to the plan are based either on the Master Plan's analyses of identifying future needs, changes related to the Airport's vision, a change in FAA design criteria, or a combination of all

these factors. Enhancements and changes to the ALP set are detailed within this section as related to the future development within the master plan 20-year planning period.

7.4.1 Airfield Enhancements and Modifications

Within Sheet 3, *Airport Layout Drawing*, Taxiways A8 and B8 are shown in a new location roughly 300 feet to the north, eliminating a crossing point in the middle third section of the runway. In addition, a portion of Taxiway A8 will be demolished to stop direct apron access from Runway 17L-35R and pavement will be added to the area north of the remaining portion of Taxiway A8 to create a run-up area. The analysis completed under this study determined a dependency between operations occurring at the mid-field area, which includes Taxiway A8 and C1. The improvements shown aim to improve airfield safety by reducing runway incursions at Taxiway C1 as well as improving circulation by providing a dedicated aircraft runup area.

This study concluded that the future airport fleet mix is not anticipated to justify additional high-speed exit taxiways for Runway 17R-35L within the 20-year planning horizon. That said, larger corporate aircraft operations are forecasted to increase at Centennial Airport and, in time, Air Traffic Control may need to use Runway 17R-35L more often to accommodate operations by the changing aircraft fleet, especially during peak times. In the future, as a larger percentage of Category C aircraft capable of taking off and landing on Runway 17R-35L are operating at APA, ATC may use the runway more often for those operations to help balance the total operational capacity of the airfield. At the time when 300 annual Category C aircraft operations (60% of 500 operations) occur on Runway 17L-35R consistently, it is recommended an advanced planning study be performed to evaluate the Airport's fleet mix demand levels and the existing capacity constraints of Runway 17L-35R. This study would determine if the Runway 17R-35L should be upgraded to a Category C facility and/or a pair of high-speed taxiways should be installed.

To define the goals for the advanced planning study, it is recommended that the Airport first revisit and reestablish the intended role Runway 17R-35L at APA. Airport visioning within this Master Plan determined a desire to balance the needs of the airport community operating smaller aircraft (especially flight training) that make heavy use of Runway 17R-35L. The visioning process also determined expansion of the Airport's geographic footprint was not desirable. Accommodating growth in Category C aircraft using Runway 17R-35L creates the potential to justify upgrading the runway from a Category B to a Category C. This upgrade would require additional spacing and airspace (i.e., expansion of footprint) and create a facility that further accommodates performance needs of larger aircraft, therefore potentially reducing capacity for smaller aircraft operations. The addition of high-speed exits could still be justified for a Category B runway to expedite the clearance of small jets with performance capabilities suited to the runway.

Visibility minimums for the Runway 28 approach have improved since the previous ALP update. The improved visibility minimums require that the Airport protect for a larger Runway Protection Zone (RPZ) than they were previously. Sheet 2, *Airport Data Sheet* and Sheet 3, *Airport Layout Drawing*, depict the RPZ dimensions and land area that needs to be reserved and protected. It is recommended that the Airport, at a minimum, acquire easements to protect the RPZ's from any incompatible land uses or potential airspace

penetrations. In addition, it is recommended that the Airport Sponsor continue to strategically purchase available land surrounding the Airport to protect navigable airspace, eliminate the potential for incompatible and noise sensitive land uses, and ensure FAA design standards can be met.

7.4.2 Tenant Development

Sheet 3, *Airport Layout Drawing* and Sheet 14, *Future On-Airport and Off-Airport Land Use Plan*, shows proposed development within the 20-year planning horizon. Most developable land has been leased to existing tenants. All future demand for aircraft hangars, transient aircraft parking, and tie-downs would be accommodated by tenant development under lease terms in accordance with Airport minimum standards and the Airport's development review process. Therefore, this Master Plan incorporated tenant development concepts into the Airport Layout Plan. These concepts are preliminary, and all land development is done in accordance with Airport policy and demand needs.

7.4.3 Future Land Uses

Sheet 16, *Future On-Airport and Off-Airport Land Use Plan*, illustrates a revised on-airport land use plan compared to the existing land uses. Parcels controlled by the Airport that have been redesignated include the sites presently occupied by the South Suburban Sports Campus, FAA Technical Operations, Arapahoe County Road and Bridge, the former go-kart track, and the undeveloped land between Isbill Rd and County Line Rd. These parcels are all shown to be future nonaeronautical land uses. All of these sites lack a practical ability for the Airport to make use of them for aeronautical purposes. For the undeveloped site in the Interport area, roadways isolate the land from airfield connections and would require an unfeasible degree of capital investment to allow for aeronautical use. Additionally, the master plan did not identify an aeronautical purpose for the Interport site to support future demand within the 20-year planning horizon.

