Chapter One
INVENTORY

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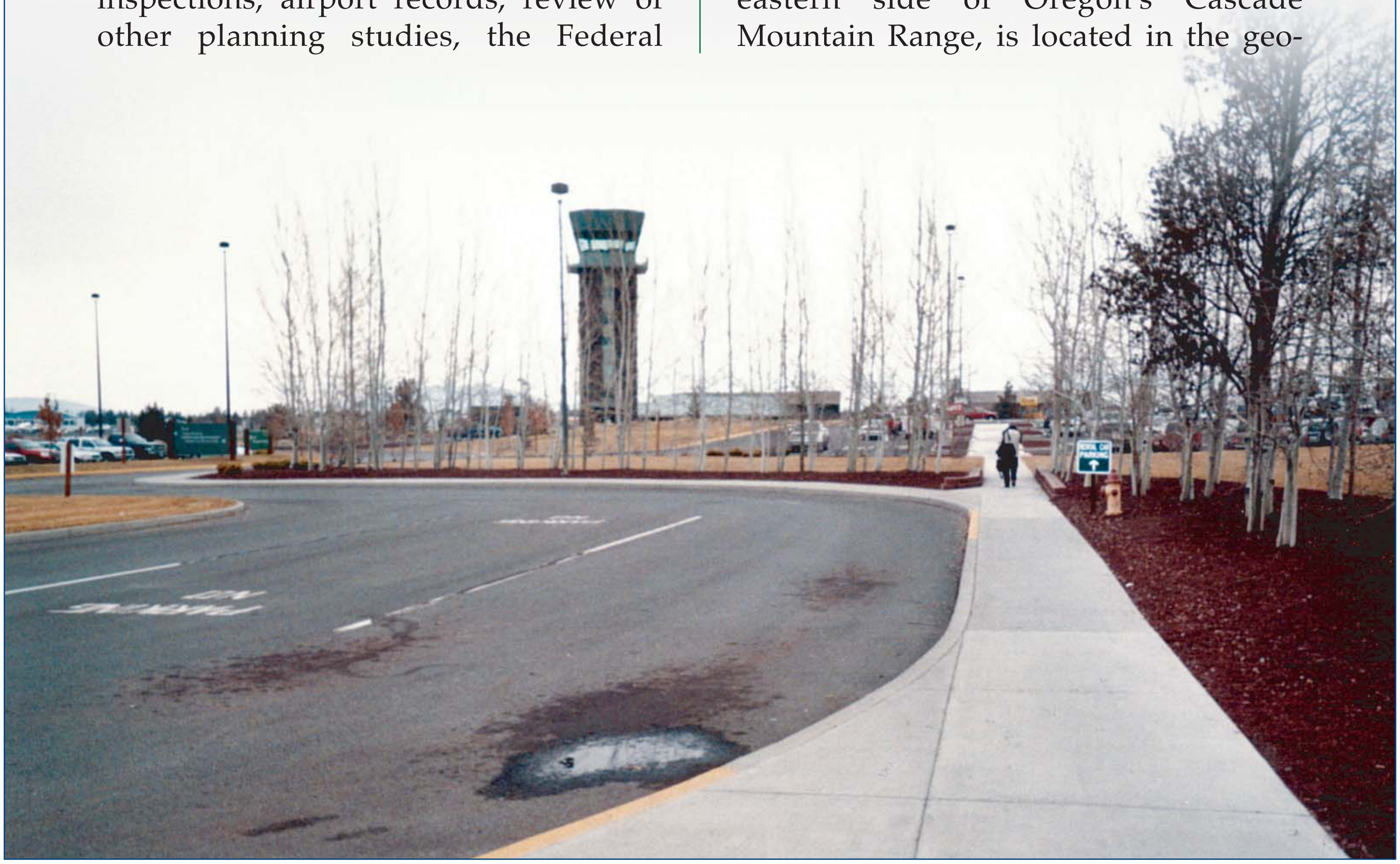
INVENTORY

The initial step in the preparation of the airport master plan for Roberts Field is the collection of information pertaining to the airport and the area it serves. The information collected in this chapter will be used in subsequent analysis in this study. The inventory of existing conditions at Roberts Field provides an overview of the airport facilities, airspace, and air traffic control. Background information regarding the regional area is also collected and presented. This includes information regarding the airport's role in regional, state, and national aviation systems, surface transportation, and a socio-economic profile.

The information was obtained from several sources, including on-site inspections, airport records, review of other planning studies, the Federal Aviation Administration (FAA), various government agencies, a number of on-line (Internet) sites which presently summarize most statistical information and facts about the airport, and interviews with airport staff, planning associations, and airport tenants. As with any airport planning study, an attempt has been made to utilize existing data or information provided in existing planning documents, to the maximum extent possible.

REGIONAL SETTING

Roberts Field is located two miles southeast of the City of Redmond and is the region's only commercial service airport. The City, which is located on the eastern side of Oregon's Cascade Mountain Range, is located in the geo-



graphical heart of Central Oregon and encompasses Jefferson, Crook, and Deschutes counties. This High Desert community is located on a flat plateau, at an elevation of 3,077 feet above sea level.

Regionally, the airport is located approximately 146 statute miles southeast of Portland, Oregon; 311 statute miles south of Seattle, Washington; and 323 statute miles west of Boise, Idaho. The location of the airport in its regional and national setting is presented on **Exhibit 1A**.

INFRASTRUCTURE

U.S. Highways 97, 20, and 26 provide the primary ground transportation links for the Central Oregon area. U.S. Highway 97 is oriented in a north-south direction through Central Oregon. U.S. Highways 20 and 26 are primarily oriented in an east-west direction. State Highway 126 borders the airport on the north. Airport Way and Sisters Avenue connect with U.S. Highway 97 and provide primary access to airport facilities.

Burlington Northern, Union Pacific, and the City of Prineville Railway provide direct rail connections for shipping to any market in the United States, Canada, and Mexico. Amtrak provides passenger rail service to Central Oregon via the Chemult station, located approximately 60 miles south of Bend on Highway 97. Shuttle services provide connections from Chemult to LaPine, Sunriver, Bend, and Roberts Field several times a week.

Bus transportation by Greyhound is available from Bend, Madras, Prineville, and Redmond. CAC Transportation Inc. offers a shuttle service from Central Oregon to Portland.

CLIMATE

Weather conditions are important to the planning and development of an airport. Temperature is an important factor in determining runway length requirements, while wind direction and speed are used to determine optimum runway orientation. The need for navigational aids and lighting is determined by the percentage of time that visibility is impaired due to cloud coverage or other conditions.

Central Oregon's climate is considered semi-arid, characteristic of its high desert setting. Temperatures range from 20-47 degrees in the winter to 42-85 degrees in the summer. Clear skies predominate in this climate, with the area averaging 300 sunny days per year. The Cascade Mountains keep most of Oregon's precipitation over in the valley and on the coast, so Central Oregon receives very little rain. Occasional showers occur during the spring and summer months, with an average precipitation of less than two inches per month. Surface winds prevail out of the south and southeast from October to February, then west and northwest for the remaining months. Wind speeds average 5-7 miles per hour most months. **Table 1A** summarizes climatic data for Redmond, including temperatures and precipitation.

