May 29, 1979

Mr. Phillip H. Schmuck, Director
Colorado Division of Planning
520 State Centennial Building
1313 Sherman Street
Denver, Colorado 80203

Subject: Jefferson County Airport
Airport Master Plan
A-95 Review

Dear Mr. Schmuck:

Enclosed please find sixteen (16) copies of the environmental impact assessment which Jefferson County has prepared for airport improvements recommended in the above cited master plan.

We request your review, approval and specific comments, as appropriate, addressed to or including information about:

1. The extent to which this project is consistent with or contributes to the fulfillment of comprehensive planning for the state, region, or locality.

2. The extent to which the project contributes to the achievement of state, regional or local objectives as specified in Section 401 (A) of the Intergovernmental Cooperation Act of 1968.

3. The extent to which the project significantly affects the environment, as provided under section 102 (c) of the National Environmental Policy Act of 1969.

Your earliest review and approval in this matter will be greatly appreciated. Please address your original comments to: Mr. Edward G. Tatum, Chief: Planning Branch - ARM-610; Federal Aviation Administration; 10455 East 25th Avenue' Aurora, Colorado 80010; with a copy to this office and one to our consultants, Isbill Associates, Inc.; Terminal Building; Stapleton International Airport; Denver, Colorado 80207.

If there are any questions, or you require additional information, please contact us.

Very truly yours,

William Reefe

William Reefe, Chairman
Jefferson County Airport Authority

cc: Edward G. Tatum, FAA
Denver Regional Council of Governments

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JEFFERSON COUNTY AIRPORT
JEFFERSON COUNTY, COLORADO

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

AIRPORT MASTER PLAN
(20 YEAR)

PREPARED FOR THE
JEFFERSON COUNTY AIRPORT AUTHORITY AND
JEFFERSON COUNTY

MAY, 1979

Prepared by:

Isbill Associates, Inc.
Airport Consultants • Engineers

Denver, Colorado

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PREFACE

In August 1978, the Jefferson County Airport Authority circulated a draft Environmental Impact Assessment Report. This document summarized intended airport development based on projected aviation activity. Since that time there has been an increased effort to divert General Aviation from air carrier airports such as Denver's Stapleton International Airport. Combined with recent socio-economic and aviation trends, the important role of the Jefferson County Airport as a reliever facility has resulted in revised forecasts and development plans. Therefore, the Jefferson County Airport Authority has elected to re-circulate this updated draft Environmental Impact Assessment.

I. SUMMARY

Environmental Impact Assessment (DRAFT)

This Environmental Impact Assessment (EIA) has been prepared for the Jefferson County Airport on behalf of Jefferson County, Colorado, in compliance with the Federal Airport and Airway Development Act (Aviation Act) as amended in 1976, and the National Environmental Policy Act of 1969 (NEPA).

A. Description of Project

Jefferson County, the owner of the Jefferson County Airport (Jeffco), is preparing a Master Plan for airport development over the next 20 years. This EIA assesses the potential economic, social, and environmental impacts of the improvements recommended in the Master Plan.

The Jeffco Airport has experienced a steady increase in air traffic from 183,396 operations (takeoffs and landings) in 1970, to 248,351 in 1977, a 35.4 percent increase in seven years. The number of based aircraft grew from 280 to approximately 475 during this period, due to an increase in business related aviation of the airport. The trend of the 1960's continued for itinerant (non-based) traffic, as operations increased from 70,494 in 1970 to 138,033 in 1977, a 96 percent increase. The airport is a Federal Aviation Administration (FAA) designated reliever facility for Denver's Stapleton International Airport, 20 miles east-southeast of Jeffco. In this capacity it is estimated that in 1977 over 30,000 operations were diverted to Jeffco to relieve the general aviation demand at Stapleton. The rapid growth in the nearby communities of Broomfield, Westminster and unincorporated portions of Jefferson County has created a local aviation demand which, when combined with directed air traffic, requires capacity improvements at Jeffco.