7.4.4 Maintenance Facility

Chapter 4, Facility Requirements, identified the need to expand the Snow Removal Equipment (SRE) facility. Within Sheet, 3, *Airport Layout Drawing* the existing facility, shown as Building #28, is expanded to both the east and west. This provides the necessary room to store equipment needed to remove contaminants from paved surfaces during inclement weather events. Though the west expansion is within the Building Restriction Line (BRL) the proposed height is below 14 CFR Part 77 surfaces.

7.5 AIRPORT LAYOUT PLAN DRAWINGS SHEETS

The complete ALP set for Centennial Airport consist of the following sheets, defined in the following subsections:

- » Sheet 1 – Cover Sheet
- » Sheet 2 – Airport Data Sheet
- » Sheet 3 – Airport Layout Plan Drawing
- » Sheet 4 – Terminal Area Drawing – North Side
- » Sheet 5 – Terminal Area Drawing – South Side
- » Sheet 6 – Terminal Area Drawing – East Side
- » Sheet 7 – 14 CFR Part 77 Airspace Drawing

- » Sheet 8 – 14 CFR Part 77 Runway Centerline Profiles
- » Sheet 9 – Runway 17L Inner Approach Plan and Profile
- » Sheet 10 – Runway 35R Inner Approach Plan and Profile
- » Sheet 11 – Runway 17R-35L Inner Approach Plan and Profile
- » Sheet 12 – Runway 10 Inner Approach Plan and Profile
- » Sheet 13 – Runway 28 Inner Approach Plan and Profile
- » Sheet 14 – Runway Centerline Profiles & Runway 35R Obstructions
- » Sheet 15 – Existing On-Airport and Off-Airport Land Use Plan
- » Sheet 16 – Future On-Airport and Off-Airport Land Use Plan
- » Sheet 17 – Exhibit ‘A’ Airport Property Inventory Map
- » Sheet 18 – Exhibit ‘A’ Airport Property Inventory Map

7.5.1 Sheet 1 - Cover Sheet

This sheet denotes the Airport name and an index chronicling the ALP drawing sheets contained in the drawing set. The sheet also provides an Airport location and vicinity map, as well as a title block organized to include approval signatures and a history of ALP revisions.

7.5.2 Sheet 2 - Airport Data Sheet

This sheet provides data tables containing detailed information about the Airport’s existing and anticipated conditions. This sheet also provides critical information about Airport runways and safety area dimensions. Major components on this sheet include:

- » Airport Data Table
- » Wind Rose Data
- » Runway Data Table
- » Taxiway / Taxilane Data Table
- » Survey Monuments
- » Declared Distance Table
- » Modification to Standards Table

7.5.3 Sheet 3 - Airport Layout Plan Drawing (Existing)

The Airport Layout Plan Drawing is a key document serving as a graphic representation of existing and future Airport facilities. The future Airport facilities include those scheduled to be completed during the planning period. One of the primary purposes of this drawing is to depict land areas where future facilities are planned to be constructed so it can be reserved for future uses.

The drawing also reflects changes to physical features on, and in the vicinity of, the Airport that may affect navigable airspace or the ability of the Airport to operate safely. Development shown on the ALP corresponds with the Airport’s Capital Improvement Program (CIP) for the 20-year period. Specifically, the sheet depicts the limits of the Airport property interests, land uses, and configuration of facilities in

compliance with geometric design separation and clearance standards. It also includes a plan view of Code of Federal Regulations (CFR) 14 Part 77 approach surface for each runway end along with identifying navigational aid (NAVAID) facilities.

Lastly, the ALP includes the dimensional information in order for recommended development to be designed in accordance with FAA planning and design specifications outlined in FAA Advisory Circular 150/5300-13A – Change 1, *Airport Design* and 150/5070-6B - Change 2, *Airport Master Plans*. Dimensional information aids users of the ALP to determine and plan for adequate separation between future development and existing and future runways, taxiways, taxilanes, and associated airspace. Finally, the sheet provides a location to chronicle the ALP reviewer and approval stamps/letter(s).