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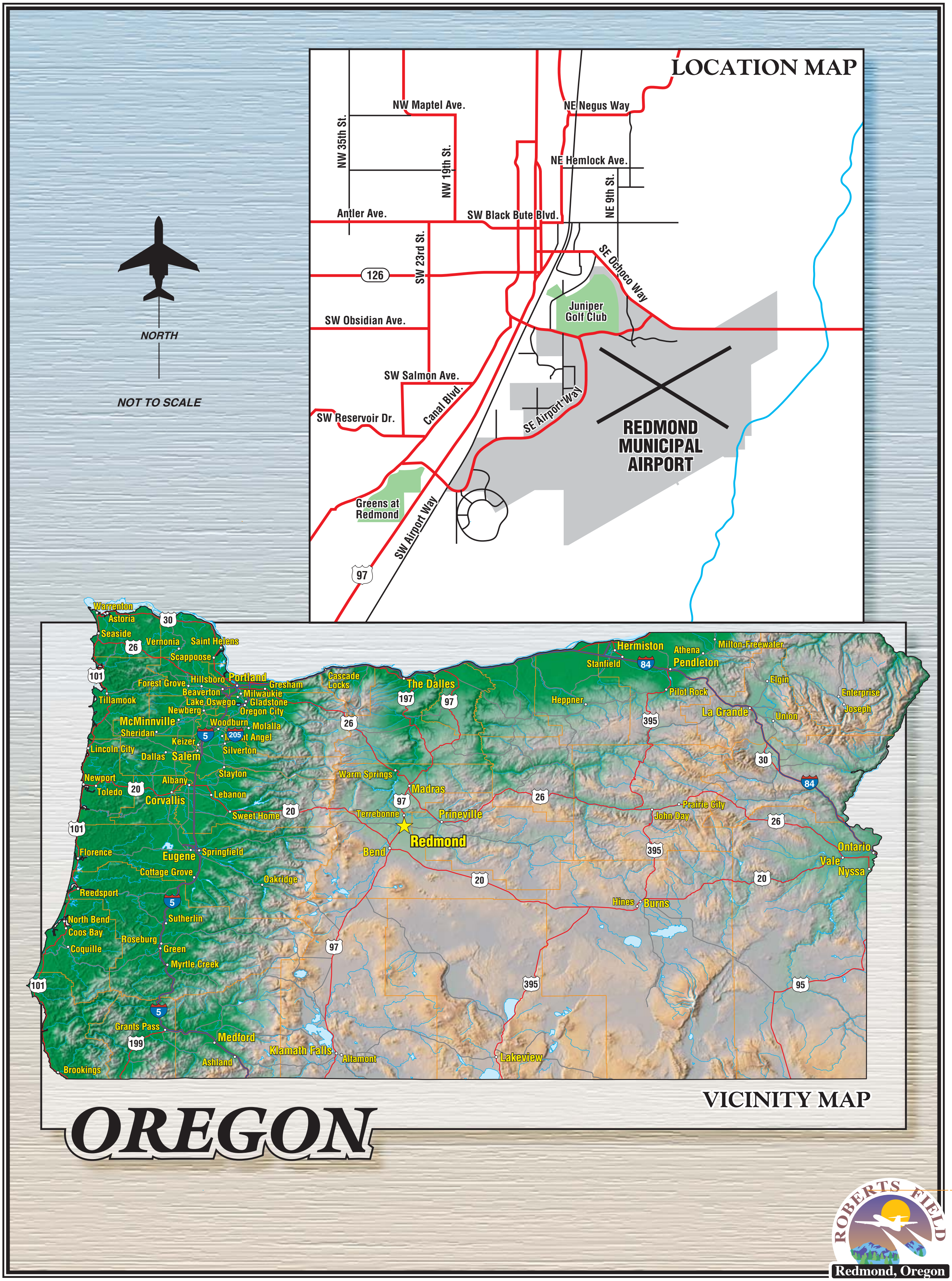

Exhibit 1A
VICINITY MAP

TABLE 1A Climate Summary Redmond, OR				
Month	Average High (ºF)	Average Low (ºF)	Mean (ºF)	Average Precipitation (in.)
January	43	23	33	0.97
February	48	26	37	0.68
March	54	27	41	0.76
April	62	30	46	0.65
May	69	36	52	0.95
June	78	42	60	0.62
July	86	47	67	0.55
August	86	47	67	0.54
September	78	40	59	0.37
October	66	33	50	0.56
November	50	28	39	0.98
December	43	23	33	0.92
Source: www.weather.com (averages based on a 30-year period).				

UTILITIES

Redmond's municipal water system supplies a minimum of two million gallons of domestic water daily. All of the system's sources are subsurface from deep wells. Natural gas service in Redmond is provided by Cascade Natural Gas. The utility serves more than 20,000 customers, both industrial/commercial and residential. Pacific Power and Central Electric Cooperative provide electricity to the City of Redmond. The area's landfill, Knott Landfill, is located southeast of Bend. Telecommunications are provided by Qwest.

AIRPORT SYSTEM PLANNING ROLE

Airport planning exists on many levels: local, state, and national. Each level has a different emphasis and purpose. An airport master plan is the primary local airport planning document.

At the national level, the airport is included in the *National Plan of Integrated Airport Systems* (NPIAS). This plan identifies 3,344 existing airports which are significant to national air transportation, as well as airport development necessary to meet the present and future requirements in support of civil needs. An airport must be included in the NPIAS to be eligible for federal funding assistance. Roberts Field is classified as a primary commercial service airport in the NPIAS.

At the state level, the Oregon Department of Aviation provides statewide planning through the *2000 Oregon Department of Aviation Plan*. The purpose of this plan is to identify the physical facility needs for the state's system of airports. According to this plan, there are 101 public-use airports in the State of Oregon, including nine commercial service airports that provide regularly scheduled passenger services.

The *2000 Oregon Department of Aviation Plan* has established five categories of airports based on their different functions. Roberts Field is listed as a Category 1 airport, which is classified as a commercial service airport. A criterion of Category 1 airports is the presence of scheduled commercial service, while their function is to accommodate scheduled major/national or regional/commuter commercial air carrier service. Category 1 coverage is concentrated along the Interstate 5 corridor, east of the Cascades, for Redmond and Klamath Falls.

AIRPORT ADMINISTRATION

Roberts Field is owned and operated by the City of Redmond. Day-to-day administration and management of the airport is the responsibility of the Airport Manager, who reports to the City Manager. The airport is a stand-alone department within the city. Additional airport staff positions support administration, operations, and maintenance. Administrative and financial oversight of the airport is the responsibility of the Redmond City Council.

COMMERCIAL AIR SERVICE

Two airlines currently provide scheduled passenger service to Roberts Field. Horizon Airlines operates the 37-seat Bombardier Q-200 and United Express (Skywest) operates the 30-seat Embraer Brasilia 120. Together these two airlines provide daily direct flights to Seattle, Washington; Portland, Oregon; and San Francisco, California. The airline's flight schedule is presented in **Table 1B**.

AIR CARGO SERVICE

Daily air cargo service is provided at Roberts Field by AirPac (Airborne Express), Ameriflight (UPS), and Empire (FedEx). Airborne Express operates the Cessna 404, Piper Chieftan, and Piper Seneca aircraft. UPS operates the Cessna 402, Beechcraft 99, and Piper Chieftan aircraft. FedEx operates the Cessna Caravan aircraft.

AIRPORT FACILITIES

Airport facilities can be functionally classified into two broad categories: airside and landside. The airside category includes those facilities directly associated with aircraft operations. The landside category includes those facilities necessary to provide a safe transition from surface to air transportation and support aircraft servicing, storage, maintenance, and operational safety.