Major developments recommended to improve safety and airfield capacity over the 20 year study period are displayed on Exhibit I and include: construct a second Runway 11R/29L (6,000 feet x 75 feet); extend and widen second Runway 11R/29L to 7,000 feet x 100 feet; extend and light Runway 11L/29R to 9,500 feet; construct a third Runway 11R/29L (5,000 feet x 60 feet); construction and lighting of additional taxiways and apron area; relocation and realignment of an access road and perimeter arterials; installation of a High Intensity Runway Lighting System; construction of additional T-hangars; expansion of the crash/fire/rescue facilities; and other improvements as discussed in Chapter II.

The third parallel runway mentioned above was originally considered as a long-range option to provide future capacity. Based on revised aviation forecasts and noise abatement considerations, this runway has been included as a Phase III development item (10-20 years), resulting in subsequent impacts on adjacent roadways to the north and west. The runway is planned to have initial dimensions of 75 feet x 6,000 feet, and be used for training purposes. The location of the runway will provide flexibility so that it can be lengthened and widened as needed, and an Instrument Landing System (ILS) added to the east end, also as necessary. The Master Plan recommends the acquisition of approximately 560 acres, supplemental to the 1,717 acres already in airport possession. None of this acreage would be utilized for further airport facilities. The acquisition of this land is primarily for airport protection from future residential encroachment from the south, and for the clear zone of Runway 11L. All airport improvements will occur on existing airport property and adjacent county owned land directly west of the airport.

B. Alternatives

In the preparation of this assessment, alternatives considered included: do nothing; obtain service from another airport; develop alternative sites; and improve the present site. The increasing general aviation and air carrier demand in the Denver metropolitan area has resulted in efforts to develop additional reliever airports in the region; however, construction of new airports is several years away and may do little to relieve growth pressure at Jeffco. A proposed new regional air carrier airport for Denver would further increase general aviation needs at Jeffco, as the surrounding community relies more on Jeffco to satisfy air transit needs. The excellent location of the airport, and the capital investment in present facilities, make the further development of the existing site the best alternative to meet the ever increasing aviation demands placed upon the community.

C. Environmental Impacts

Increased airport activity will result in the emission of more air pollutants, from both aircraft and ground traffic; however, exhaust emission standards which take affect in the early 1980's should limit overall increases. An air pollution analysis was made using a Guassian diffusion model. The analysis showed that increased activity should not prevent attainment or maintenance of state and national air quality standards. Increased activity will have a noise impact which is of particular concern to nearby communities. A program of land acquisition and runway development has been recommended to provide for long-range airfield capacity and to control noise. A third parallel runway will shift training operations further to the south, thereby reducing flight pattern activity over Broomfield. Use of this runway, land acquisition (including noise buffer areas), approach/departure procedural improvements, and federal engine noise abatement standards (Part 36) are all expected to limit noise impact to airport property and portions of the primary approach zones (Exhibit VI). Air traffic can affect areas outside predicted noise impact zones.

Although exposures may be infrequent, the affect may be incompatible with neighboring community development. Accordingly, future residential and other noise sensitive land uses within the "Airport Influence Area" (Exhibit VI) should either be discouraged or constructed with noise atenuation materials and covered by avigation easements.

The approach/departure corridor of the parallel runways is approximately three miles north of the Rocky Flats nuclear weapons plant (west-southwest of Jeffco). Addition of a third parallel runway is not expected to conflict with the Rocky Flats land use. Colorado Highway 128 and West 120th Street, both immediately north of the airport, and Simms Street along the west perimeter, will have to be realigned to accomplish the proposed airfield improvements. These realignments will not affect currently developed areas, and they should be compatible from a land use and traffic flow standpoint. Special attention should be given to aesthetic features, revegetation programs and slope stablization needs. During construction of all improvements, dust and surface runoff can create problems, therefore, local, state and federal guidelines and regulations should be followed in order to minimize impacts.