7.5.4 Sheet 4 through 6 - Terminal Area Drawings

The Terminal Area Plan sheets center on existing and future areas of major general aviation operations and major taxiway geometry enhancements. These sheets, scaled at one inch equals 200 feet, depict existing and future facilities as well as dimensional criteria involving runways, taxiways and taxilanes, surfaces, and aprons. The construction of a new apron taxiway and runway exit is shown immediately north of Taxiway A8, along with future closure of Taxiway A8 between the apron edge and Taxiway A, with repurposed and additional pavement for an aircraft run-up area in its place. Relevant terminal area drawings also show proposed tenant development concepts east of Runway 17L-35R and south of Runway 10-28.

7.5.5 Sheet 7 - FAR 14 CFR Part 77 Airspace Drawing

This scaled drawing identifies the imaginary surfaces defined in the Code of Federal Regulations (CFR) 14 Part 77, *Safe, Efficient Use, and Preservation of The Navigable Airspace*. These surfaces define the limits of recommended land use control for the height of objects surrounding the Airport. Airspace features corresponding to the runway dimensions are depicted in the ALP Drawing. A digital USGS map is used as the base map for the drawings in which each of the FAR Part 77, Subpart C, Imaginary Surfaces (Primary, Approach, Transitional, Horizontal, and Conical) are depicted. These drawings depict the existing and future airspace configuration for the Airport.

The sheets also provide numerical data for all obstructions visually depicted in plan view of the airspace surface drawing. Each obstruction is identified with a description, a top elevation, object surface penetrations, the surfaces' elevation at the penetrating point, the amount of penetration, and a recommended disposition. Obstructions vary from vegetation to human-made objects. Some objects are defined as fixed-by-function, such as NAVAIDS, because of current sitting requirements and the role they play in ensuring the safe navigation of flight. Potential obstructions are identified by a negative number in the "Part 77 Surface Penetration (+)" column.

7.5.6 Sheet 8 - FAR 14 CFR Part 77 Runway Centerline Profiles

This sheet depicts the full extent of each runway's existing Part 77 Approach Surfaces in a profile view. The approach surfaces shown extend out to 52,000 feet beyond the runway threshold for Runway 35R, 11,000 feet beyond the threshold for Runways 17L and 28, and 6,000 feet beyond the thresholds for Runways 10,

17R, and 35L. Additional details can be found on Sheet 5, *CFR 14 CFR Part 77 Airspace Drawing* and Sheets 7-11, *Runway Inner Approach Plan and Profile*.

7.5.7 Sheets 9 through 13 - Runway Inner Approach Plan and Profile

Sheets 7 through 11 provide a plan and profile view of each of the Airport's runway approach surfaces. These sheets provide a more detailed view of the first 5,200 feet from the precision runway, Runway 35R, the first 3,600 feet for the non-precision runways, Runway 17L and 28, and the first 2,200 feet for runways 10, 17R, 35L. Obstructions are depicted in blue and identified with an object number. Additionally, the Runway Protection Zone, navigational aids, and roadways are identified, and applicable data is provided. Roadways are depicted by a solid line that intersects the extended runway centerline, and dashed lines represent the roadway intersection to the edge of the Part 77 approach surface. Roadways intersecting the edge of the Part 77 surface may be above or below the grade of the extended centerline. The length of the dashed line represents the traverse adjustment to account for vehicle heights.

The obstruction analysis performed during this Master Plan study identified obstructions off each runway end; mainly vegetation. The approach end of Runway 35R, as shown on Sheet 8, *Runway 35R Inner Approach Plan and Profile*, has the largest number of obstructions due to the high density of trees and sloping terrain. Vegetation obstructions found on airport property should be mitigated under routine maintenance. Obstructions off airport property will require coordination with the landowner to determine the proper mitigation. The trees north of the approach end of Runway 35R reside in public rights-of-way and private development. Coordination for the mitigation of these tree obstructions requires coordination with local FAA and landowners to develop an effective and implementable solution.

Lastly, the obstruction analysis identified multiple penetrations from the terrain to the primary surface. It is recommended that when the Airport is developing or modifying land and airfield infrastructure, terrain should be cut where practical. The Airport and local FAA ADO should monitor and collaborate on appropriate mitigation techniques.

7.5.8 Sheet 14 - Runway Centerline Profiles & Runway 35R Obstructions

This sheet provides a longitudinal view of each runway centerline profile. Each centerline profile illustrates the runway elevation, change in surface gradient and Runway Safety Area gradients, vertical curves, and runway line-of-sight requirements. The previous ALP and analysis in this Master Plan concluded the first quarter of Runway 17L does not meet FAA grading requirements. Sheet 2, *Airport Data Sheet*, documents the nonstandard condition.