TABLE 1B Flight Schedule – Effective October 31, 2004 Roberts Field					
Arrival	**Flight #**	**Origin**	**Depart**	**Flight #**	**Destination**
HORIZON AIR FLIGHTS					
Originates	---	---	5:10 a.m.	2034	Portland
Originates	---	---	6:40 a.m.	2220	Seattle (ex. Sun.)
7:45 a.m.	2149	Portland	8:05 a.m.	2142	Portland
9:01 a.m.	2055	Seattle (ex. Sun.)	9:22 a.m.	2054	Seattle
12:50 p.m.	2162	Portland	1:10 p.m.	2161	Portland
1:41 p.m.	2043	Seattle	2:05 p.m.	2042	Seattle
3:00 p.m.	2135	Portland	3:20 p.m.	2128	Portland
5:30 p.m.	2033	Portland	5:50 p.m.	2122	Portland
6:40 p.m.	2053	Seattle	7:00 p.m.	2056	Seattle (ex. Sat.)
8:40 p.m.	2139	Portland	Terminates	---	---
11:46 p.m.	2167	Seattle (ex. Sat.)	Terminates	---	---
SKYWEST FLIGHTS					
Originates	---	---	6:20 a.m.	6321	Portland (ex. Sun.)
Originates	---	---	7:30 a.m.	6240	San Francisco
9:31 a.m.	6322	Portland	9:47 a.m.	6322	Portland
11:56 a.m.	6323	Portland	12:30 p.m.	6323	Portland
1:03 p.m.	6241	San Francisco	1:19 p.m.	6241	San Francisco
2:26 p.m.	6324	Portland	2:45 p.m.	6324	Portland
5:33 p.m.	6325	Portland	5:50 p.m.	6325	Portland
8:38 p.m.	6242	San Francisco	Terminates	---	---
11:11 p.m.	6326	Portland (ex.Sat.)	Terminates	---	---
Source: Airport Records.					

AIRSIDE FACILITIES

Airside facilities include runways, taxiways, airfield lighting, and navigational aides. Airside facilities are identified on **Exhibit 1B**. **Table 1C** summarizes airside facility data.

Runways

The existing runway configuration at Roberts Field includes two intersecting runways. Runway 4-22, which is oriented in a northeast-southwest direction, serves as the primary air carrier runway and is 7,040 feet long and 150 feet wide. Runway 10-28 is 7,006 feet long, 100 feet wide, and oriented in a southeast-northwest direction. Both runways are constructed of asphalt, which is grooved to aid with aircraft braking and water runoff.

The load bearing strengths of each runway were also examined. Single wheel loading (SWL) refers to the design of certain aircraft landing gear which has a single wheel on each main landing gear strut. Dual wheel landing (DWL) refers to the design of certain aircraft landing gear which has two wheels on each main landing gear strut. Dual tandem wheel loading (DTWL) refers to the aircraft landing gear struts with a tandem set of dual wheels on each main landing gear strut. The load bearing strengths for each runway are as follows: Runway 4-22: 68,000 pounds SWL, 110,000 pounds DWL, 200,000 pounds DTWL; and Runway 10-28: 28,000 pounds SWL and 40,000 pounds DWL.

TABLE 1C
Airside Facility Data
Roberts Field

	Runway 4-22	**Runway 10-28**
Runway Length (feet) Runway Width (feet)	7,040 150	7,006 100,
Runway Surface Material Condition	Asphalt (Grooved) Good	Asphalt (Grooved) Good
Pavement Markings	Precision	Nonprecision
Runway Load Bearing Strengths (lbs.) Single Wheel Loading (SWL) Double Wheel Loading (DWL) Dual Tandem Wheel Loading (DTWL)	 68,000 110,000 200,000	 28,000 40,000 -
Runway Lighting	High Intensity	Medium Intensity
Taxiway Lighting	Medium Intensity	
Approach Lighting	VASI-4L (4) MALSR (22) REIL (4)	VASI-4L (10) PAPI-4L (28) REIL (10 and 28)
Instrument Approach Procedures	ILS Runway 22 NDB Runway 22 VOR/DME Runway 22 VOR-A Runway 10 GPS Runway 10-28	
Weather or Navigational Aids	Automated Surface Observation System (ASOS) Segmented Circle Lighted Wind Cone	

Source: *Airport/Facility Directory, Northwest U.S.* (February 19, 2004).

Taxiways

The existing taxiway system at Roberts Field, as illustrated on **Exhibit 1B**, consists of parallel, connecting, access, and entrance/exit taxiways.

- **Taxiway A** is located at the Runway 10 end and extends from the general aviation apron located north of Runway 10-28 to the south of Taxiway G. Taxiway A is 75 feet wide.
- **Taxiway B** connects with the Runway 22 end and provides access to the U.S. Forest Service facilities and the general aviation apron area located north of Runway 10-28. Taxiway B is 75 feet wide and is restricted to aircraft with less than 30 seats.
- **Taxiway C** is parallel to Runway 10-28 and extends between Taxiway A and Runway 4-22. Taxiway C is 50 wide and located 400 feet north of Runway 10-28.

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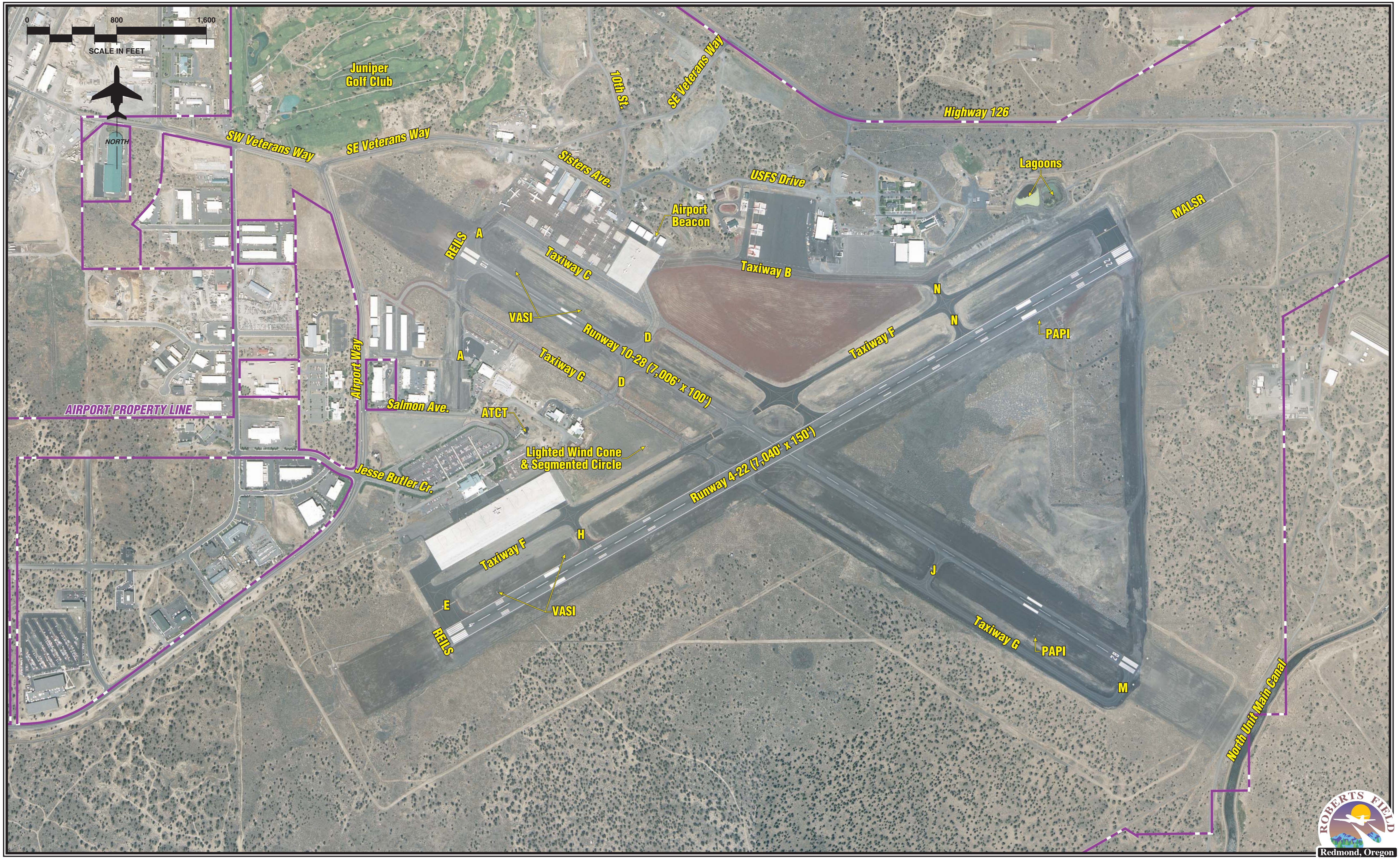