Mitigating measures, to control the majority of construction caused dust, should include the use of appropriate watering techniques and dust retardants. An immediate recontouring and revegetation program is recommended to control wind and runoff erosion, preserve adjacent topsoil and minimize visual, aesthetic and biological impacts. Provisions for erosion controls such as retention ponds will help limit sediment runoff. Measures will have to be developed to prevent runoff of spilled gasoline or other toxic substances. Storm runoff should be controlled in a similar manner, in order to comply with Section 303 of the Water Pollution Control Act Amendments of 1972, which states, "new or expanded airport facilities must demonstrate that project construction and operation will not result in storm water runoff pollution that

would exceed the established water quality criteria from their drainage basin." The Aviation Act states (Section 16(e)(1)) that improvement projects, involving runway location and major runway extension, will not be approved by FAA unless there is "reasonable assurance" that the project will be located, designed, constructed and operated in compliance with applicable water quality standards.

Barring any unforeseen circumstances, the airport present and forecasted energy demands should be met. With the increased aviation activity projected for the airport, the net effect upon the national energy resource inventory should be insignificant, and the airport should have a negligible effect on future energy research and development. Many government energy research projects currently utilize Jeffco for testing and reconnaissance activities.

The socioeconomic impacts, associated with development, consist primarily of the local share of the capital development. In addition, land to be acquired will no longer be available for community development, and rezoning or other actions implemented for land use compatibility, could impact land speculation interests. Airport development might require the relocation of one homesite. In such a case, the Uniform Relocation and Real Property Acquisition Policies Act of 1970 would apply. This act is "designed to establish a uniform policy for the fair and equitable treatment of persons who are displaced, or have their property taken for federal and federally assisted programs".

An archaeological field investigation of the present site and future airport property has been conducted by a recognized authority in compliance with the Historic Preservation Act (36 CFR 800). The purpose of the study was to determine the potential risk, if any, to historic, archaeological and architectural resources which would warrant local, state, or federal recognition. The full report of the archaeological study is included in APPENDIX B. As stated in the report, no significant cultural artifacts were found in any of the areas to be affected by future airport development. If, during construction activities, any such significant remnants are found, proper steps will be taken to sufficiently analyze and make deposition of such articles before proceeding with development.

D. Environmental Impact Assessment (EIA) Circulation

In accordance with the A-95 review process, a (Draft) EIA was circulated to appropriate state and local agencies in July and August, 1978. A subsequent review of regional aviation and socioeconomic trends, and consideration of the A-95 responses, requires a recirculation of this updated (Draft) EIA. On receipt of further agency comments, a public hearing will be held for the purpose of obtaining public input, and further evaluating the environmental impacts of the development program outlined in the Airport Master Plan.

The official hearing record will remain open for 30 days following the hearing date, in order to receive any additional written public comments about the development program. The final EIA will incorporate A-95 review comments, the hearing transcript, FAA suggestions and further citizen comments.

II. AIRPORT LOCATION

The Jefferson County Airport is located in the Denver metropolitan area on the eastern edge of the Rocky Mountains (see Exhibit II). It is situated at the extreme north end of Jefferson County, and small portions of the site extend into Boulder County to the north. The airport property includes all or portions of: Sections 34 and 35, Township 1 South, Range 69 West; and Sections 3, 4 and 5, Township 2 South, Range 69 West of the 6th Principal Meridian. The City of Golden, the county seat, is located approximately 12 miles southwest of the airport. Downtown Denver is the same distance to the southeast.

The airport lies on the north fringe of the urbanized region in the unincorporated portion of the county. Nearby cities include Broomfield, immediately to the east, and Westminster, which is just south of the airport property. The City of Boulder is eight miles northwest, and Louisville and Lafayette are due north at distances of three and five miles respectively. Northglenn is six miles east and Arvada is five miles south.

Primary access to the airport vicinity is via U.S. Highway 36 which connects Denver and Boulder, and which passes between Broomfield and the airport. The main airport access road (Jeffco Airport Avenue) is off Colorado Highway 121, a primary arterial, which forms the airport east boundary. Colorado Highway 128, located just north of the property, is an east-west route between Broomfield and Colorado Highway 93, which runs along the mountain foothills. West 120th Avenue forms the airport's northern boundary, and it joins Highway 128 at two points. A second access road (Jellison Avenue) connects West 120th to the airport building area. West 108th Avenue is the major arterial running along the airport future southern boundary (with land acquisition). Simms Street and Indiana Street provide access from rural roads to the west.