The slopes of the first quarter (2,500') of Runway 17L are 0.92 percent and 1.50 percent, as shown on Sheet 12. These slopes exceed the FAA standard of 0.8 percent of the first and last quarter, or the first and last 2,500', whichever is less, of the runway length. At a length of 10,001', the first quarter of Runway 17L is 2,500.25' (rounded to 2,500'), meaning the area of concern ends near the north edge of Taxiway A5. Resolving this runway grade deficiency to meet FAA standards would require that 2,500' (the first quarter) of Runway 17L be reconstructed, all connections to Taxiway A1, A4, and B4 to be adjusted to tie back into the runway, and the Runway Safety Area (RSA) be regraded to a minimum of 200' past the runway end. It

should also be noted that the crown of the parallel Taxiway A should not be higher than the crown of the runway.

FAA is aware of this grade issue and understands it is impractical, both physically and financially, to fully correct when considering other constraining airfield factors like the adjacent airfield infrastructure. For these reasons, a Modification of Standard has been requested with FAA.

7.5.9 Sheet 15 - Existing On-Airport and Off-Airport Land Use Plan

The Existing Airport Land Use Plan depicts the existing land use and zoning within the airport property boundary. This drawing also depicts noise contour lines at 65 Day-Night Average Sound Level (DNL). The noise contour line was generated as part of the 2015 Part 150 Noise Study and carried forward. It is recommended the next master plan study and update the noise contours based on the existing and forecasted fleet mix.

7.5.10 Sheet 16 - Future On-Airport and Off-Airport Land Use Plan

The master planning process examined existing land uses and established a strategic plan to utilize the parcels on Airport property effectively. The Future On-Airport Land Use Plan proposes to release five parcels of land from aeronautical to nonaeronautical land use. Existing roadway networks and infrastructure make airfield connectivity to these sites unachievable as unfeasible capital investment would be needed. Master Plan analysis shows that these parcels are not needed to support the forecasted growth in aeronautical activity within the 20-year planning horizon. Surrounding off-airport land uses are anticipated to remain the same.

7.5.11 Sheet 17-18 - Exhibit 'A' Airport Property Inventory Map

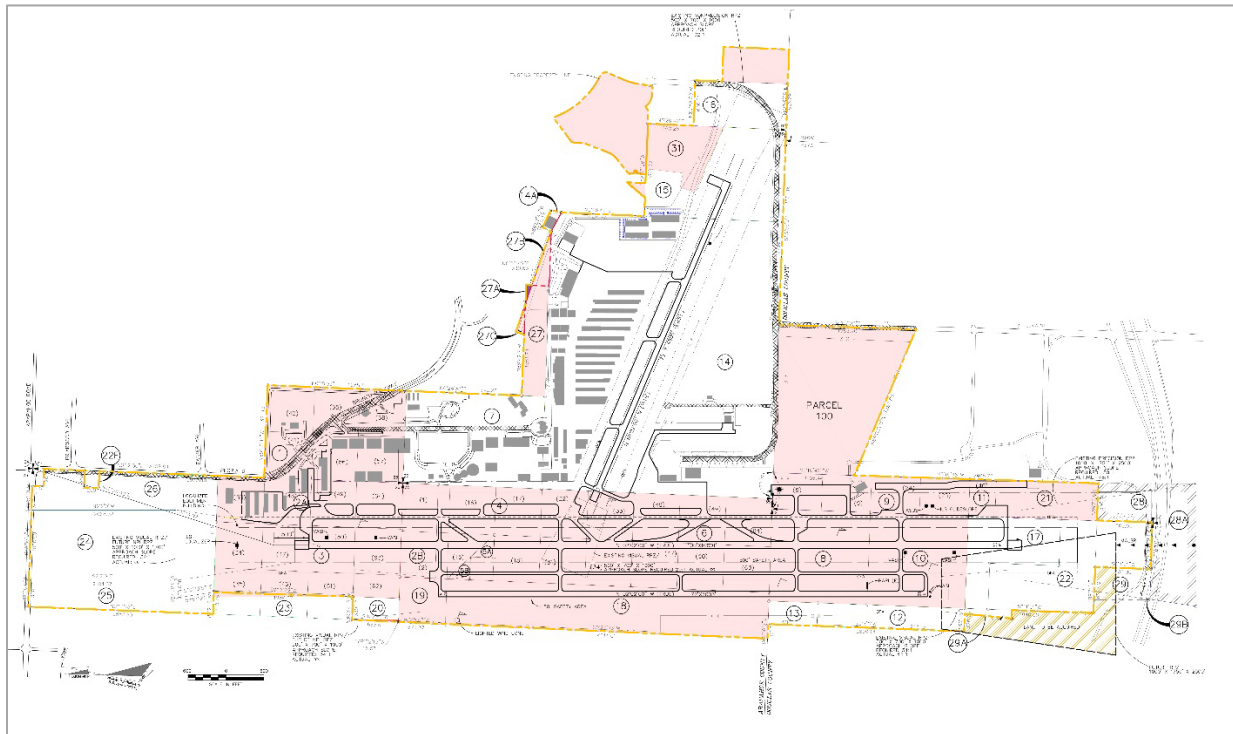
The Airport Property Map – Exhibit 'A', divided into separate sub-sheets, depicts the airport property interests consistent with the Airport Layout Plan drawing. Using information from available property deeds containing parcel legal descriptions, the Exhibit 'A' drawing documents past airport land acquisition, including fee-simple and easement tracts, and includes all those acquired or disposed since 2019. This sheet was developed in accordance with ARP SOP 3.00 *FAA Review of Exhibit 'A' Airport Property Inventory Maps*. Sought after information for each of the existing 38 parcels at APA includes:

- » Grantor (Selling Owner)
- » Type of interest acquired
- » Acreage
- » Type of conveyance instrument
- » Liber/book and page of recording
- » Federal Agreement (FAA Grant Number/PFC Project Number)
- » Type of Easement
- » Purpose of Acquisition

The development of the Exhibit 'A' carried forward information from the previous Exhibit 'A' Property Map, established in 2008. Since the development of the previous Exhibit 'A', FAA has updated the

requirements for compliance to meet current ARP SOP 3.00 standards. These changes in standards for a compliant Exhibit 'A' require that additional information be presented for each of the parcels. Airport staff, Arapahoe and Douglas County Assessor offices, and local FAA ADO representatives were solicited to obtain deeds and information for each parcel owned and released by ACPAA. During this process, 23 of the 44 deeds for parcels owned by ACPAA were unable to be obtained and therefore, the information is not included in this Exhibit 'A'. **Figure 7-1** shows the previous Exhibit 'A' Property Map with red hatched areas depicting those parcels where deeds were not obtained and/or parcel information was unavailable to meet ARP SOP 3.00 standards.

FIGURE 7-1
2008 CENTENNIAL AIRPORT EXHIBIT 'A'



Source: Centennial Airport, 2008

No property or title searches were conducted as part of this study, and because some deeds could not be obtained, certain parcels are shown overlapping with estimated acreage values. Since the scope of this Master Plan did not include property of title searches, discussions with the FAA Denver ADO recognized the Exhibit 'A' Property Map would be submitted for approval with incomplete data. A capital project is identified in the Airport Capital Improvement Program to locate the missing Exhibit 'A' information as soon as practical.

The capital project to complete the Exhibit 'A' requires performing a detailed title search on the missing parcels as well as additional survey to determine the Airport's property boundary. Completing this project requires hiring a title search and land survey firm to supplement the Exhibit 'A' Airport Property Map developed in this study with additional information to meet ARP SOP 3.00 standards. Property deed searches will be required for 13 missing parcels in Arapahoe County, four parcels in Douglas County and

the one parcel released by ACPAA. The Airport should also consider conducting searches for any parcels they are interested in acquiring. Lastly, the project should include a ground survey of the existing Airport property boundary line.

The Airport has plans for future property acquisitions. One parcel (Parcel A) located west of Runway 17L is planned to be acquired to resolve a minor Runway Protection Zone (RPZ) deficiency and protect navigable airspace surfaces for Runway 17R. In addition, several parcels (Parcels F, G, and I) are planned to be acquired to control land in fee for the Runway 35R RPZ. Lastly, ACPAA plans to work with landowners of Parcels B – E to acquire aviation easements that protect persons and property on the ground in the Runway 28 RPZ and protect navigable airspace surfaces.

7.6 AIRPORT LAYOUT PLAN DRAWING

The Airport Layout Plan drawing set inserted as part of this report is a reduced-size version of the 24-inch by 36-inch drawings that have been reviewed and approved by the FAA and the Airport.