Exhibit 1B
EXISTING AIRFIELD FACILITIES

- **Taxiway D** is a connecting taxiway extending between Taxiways C and G. North of Runway 10-28, Taxiway D is 75 feet wide. South of Runway 10-28, Taxiway D is 40 feet wide.

- **Taxiway E** extends between the Runway 4 end and terminal apron. Taxiway E is 100 feet wide.

- **Taxiway F** is a full-length parallel taxiway serving Runway 4-22 and provides primary access to the passenger terminal apron. Taxiway F is 50 feet wide and lies 400 feet northwest of Runway 4-22.

- **Taxiway G** is a full-length parallel taxiway serving Runway 10-28 and provides access to the landside facilities on the northwest corner of the airfield. Taxiway G is 50 feet wide and lies 400 feet southwest of Runway 10-28. West of Taxiway F, Taxiway G is restricted to aircraft 26,000 pounds or less. East of Taxiway F, Taxiway G is restricted to 20,000 pounds SWL and 40,000 pounds DWL.

- **Taxiway H** is 90 feet wide and extends between Runway 4-22 and the terminal apron.

- **Taxiway J** is an exit taxiway near the Runway 28 end. Taxiway J is 75 feet wide.

- **Taxiway M** is a connecting taxiway at the end of Runway 28.

- **Taxiway N** is 75 feet wide and extends between Runway 4-22 and Taxiway B.

Airfield Lighting

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the airport for this purpose. These lighting systems, categorized by function, are summarized as follows.

Identification Lighting: The location of the airport at night is universally identified by a rotating beacon. A rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon at Roberts Field is located atop a metal tower on the north side of the airfield.

Pavement Edge Lighting: Pavement edge lighting utilizes light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility, in order to maintain safe and efficient access to and from the runway and aircraft parking areas. Runway 4-22 is equipped with high intensity runway lighting (HIRL) and Runway 10-28 is equipped with medium intensity runway lighting (MIRL). Taxiways at the airport are equipped with medium intensity taxiway lighting (MITL).

Visual Approach Lighting: A precision approach path indicator (PAPI-4L) is installed on the approach ends of Runways 22 and 28. A PAPI consists of a system of lights located at various distances from the runway threshold. When interpreted by the pilot, these lights give him or her an indication of being above, below, or on the designed descent path to the runway.

A visual approach slope indicator (VASI-4L) is installed on the approach ends of Runways 4 and 10. A VASI consists of a system of lights located at various distances from the runway threshold. When interpreted by the pilot, these lights give him or her an indication of being above, below, or on the designed descent path to the runway.

The approach end of Runway 22 is equipped with a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). A MALSR provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway.

Runway End Identification Lighting

Runway end identifier lights (REILs) provide rapid and positive identification of the approach end of a runway. REILs are typically used on runways without more sophisticated approach lighting systems. The REIL system consists of two synchronized flashing lights, located laterally on each side of the runway facing the approaching aircraft. REILs are installed on both ends of Runway 10-28, as well as the end of Runway 4.

Pilot-Controlled Lighting: All airfield lighting systems are controlled through a pilot-controlled lighting system (PCL). This allows pilots to increase the intensity of the airfield lighting systems from the aircraft with the use of the aircraft's radio transmitter. At Roberts Field, both runways are equipped with PCL. The PCL is enabled only when the control tower is closed.

Pavement Markings

Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. The precision markings on Runway 4-22 identify the runway designation, threshold, centerline, side stripes, aiming point, and touchdown zone. The nonprecision markings on Runway 10-28 identify the runway designation, threshold, centerline, side stripes, and aiming point.

Taxiway and apron centerline markings are provided to assist aircraft using these airport surfaces. Taxiway centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxiway/taxilane edges. Pavement edge markings also identify aircraft parking and aircraft holding positions.

Airfield Signs: Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed at all taxiway and runway intersections.

Each runway is equipped with lighted runway distance-remaining signs. Placed in 1,000-foot intervals along the runway edge, runway distance-remaining signs notify pilots of the amount of usable runway length left, in feet.

Weather and Communication Aids

The airport is equipped with an automated surface observation system (ASOS). The ASOS provides automated aviation weather observations 24 hours a day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. The ASOS system reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for temperature).

The airport is also equipped with a lighted wind cone and segmented circle, which provides pilots with information about wind conditions. A segmented circle provides traffic pattern information to pilots. The lighted wind cone and segmented circle are located west of the Taxiway G and F intersection. A lighted supplemental wind cone is also located near the end of Runway 10.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include the terminal building, aircraft storage/ maintenance hangars, aircraft parking aprons, and support facilities such as fuel storage, automobile parking, roadway access, and aircraft rescue and firefighting. Landside facilities are identified on **Exhibit 1C**.

Passenger Terminal Facilities

The passenger terminal building is located north of the Runway 4 end. The passenger terminal building was reconstructed and expanded from 8,000 to 22,870 square feet in 1993, and provides areas for ticketing, bag claim, airport administration, secure gate lobby, a restaurant, gift shop, and deli. Three rental car companies (Avis, Budget, and Hertz) are also located in the terminal building. The terminal apron, which is constructed of asphalt, encompasses approximately 58,000 square yards on the south side of the terminal building.

Approximately 557 vehicle parking spaces are available in the paved public parking lot located north of the terminal building. It is attended 24 hours a day. Parking rates are $1.00 per hour, $5.00 maximum per day, and $35.00 per week. Employee parking is available in an unpaved lot located adjacent to the southwest end of the terminal building. Approximately 105 spaces for rental car parking are available in a paved lot located northeast of the terminal building.

General Aviation Operators

General aviation facilities at Roberts Field are concentrated in three separate areas: north of Runway 10-28 along Taxiway C, south of Runway 10-28 along Taxiway G, and west of Taxiway A.

A full range of aviation services are provided at Roberts Field. There are two fixed based operators (FBOs) available at the airport; Butler Aircraft Company and Redmond Air. These FBOs offer aviation fuel (100LL and Jet A), aircraft parking (ramp or tiedown), flight school/flight training, aircraft rental, aircraft maintenance, pilot supplies, catering, rental cars, and courtesy transportation. Butler Aircraft formerly operated an air tanker operation.

Butler Aircraft's facilities include an 11,700 square-foot hangar used for large aircraft maintenance and a 5,000 square-foot hangar used for small aircraft maintenance, FBO administration, and a pilot's lounge. These two hangars, which are city-owned, are located north of Taxiway C. Butler Aircraft also leases a 4,200 square-foot storage building from the City, which is located at the west end of the general aviation apron.