The Denver metropolitan area is the largest and most populated area in the Rocky Mountain region. Distances from the airport to other selected cities include:

Salt Lake City, Utah	504 miles
Grand Junction, Colorado	248 miles
Albuquerque, New Mexico	417 miles
Kansas City, Missouri	600 miles
Casper, Wyoming	279 miles

A. Existing Facilities

The Jefferson County Airport was founded in 1959 as a general aviation facility, and construction was begun that year on the first runway, taxiway, apron and hangar. Since that time the airport has grown significantly, not only in terms of aviation activities, but also with respect to offices, aviation related industries, and flight training activities. The principal facilities at the airport now include:

- Approximately 1,717 acres of land, owned by the Jefferson County Airport Authority, and used for aviation and industrial park development.

- Primary Runway 11L/29R, which is 7,500 feet long x 100 feet wide, and is equipped with an Instrument Landing System (ILS), Visual Approach Slope Indicator (VASI-4), and Medium Intensity Approach and Runway Alignment Light System (MALSR), to provide precision approaches to Runway 29R.

- Parallel Runway 11R/29L, southeast of the primary runway, which is 4,000 feet x 60 feet.

- Crosswind Runway 2/20 which is 3,600 feet x 75 feet, intersecting the parallel runways near their midpoints.

- Nearly continuous parallel taxiways for Runways 11L/29R and 2/20, with connections to apron areas adjacent to the two runways.

- An administration building of 3,350 square feet and an air traffic control tower, FAA operated, which is in its tenth year of operation.

- Three fixed base operators (FBOs) provide hangar and tiedown space, aircraft rentals, maintenance, and flight instruction.

- The FAA General Aviation District Office (GADO), and separate aviation facilities for the U.S. Forest Service and National Center for Atmospheric Research.

- Extensive navigational aids, lighting systems, communication equipment and crash/fire/rescue equipment.

- An industrial park of 98 acres, under lease for office buildings and research and development uses.

B. Aviation Activity

The Jefferson County Airport is a general aviation facility, publicly owned, and operated by the Jefferson County Airport Authority. Other airports in the region include: Stapleton International Airport, the region's only air carrier airport; Arapahoe County Airport; Boulder Municipal Airport; Longmont Municipal Airport; Littleton Airport; Columbine Airport; and Buckley Air National Guard Base. All of these airports are publicly owned except for Columbine and Littleton.

The Jeffco Airport is classified in the National Airport System Plan as a general aviation (G/A) reliever, with a Basic Transport functional role. By offering precision approach navigational aids and lighting systems, Jeffco provides en route (itinerant) general aviation aircraft with an alternative to the possible congestion and operating delays at Stapleton International Airport. Therefore Jeffco serves local needs while also relieving G/A demands at Stapleton International Airport. 1977 operations totaled 248,351, of which over one-half were itinerant. The National Airport System Plan projects this facility to increase in activity to approximately 385,000 total operations by 1988.

The 1974 Denver Regional Airport System Plan concluded that Jefferson County Airport, and the other publicly owned general aviation airports, would require expansion to meet future aviation needs. The Regional Plan recommended that four new general aviation airports be constructed by the year 2000 to meet aviation forecasts. In the plan, general aviation operations were expected to increase to 4.35 million by the year 2000, or nearly seven times the region's estimated level of activity in 1970.

Currently, approximately 89 percent of total annual Jeffco operations are performed by single and light twin engine aircraft. The balance includes helicopters (five percent) and executive turboprops and pure jets (six percent). In 1976, of all airports in the FAA Rocky Mountain Region, the Jeffco airport ranked second in itinerant operations, third in total operations, and third in based aircraft.[1/] By 1998 total operations are projected to reach 605,000 as summarized in Table II-1. This represents an average annual growth of 7.2 percent, with executive and light twin aircraft expected to grow at the fastest pace. Helicopter activity is forecast to remain a significant portion of total operations (5.2 percent in 1978 compared to 3.3 percent in 1998). A steady increase in air taxi flights is expected, while the number of military operations is expected to remain nominal.

1/ Rocky Mountain Region Aviation System Plan 1977-1988, FAA, September, 1977.

C. Purpose and Description of Proposed Development

The purpose of the Airport Master Plan is to outline a logical development program which meets demands, and is within the financial capability of the airport sponsor. As a planning goal it is intended to use existing facilities efficiently while emphasizing FAA grant eligible improvements to meet future demand. Runway, taxiway, tiedown apron and hangar space should remain major priorities throughout the entire 20 year study period. This will require land acquisition, road realignment, and area land use planning so that the airport can be developed in an orderly and compatible manner.

Development of a third parallel runway is proposed for the latter half of the development period in order to expand airfield capacity and improve land use compatibility. A staged lengthening of parallel Runways 11R/29L and 11L/29R is proposed in Phase I and early Phase II of the Master Plan. Runway development will allow simultaneous VFR (Visual Flight Rules) operations by aircraft using the airport. Connecting and parallel taxiways will be required to gain capacity from the resulting runway configuration. During the latter half of the planning period, the type and frequency of executive aircraft operations should require extensions and widening of the main instrument runway (11L/29R). For airfield capacity and for noise abatement reasons, the Master Plan recommends that the crosswind runway remain at its present length and approximate level of use.

Taxiway improvements are proposed throughout the development program to provide for more efficient runway use, and to avoid congestion of arriving and departing aircraft. A new area for apron and hangar space is proposed north of the intersection of Runways 2 and 11L. Other improvements involve relocation of an access road, relocation of fuel facilities, construction of additional hangars, the enlargement of present areas of aviation use, and the renovation of areas which are presently deteriorated or are expected to become so in the future.

With the two existing parallel runways being developed primarily to accommodate arrivals and departures of itinerant aircraft a third parallel runway is planned for touch-and-go training activity. Construction of this runway will allow local traffic to be directed south of the airport overlapping its flight pattern with that of the existing southern parallel. Provided that aircraft operations are properly controlled and traffic patterns are effectively blended, an overall increase in capacity of up to 56 percent can be realized.

These airport improvements have been staged through time to meet the aviation forecasts and the projected needs of general aviation. A three-phased, 20 year improvement program, consistent with FAA Master Plan criteria, is proposed to meet these future requirements. This program is the basis upon which this environmental impact assessment has been prepared. The schedule and type of future development proposals of the Jefferson County Airport are shown in Exhibit I and are described in Table II-2.

TABLE II-1

AIRCRAFT FLEET MIX
JEFFERSON COUNTY AIRPORT
AVIATION FORECAST
(ANNUAL OPERATIONS)

	1978 (Est.)	1983	1988	1998
Air Taxi				
Single	370	490	630	1,270
Twin	250	340	520	1,370
Subtotal	620	830	1,150	2,640
General Aviation				
Heavy Twin	1,460	2,000	3,000	4,200
Light Twin	51,910	72,260	109,590	143,190
Single	179,490	237,910	304,470	424,630
Business Jet	1,320	3,400	4,500	9,200
Helicopter	12,510	13,400	15,890	19,540
Subtotal	246,690	328,970	437,450	600,760
Military				
Twins	900	1,020	1,190	1,340
Helicopter	150	180	210	260
Subtotal	1,050	1,200	1,400	1,600
TOTAL	248,360	331,000	440,000	605,000

TABLE II-2

JEFFERSON COUNTY AIRPORT

PROPOSED DEVELOPMENT SCHEDULE

AIRPORT MASTER PLAN STUDY

Phase I (0-5 Years)

- Construct New Taxiway Connecting Runway Ends 11L to 11R
- Construct Access Taxiways to Proposed Airport Related Building Sites
- Acquire Upper Church Lake (36 Acres)
- Acquire Land for Clear Zones and Land Use Protection (520 Acres)
- Expand Aircraft Tiedown Apron (224,800 S.Y.)
- Construct New T-Hangars (three 10 unit) and Access Taxiways
- Construct New Runway 11R/29L (75 feet x 6,000 feet) to the North of Existing Location and Convert Existing Runway to Parallel Taxiway
- Install Medium Intensity Runway Lighting System on New Runway 11R/29L
- Install Emergency Standby Generator
- Relocate Simms Street to Accommodate Future Development
- Construct Holding Pond in Clear Zone of Runway 20 for Drainage Storage
- Overlay and Mark Runway 11L/29R; Install New High Intensity Runway Lighting System
- Fence Property Line
- Install VASI-4 on Runway 11L
- Expand Auto Parking