Redmond Air's facilities are located south of Taxiway G and include an 8,500 square-foot hangar for aircraft storage and maintenance and a 2,500 square-foot (two-story) terminal area adjacent to the storage hangar. A separate 2,500 square-foot building located along the west end of the apron provides classroom, office, and storage space. A 5,600 square-yard apron provides approximately nine aircraft tiedown positions. An additional 40 aircraft can tie down along the portion of Taxiway A extending south from the Taxiway A and G intersection. This area is used by AirPac and Ameriflight for daily cargo activities.

Lancair, whose facilities are located south of Centurion Air (off of airport property), produces kit planes. They also provide aircraft maintenance and avionics service.

Wings of the Cascades offers flight training in six Cessna aircraft. Two Citation Mustang jets are on order for 2007.

In addition to the facilities previously described, a number of organizations and businesses are located on airport property, west of Airport Way. This includes the Army National Guard, an 18-hole golf course, the City of Redmond Public Works Department, and commercial facilities. Additional landside facilities, which are county-owned, are discussed in a separate document, which was prepared by Morrison Maierle, Inc. This document is attached as **Appendix B**.

Aircraft Storage Facilities

Hangar space at Roberts Field is comprised of mainly executive-type hangars. Executive hangars provide a large open space, free from roof support structures. They have the capability to accommodate several aircraft simultaneously, and are typically less than 10,000 square feet in size. T-hangars, which provide for individual aircraft storage within a larger contiguous facility, are also available at the airport. These hangars are identified on **Exhibit 1C**.

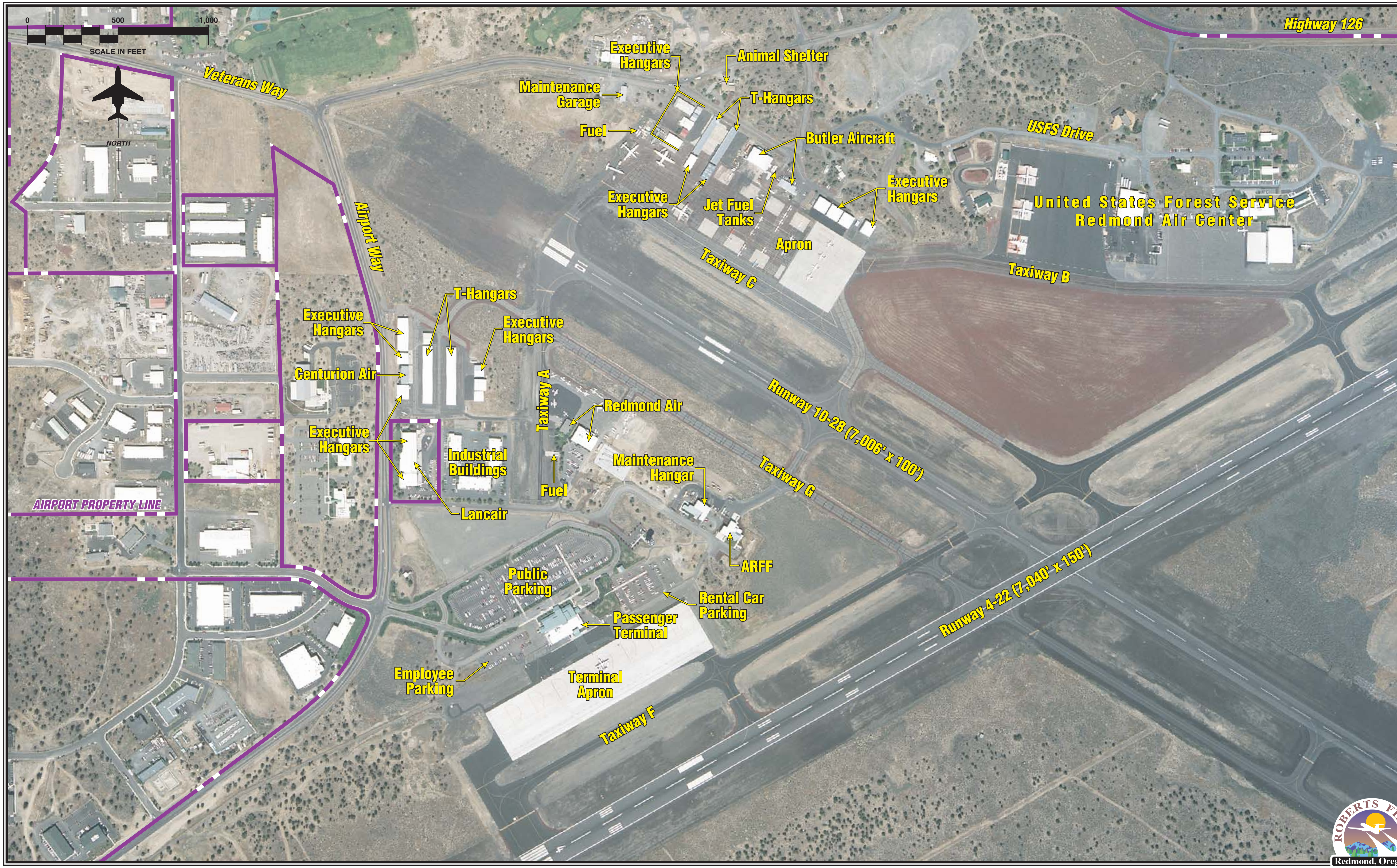

Exhibit 1C
EXISTING LANDSIDE FACILITIES

Maintenance/Storage

Several maintenance buildings/hangars are available at Roberts Field. These facilities, which are identified on **Exhibit 1C**, are used to perform aircraft maintenance and to store equipment and vehicles used in general maintenance activities at the airport.

Fuel Storage Facilities

All aircraft fuel storage facilities at the airport are privately-owned and operated. Butler Aircraft owns and operates four aboveground fuel storage tanks; two 10,000-gallon tanks for 100LL (located at the west end of the apron) and two 12,000-gallon tanks for Jet A (located near their large aircraft storage hangar). Redmond Air owns and operates two 12,000-gallon fuel storage tanks (one each for 100LL and Jet A), which are located along Taxiway A, north of Taxiway G.

Aircraft Rescue and Firefighting (ARFF)

The airport is required to maintain airport rescue and firefighting (ARFF) capabilities under F.A.R. Part 139, which governs the operation of airports with scheduled or unscheduled passenger service by aircraft with more than 30 seats. Roberts Field has been classified with Index B requirements, which apply to airports servicing aircraft less than 126 feet. Specifications have been developed for the trucks in terms of dry chemicals, water, and foam application agents they are required to carry. The ARFF equipment is located in a three-bay building located east of Redmond Air, along Taxiway G.

United States Forest Service – Redmond Air Center

The U.S. Forest Service –Redmond Air Center is a hub for the Pacific Northwest Region, which includes Oregon and Washington. Their mission is to provide timely, cost-effective, logistical support to any Federal, State, and designated cooperator incidents in the Pacific Northwest, such as wild land fires, floods, earthquakes, and other natural disasters. Their facilities are located on airport property north of Taxiway B. They maintain two aircraft apron areas totaling approximately 65,900 square yards.

ENROUTE NAVIGATION AND AIRSPACE

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from Roberts Field include the very high frequency omnidirectional range (VOR) facility, nondirectional beacon (NDB), and global positioning system (GPS).