Phase II (5-10 Years)

- Reconstruct Terminal Area Apron and Install Drainage
- Construct New Taxiway Connecting Runway Ends 29R to 29L
- Expand Aircraft Tiedown Apron Area (90,000 S.Y.)
- Realign Colorado Highway 128 and Perimeter Access Road (Jefferson Avenue) to Accommodate Future Runway 11L/29R Extension
- Extend Runway 11R 1,000 feet to a total length of 7,000 feet and widen to 100 feet
- Expand Auto Parking
- Construct Additional T-Hangars (six 10 units and Associated Access Taxiways
- Relocate and Expand Fuel Storage Facility

TABLE II-2 (Continued)

Phase II (5-10 Years) (Continued)

- Extend and Light Runway 11L/29R 1,500 feet to the West and 500 feet to the East (to 9,500 feet), Including Parallel Taxiway and Relocation of Localizer, Glide Slope Facility and MALSR
- Install VASI and REIL on Runway 11R/29L
- Install Radar (BRITE Display) in Control Tower

Phase III (10-20 Years)

- Construct and Light Remaining Parallel Taxiway to Runway 2/20
- Construct Third Parallel Runway 11R/29L (60 feet x 5,000 feet) (Second Parallel Changes to 11C/29C), Including Parallel and Connecting Taxiways
- Construct Additional Tiedown Apron Area (222,500 S.Y.) Adjacent to New Parallel Runway/Taxiway
- Construct Auto Parking and Access Road to New Building Area Adjacent to New Third Parallel Runway
- Expand Maintenance and C/F/R Facilities

D. Location of Recreation Areas, Parks, and Refuges

The Denver metropolitan area and adjacent mountain region have numerous natural and cultural features. Recreation lands account for a major part of this region, and various national forests are the largest of these lands. Within Jefferson County, Pike National Forest covers almost the south one-third of the county. Portions of the Arapahoe and Roosevelt National Forests are located along the extreme west side and at the north end. Larger portions of these and other forests are located west of the county. Rocky Mountain National Park lies to the northwest. The closest area of public forest is approximately 14 miles west of the airport.

State recreation areas within proximity to the airport include: Barr Lake State Park, 16 miles to the east, and currently under development to provide water recreation in conjunction with extensive wildlife habitat areas; Chatfield State Recreation Area, a major regional park facility, 24 miles south, being developed around a Corps of Engineers flood control project; and Golden Gate Canyon State Park, in the foothills 12 miles west of the airport, and used for diversified mountain recreation activities. Jefferson County has an active open space acquisition program which purchases land in urban and rural areas with funds from sales tax revenues. These lands are generally put to limited recreation and passive public use. A 3,000 acre ranch ten miles southwest of the airport is included in the county land holdings, and future plans call for acquiring the remaining portion of Standley Lake which is not owned by the county. This area is located two miles south of the airport. Lands west of the Great Western Reservoir and along Big Dry Creek, at distances of about one mile to the southwest and southeast of the airport, might be acquired, if future urban development were to encroach into these areas. The City and County of Denver has a mountain park system which also provides recreation area in Jefferson County.

The communities surrounding the airport have their own parks and recreation systems, and there are also special districts which have been created to further provide for the leisure time desires of residents in this area. The Countryside Recreation Center in the City of Westminster is one mile south of the airport. The city leases Standley Lake during the summer and provides water recreation at this site. Other parks and recreation areas in Westminster are smaller and more distant from the airport. Parkland in Broomfield begins at a distance of about one mile from the northeast corner of the airport property. This point is the start of a linear park system which goes through the center of Broomfield and toward the east. All of the other city parks are further east, and the city community center is approximately two miles from the airport. The park and recreation facilities of special districts are three miles or more to the south and southeast of the airport. None of the above parks or recreation facilities will be affected by proposed airport improvements. Accordingly, there are no known areas of potential conflict with Section 4(f) of the Department of Transportation Act, 1966. Neither flood hazards, wetlands or coastal zone management programs apply to the airport development, due to the location, high elevation and general topography of the airport and surrounding area.

III. IMPACT ON THE NATURAL ENVIRONMENT

This section of the Jefferson County Airport Environmental Impact Assessment identifies and examines baseline data and significant natural environmental aspects affecting the airport. It discusses local and regional characteristics which might be impacted by present or future airport development.

A. Physiography and Geology

The Jefferson County Airport is located on the westerly edge of the Colorado Piedmont section of the Great Plains physiographic province. The Front Range of the Southern Rocky Mountain province is just to the west, beginning approximately eight miles from the airport. The mountain foothills extend easterly, ending in low lying plateaus in the Denver metropolitan area, such as the one on which the airport is located. The dominant feature of the Great Plains is the South Platte River, lying to the east and southeast of the airport, about 12 miles east of the mountain front. It flows through the center of the Denver metropolitan area, and all major streams in this area, flowing from the Rockies and the Plains, are tributary to the Platte. The largest waterways in the vicinity of the airport are: Coal Creek, three miles northwest; Big Dry Creek, two miles south; and Ralston Creek, five and one-half miles to the south. A number of smaller creeks and irrigation ditches are located throughout this area, in addition to artificial lakes and reservoirs, which are used for irrigation water storage.

The airport lies on the edge of the mountain and plains climatic zones and is subject to relatively extreme variations in weather. In the airport vicinity, the climate is a semiarid steppe type which is characteristic of high elevation continental climate. The temperatures throughout the Denver metropolitan area are generally moderate, with a mean annual temperature of 52.3° F., although extreme temperatures have been recorded as low as -30° F. and to 105° F. There is generally low humidity, low precipitation and abundant sunshine throughout this region.

In Jefferson County the temperature varies considerably over short distances, due in large part to the variations in land form. Monthly mean maximum temperature is 66.5° F. Normal precipitation amounts to 15.2 inches, and an annual average snowfall of 52 inches. The dominant climatic hazard is the chinook winds which blow gusts up to 120 mph in a 15-20 mile wide zone along the foothills of the Rocky Mountains. There is a pollution susceptible zone approximately four miles wide, along the foothills to the north of the airport, where rising thermals are trapped under westerly winds, at higher altitudes, and along the windswept ridge tops. This zone expands to the south, and it accumulates pollution over most of the Denver metropolitan area, until prevailing southwesterly winds through the city push the polluted air down the South Platte River Valley. Occasional heavy thunderstorms in the foothills and plains present some hazards in the form of flash floods. These are generally localized to subarea watersheds, although major floods have occurred on a region wide basis in the past.

The land on which the Jefferson County Airport is situated is one of a number of tablelands to the east of the mountain front of the Rockies. Depth to bedrock in the vicinity of the airport is generally ten feet or less, but locally, the depth may be considerably greater in some parts of the area.

Most of the airport is located on Slocum and Verdos Alluvium of Pleistocene age, composed of silty and clayey sand and gravel with local boulder fields. These alluviums also contain some decomposed stone, and typically form terraces 80-250 feet above modern streams. There are areas of uncompacted earth fill on the airport site which have been used for construction purposes. The side slopes of the alluvial airport terrace are generally from sedimentary and volcanic rocks of Pretertiary age.

Geologic hazards which must be considered in airport planning include faults, landslides and earthquakes. The largest fault zone in the vicinity of the airport is the Golden Fault, which extends in a north-south direction around the City of Golden, well to the southwest of the airport. This is a compression fault in which rock formations on the west side are displaced upward and then eastward. The Golden Fault marks where the gently upsloping land from the Platte Valley begins to rise sharply to form the north-south trending ridges and hogbacks, just east of the Front Range. Several smaller but distinct faults are associated with this zone. Some of these have approximate locations within the south portion of the airport property. These inactive faults are associated with a slump block in the Laramie Formation that apparently occurred during deposition of the formation and, to date, they have had no effect on the developed portions of this area. Therefore, no geologic hazards are expected to conflict with airport development.