The VOR, in general, provides azimuth readings to pilots of properly equipped aircraft by transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility (VOR/DME) to provide distance as well as direction information to the pilot. In addition, military TACAN and civil VORs are commonly combined to form a VORTAC. A VORTAC provides distance and direction information to civil and military pilots. Pilots flying to or from the airport can utilize the Deschutes VORTAC located six miles west of the airport. **Exhibit 1D**, a map of the regional airspace system, depicts the location of the Deschutes VORTAC.

The NDB transmits nondirectional radio signals whereby the pilot of properly equipped aircraft can determine the bearing to or from the NDB facility and then "home" or track to or from the station. Pilots flying to or from Roberts Field can utilize the Bodey NDB. As shown on **Exhibit 1D**, the Bodey NDB is located approximately six miles northeast of the airport.

GPS is an additional navigational aid for pilots enroute to the airport. GPS was initially developed by the United States Department of Defense for military navigation around the world. Increasingly, GPS has been utilized more in civilian aircraft. GPS uses satellites placed in orbit around the globe to transmit electronic signals, which properly equipped aircraft use to determine altitude, speed, and position information. GPS allows pilots to navigate to any airport in the country, and they are not required to navigate using a specific navigational facility. The FAA is proceeding with a program to gradually replace all traditional enroute navigational aids with GPS over the next 20 years.

In July of 2003, the FAA commissioned a Wide Area Augmentation System (WAAS), which is a GPS-based navigation and landing system that provides guidance to aircraft at thousands of airports and airstrips where there is currently no precision landing capability. Systems such as WAAS are known as satellite-based augmentation systems (SBAS). WAAS is designed to improve the accuracy and ensure the integrity of information coming from GPS satellites. The FAA is using WAAS to provide Lateral Navigation/Vertical Navigation (LNAV/VNAV) capability.

INSTRUMENT APPROACH PROCEDURES

Instrument approach procedures are a series of predetermined maneuvers established by the FAA using electronic navigational aids that assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. At Roberts Field, there are six published public instrument approaches: ILS Runway 22, RNAV (GPS) Runway 28, VOR/DME Runway 22, VOR-A, NDB or GPS Runway 22, and GPS Runway 10. Approaches to Runway 22 are precision instrument approaches, which provide vertical descent information, as well as course guidance information.

The capability of an instrument approach is defined by the visibility and

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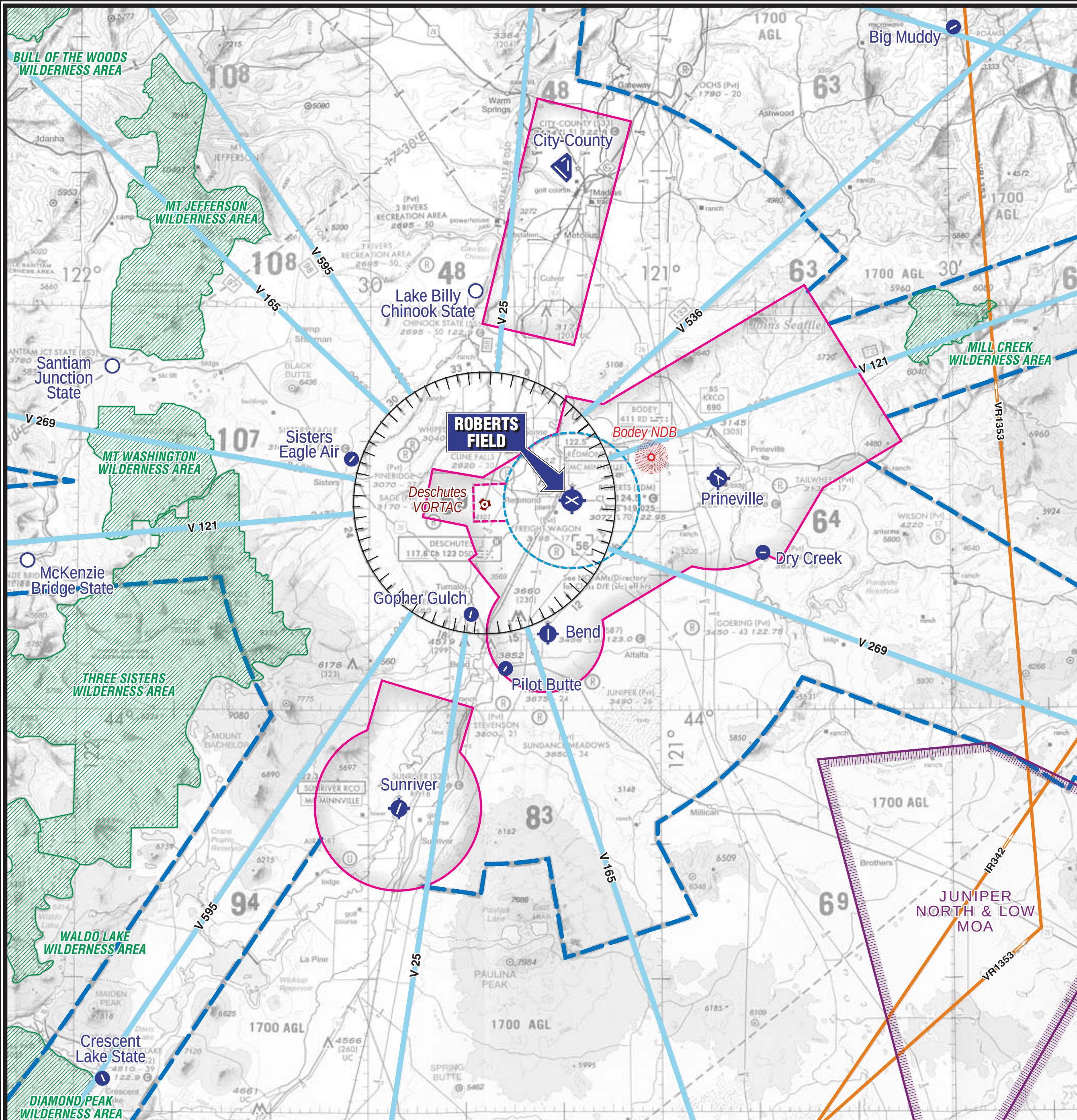


LEGEND

- Airport with other than hard-surfaced runways
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Non-Directional Radiobeacon (NDB)
- VORTAC
- VHF Omni Range (VOR)
- VOR-DME
- Compass Rose
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700 ft. above surface
- Differentiates floors of Class E Airspace greater than 700 ft. above surface
- Victor Airways
- Military Training Routes
- Wilderness Area
- Military Operations Area - MOA

Source: Klamath Falls October 2, 2003 & Seattle December 25, 2003 Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration

NORTH

NOT TO SCALE

ROBERTS FIELD Redmond, Oregon

Exhibit 1D
AREA AIRSPACE

cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance that the pilot must be able to see in order to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for the pilot to complete the approach. If the observed visibility or cloud ceilings are below the minimums prescribed for the approach, the pilot cannot complete the instrument approach. The different minimum requirements for visibility and cloud ceilings are varied, dependent on the approach speed of the aircraft.

The ILS Runway 22 approach provides the airport with its lowest minimums. Utilizing this approach, a properly equipped aircraft can land at the airport with 200-foot cloud ceilings and one-half mile visibility for aircraft in any category. The ILS Runway 22 approach can also be utilized as a localizer only or circling approach. When using only the localizer portion of the ILS (for course guidance only), the cloud ceilings increase to 400 feet above ground level for all aircraft categories and the visibility minimums increase to three-fourths mile for aircraft in category D.