Areas of actual and potential landslides are located in the vicinity of Indiana Street, one mile west of the airport, and around the area of West 108th Street and the Great Western Reservoir, to the south of the property. These occurrences are on hillsides where the underlying material is variable but generally shale. More extensive areas of existing and potential landslides lie between Golden and the northline of Jefferson County, between Colorado Highway 93 and Indiana Street. Problems in this area have included slowly creeping and abruptly moving soil. Recontouring and slope stabilization will be necessary to avoid landslide problems associated with realignment of Simms Street and Colorado Highway 128, however, no problems are expected with airfield improvements.

Earthquakes have not been a problem in recent years in the Denver metropolitan area, although they have been experienced in the recent past. In June and August of 1962, tremors were felt in the Derby-Dumont area northeast of

Denver. The tremors measured V. on the Modified Mercalli Intensity Scale. In 1965, the city of Northglenn, north of Denver, Commerce City, and Adams City experienced an earthquake with an intensity of V. and a magnitude of 4.9 of the Gutenberg Richter scale. Thereafter, a series of shocks with nearly the same intensity and magnitude, and in nearly the same directions and distances from Denver, continued to occur from 1966 through 1970. Substantial effects were also noted in Broomfield and Louisville. The strongest earthquake in Denver's history was recorded on August 9, 1967. An intensity of VI. and magnitude of 5.3 were recorded at that time. These intermediate and minor earthquakes continued as an unusual series which centered around the Rocky Mountain Arsenal 11 miles east of the airport. It was then determined that water was being injected into highly faulted Precambrian bedrock, and the cessation of this practice has eliminated earthquake activity in the Denver metropolitan area since that time.

B. Soils and Drainage

Soils characteristics in Jefferson County are reported as associations of adjacent soils appearing over large areas and described in generalized terms, rather than the more specific soil series. The associations within and around the Jefferson County Airport are typical of the rolling uplands of this general vicinity, mostly tending toward loam and clay, somewhat shallow, and having locally scattered cobbles and stones. The U.S. Soil Conservation Service has stated that none of the soils on the existing or future airport property have been designated as prime or unique farmlands, due to climatic conditions, lack of sufficient moisture, and no irrigation. (See the SCS letter in APPENDIX B.) The SCS does not anticipate that any of the soils in the airport area will be designated as either prime or unique farmlands in the future, due to a lack of possible irrigation and increasing urban development.

The principal soil association over almost all of the present and proposed airport property is the Samsil-Shingle association, which also extends to Rocky Flats, south to around West 108th Avenue, and through much of the area north of the airport for approximately one and one-half miles. This association is formed in residuum weather from shale and sandstone of about 40 percent Samsil clay and about 40 percent Shingle soils. It is shallow and well drained and is used for pasture and dryland crops. Samsil soils are generally shallow and well-drained with slow to moderate permeability. The Samsil-Shingle complex has a high runoff rate and high erosion hazard, resulting in a low shrink-swell, flooding and frost action potential. This association has severe limitations for use in septic tank leach fields and sewage lagoons, because of its shallow depth to bedrock, often 10-20 inches, and because its hillside locations make its erosion potential high in some areas. It is considered unsuitable as a source of sand and gravel, and poor for use as road fill.

Actual tests of soils at the airport were made in 1976 in connection with a pavement evaluation study (Isbill, 1976). Samplings and soil tests were performed by drilling or cutting holes into existing pavements, according to FAA criteria, and subgrade conditions were investigated from 22 exploratory holes and eight excavation test pits. Subgrade soils varied considerably, but generally consisted of E-7 clays with varying amounts of sand and gravel. (FAA Method of Soil and Subgrade Classification.) Areas of clayey soils having a classification of E-8, and some areas of granular material having a classification of E-1 and E-2, were also encountered. The E-7 and E-8 areas have a hard consistency when they are dry, and become plastic when wet, producing a detrimental volume change resulting in lower stability under adverse moisture conditions.

According to documentation of the U.S. Atomic Energy Commission's Division of Technical Information, soils within and around the Rocky Flats Plant, three and one-half miles west of the airport, have been periodically contaminated with plutonium. Pu-239 as high as 2,000 mCi/km^2 was found off the plant site