When using the ILS approaches to land at a different runway end (defined as a circling approach), the cloud ceilings increase to 500 feet above ground for aircraft in categories A and B and 600 feet above ground for aircraft in categories C and D. The visibility minimums increase to one mile for aircraft in categories A and B; one and one-half mile for aircraft in category C; and two miles for aircraft in category D. **Table 1D** presents the published instrument approaches available at Roberts Field.

TABLE 1D
Instrument Approach Data
Roberts Field

	WEAHTER MINIMUMS BY AIRCRAFT TYPE					
	Category A/B		**Category C**		**Category D**	
	CH	**VIS**	**CH**	**VIS**	**CH**	**VIS**
ILS Runway 22 Approach						
Straight-In (ILS)	200	0.5	200	0.5	200	0.5
Straight-In (Localizer)	400	0.5	400	0.5	400	0.75
Circling	500	1	600	1.50	600	2
RNAV (GPS) Runway 28 Approach						
LNAV MDA	500	1	500	1.25	N/A	N/A
Circling	500	1	500	1.25	N/A	N/A
VOR/DME Runway 22 Approach						
Straight-In	1,000	1.25	1,000	2.75	1,000	3
Circling	1,000	1.25	1,000	2.75	1,000	3
VOR-A						
Circling	600	1	600	1.50	600	2
NDB or GPS Runway 22 Approach						
Straight-In	500	0.75	500	0.75	500	1.25
Circling	500	1	600	1.50	600	2
GPS Runway 10						
Straight-In	500	1	500	1.25	500	1.25
Circling	500	1	500	1.50	600	2

Source: FAA *Terminal Procedures, Northwest U.S.*, February 19, 2004 Edition.

VICINITY AIRSPACE

To ensure a safe and efficient airspace environment for all aspects of aviation, the FAA has established an airspace structure that regulates and establishes procedures for aircraft using the National Airspace System. The U.S. airspace structure provides two basic categories of airspace, controlled and uncontrolled, and identifies them as Classes A, B, C, D, E, and G.

Class A airspace is controlled airspace and includes all airspace from 18,000 feet MSL to Flight Level 600 (approximately 60,000 feet MSL). Class B airspace is controlled airspace surrounding high-capacity commercial service airports (i.e., San Francisco International Airport). Class C airspace is controlled airspace surrounding lower activity commercial service airports and some military airports. Class D airspace is controlled airspace surrounding airports with an airport traffic control tower. All aircraft operating within Classes A, B, C, and D airspace must be in contact with the air traffic control facility responsible for that particular airspace. Class E airspace is controlled airspace that encompasses all instrument approach procedures and low-altitude federal airways. Only aircraft conducting instrument flights are required to be in contact with air traffic control when operating in Class E airspace. Aircraft conducting visual flights in Class E airspace are not required to be in radio communications with air traffic control facilities. Visual flight can only be conducted if minimum visibility and cloud ceilings exist. Class G airspace is uncontrolled airspace that does not require contact with an air traffic control facility.

Airspace in the vicinity of Roberts Field is depicted on **Exhibit 1D**. Class D airspace surrounds the airport in a radius of approximately five statute miles, beginning at the surface and extending up to 5,600 feet MSL. This Class D airspace is in effect when the tower is operating (dusk to dawn). During the period when the airport traffic control tower is closed, the Class D airspace surrounding the airport reverts to Class E airspace.

For aircraft arriving or departing the regional area using VOR facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. As shown on **Exhibit 1D**, Victor Airways in the area emanate from the Deschutes VORTAC.

Located approximately 25 nautical miles southeast of the airport is the Juniper North Military Operations Area (MOA). MOAs define areas of high-level military activity and are intended to segregate military and civilian aircraft. While civilian operations are not restricted within the MOA, civilian aircraft are cautioned to be alert for military aircraft when operating in the MOA. Military operations within the Juniper MOA are intermittent and are normally conducted between 11,000 and 18,000 feet above ground.

A number of military training routes (MTRs) are located near Roberts Field. These routes are used by military training aircraft which commonly operate at speeds in excess of 250 knots and at altitudes to 10,000 feet MSL. While general aviation flights are not restricted within this area, pilots are strongly cautioned to be alert for high speed military jet training aircraft.

AIR TRAFFIC CONTROL

The airport traffic control tower at Roberts Field controls air traffic within the Class D airspace surrounding the airport. The airport traffic control tower is located east of the passenger terminal building and operates daily from 6:00 a.m. to 8:00 p.m.

Aircraft arriving and departing the Roberts Field area are controlled by the Seattle Air Route Traffic Control Center (ARTCC). ARTCCs control aircraft in a large multi-state area. All aircraft in radio communication with the ARTCC will be provided with altitude, aircraft separation, and route guidance to and from the airport. The ARTCC directs aircraft until the pilot can contact the airport traffic control tower on the airport. The McMinnville Flight Service Station (FSS) provides additional information to pilots operating in the vicinity of the airport.

AREA AIRPORTS

A review of airports within 30 nautical miles of Roberts Field has been made to identify and distinguish the type of air service provided in the area surrounding the airport. Public-use airports within 30 nautical miles of the airport were previously illustrated on **Exhibit 1D**. Information pertaining to each airport was obtained from FAA master airport records.

Bend Municipal Airport is located approximately ten nautical miles (nm) south-southwest of Roberts Field. Bend Municipal Airport is owned and operated by the City of Bend. The airport is served by a single runway, which is 5,005 feet in length. The airport is not equipped with an airport traffic control tower. There are two published instrument approaches available at the airport. There are 126 based aircraft at Bend Municipal Airport, the majority of which are single-engine. Services available at the airport include 100LL and Jet A fuel sales, aircraft tie-downs, and aircraft maintenance.

Prineville Airport is located approximately 11nm east of Roberts Field and is owned and operated by the Prineville Airport Commission. Two asphalt runways are available for use, the longest at 5,000 feet in length. The airport is not equipped with an airport traffic control tower. Three published instrument approaches are available at the airport. There are 94 based aircraft at Prineville Airport, the majority of which are single-engine. Services available at the airport include 100LL and Jet A fuel sales, aircraft tiedowns, and aircraft maintenance.

Sisters Eagle Air Airport is located approximately 17nm west of Roberts Field and is owned and operated by Sisters Eagle Air, Inc. A single runway (3,550 feet in length) serves the airport. The airport is not equipped with an airport traffic control tower and there are no published instrument approaches available. There are 17 based aircraft at Sisters Eagle Air Airport. Aircraft tiedowns are available at the airport.

Lake Billy Chinook State Airport is located approximately 18nm north-northwest of Roberts Field. A single 5,000-foot runway serves the airport, which is owned and operated by the Oregon Aero Division. There is no airport traffic control tower at the airport and there are no published instrument approaches available. Four aircraft are based at Lake Billy Chinook State Airport and aircraft tiedowns are available.

City-County Airport is located approximately 25nm north of Roberts Field in the City of Madras. The airport, whose longest runway is 5,100 feet in length, is owned and operated by the City and the County. The airport is not equipped with an airport traffic control tower and there are no published instrument approaches available. There are 34 based aircraft at City-County Airport. Services available include fuel sales (100LL, Jet A, and 80), aircraft hangars, tiedowns, and aircraft maintenance.

Sunriver Airport is a privately-owned airport located approximately 26nm south-southwest of Roberts Field. The airport is served by a single runway, which is 5,455 feet long. The airport is not equipped with an airport traffic control tower. One published instrument approach is available at Sunriver Airport. There are 47 based aircraft at the airport and services available include 100LL and Jet A fuel sales, aircraft hangars, and tiedowns.

SOCIOECONOMIC CHARACTERISTICS

For an airport master plan, socioeconomic characteristics are collected and examined to derive an understanding of the dynamics of growth within the study area. This information is essential in determining aviation service level requirements, as well as forecasting the number of based aircraft and aircraft activity at the airport. Aviation forecasts are typically related to the population base, economic strength of the region, and the ability of the region to sustain a strong economic base over an extended period of time.

POPULATION

The size and structure of the local communities and the service area that the airport supports are important factors to consider when planning airport facilities. These factors provide an understanding of the economic base that is needed to determine future airport requirements. Historical population totals are presented in **Table 1E**.

The City of Redmond lies at the approximate center of the region, with no more than a 30-minute drive to all communities in the region. According to data obtained from the U.S. Census Bureau, Redmond's population has nearly doubled since 1990, with an average annual growth rate of 6.5 percent. Redmond is Deschutes County's fastest growing city and consistently one of the fastest in Oregon. The City of Redmond Building Inspection Department reports an average of two new home building permits processed each day.

The population of Deschutes County was also examined. Many people move to Central Oregon for its quality of life, rather than job opportunities, leading to the creation of more jobs in the area. This is in contrast to the more common pattern of people moving to an area to fill available jobs. Between 1990 and 2000, Deschutes County experienced an average annual growth rate of 4.4 percent, adding more than 40,000 residents. The State also experienced a positive growth rate between 1990 and 2000, with an average annual growth rate of 1.9 percent, resulting in a net increase of more than half a million residents. The population of Oregon is currently more than 3.4 million.

Population projections were obtained from the Deschutes County Coordinated Population Forecast. It is expected that the City will continue to outpace the rest of the region and the State, with an average annual growth rate of 5.3 percent throughout the planning period. The City's population is expected to reach over 44,000 by the year 2023. The population of Deschutes County is expected to reach over 220,00 by the end of the planning period and the State's population is expected to reach more than 4.4 million during this same time. The population forecasts are presented in **Table 1E**.

TABLE 1E
Historical and Forecast Population

	HISTORICAL			FORECAST			
Area	**1990**	**2000**	**Avg. Ann. Growth Rate 1990-2000**	**2008**	**2013**	**2023**	**Avg. Ann. Growth Rate 2000-2023**
City of Redmond	7,163	13,481	6.5%	25,200	31,800	44,600	5.3%
Deschutes County	74,958	115,367	4.4%	155,000	176,900	220,200	2.9%
State of Oregon	2,842,321	3,421,399	1.9%	3,765,000	3,996,000	4,463,000	1.2%

Source: Historical Population - U.S. Census Bureau; Forecast Population – Interpolated from Deschutes County Coordinated Population Forecast.

EMPLOYMENT

Analysis of a community's employment base can provide valuable insight to the overall well-being of the community. In most cases, the community make-up and health is significantly impacted by the availability of jobs, variety of employment opportunities, and types of wages provided by local employers.

Historical unemployment rates for Central Oregon (Deschutes, Crook, and Jefferson counties), the State of Oregon, and the United States are presented in **Table 1F**. Since 1990, the annual average unemployment rate for Central Oregon has been consistently higher than the State and the Nation. This is not due to a repressed economy, but rather because population growth (in-migration) has outpaced job growth.

TABLE 1F
Historical Unemployment Rates

Year	Central Oregon	Oregon	United States
1990	5.8%	5.5%	5.5%
1991	6.6%	6.0%	6.7%
1992	8.3%	7.5%	7.4%
1993	8.9%	7.2%	6.8%
1994	7.2%	5.4%	6.1%
1995	6.6%	4.8%	5.6%
1996	8.7%	5.9%	5.4%
1997	8.1%	5.8%	4.7%
1998	7.2%	5.6%	4.5%
1999	6.7%	5.7%	4.2%
2000	6.5%	4.9%	4.0%
2001	6.9%	5.9%	4.8%
2002	8.0%	7.5%	5.8%

Source: Economic Development for Central Oregon (EDCO).

Employment by economic sector for Central Oregon was also examined. This information, which was obtained from Woods and Poole Economics, can be found in **Table 1G**. Central Oregon's economy is based largely on tourism. As a result, services sector is the largest sector of employment in the Tri-County Region, providing over 28,000 jobs, or nearly 30 percent of total employment. Retail trade, the second largest industry sector, accounts for approximately 20 percent of total employment, with nearly 19,000 jobs reported. Manufacturing is also a significant sector of employment in the Tri-County area, with over 10,000 jobs reported in 2003. The services, retail trade, and construction industries are expected to continue dominating employment in Central Oregon and remain strong assets in the region's economic growth.

Central Oregon has steadily diversified its employment and economic base. For the past decade, Deschutes County has lead Oregon in high technology growth. Numerous companies from the Silicon Valley, Portland-Vancouver Metro, and Puget Sound have relocated or expanded here to escape skyrocketing costs, electricity shortages, and tight labor markets. Many of these firms are small but extremely innovative, producing niche-market products from semiconductors to software, medical instruments to recreational equipment.

TABLE 1G
Employment by Economic Sector
Tri-County Region (Deschutes, Crook, and Jefferson)

Economic Sector	Deschutes County	Crook County	Jefferson County	Tri-County Total	% of Total Employment in Tri-County
Total Employment	**77,160**	**8,690**	**8,400**	**94,250**	**100.0%**
Construction	8,370	520	220	9,110	9.7%
Manufacturing	6,890	1,760	2,220	10,870	11.5%
Transportation & Public Utilities	2,840	460	220	3,520	3.7%
Wholesale Trade	2,220	950	360	3,530	3.7%
Retail Trade	16,230	1,280	1,280	18,790	19.9%
Finance, Insurance, & Real Estate	8,250	550	390	9,190	9.8%
Services	24,250	1,810	2,140	28,200	29.9%
Federal Government	1,270	400	230	1,900	2.0%
State & Local Government	6,840	960	1,340	9,140	9.7%

Source: Complete Economic and Demographic Data Source (CEDDS) 2003.

Table 1H presents the major employers (private sector) in Central Oregon. As previously noted, Central Oregon's economy is based largely on tourism. In fact, Central Oregon is known as the "Destination Resort Capital of the Pacific Northwest," offering skiing, golfing, fishing, hiking, museums, biking, kayaking, and festivals. As shown in the table, three of the top largest employers in the region are resorts. The $37 million Deschutes County Fairgrounds and Expo Center, which was completed in 1999, is a major attraction in the region. This 132-acre site, located in the City of Redmond, just minutes from Roberts Field, attracts large-scale national events to the region.

Several aviation-related industries have made Central Oregon, and especially Deschutes County, their home. Lancair International/PAC USA produces both kit planes in Redmond, as well as production (ready to fly) aircraft at the company's new plant in Bend. Mountain High Equipment & Supply (Redmond), which recently relocated from the Salt Lake City area of Utah, produces oxygen systems for non-pressurized aircraft. Aerospace Tool, which relocated from the City of Orange, California, to Redmond, supplies casting moulds for Boeing, McDonald-Douglas and other suppliers. Similarly, PCC-Schlosser (Redmond) is a titanium casting foundry for the aerospace and medical industries.

TABLE 1H
Central Oregon's Largest Employers (Private Sector)

Employer Name	Location (city)	Industry	# of Employees
St. Charles Medical Center	Bend	Hospital/Medical	1,868
Bright Wood Corporation	Region-Wide	Millwork Manufacturer	1,392
Les Schwab Tire Center	Region-Wide	Automotive Retail	1,000
iSky	Bend	Customer Contact Center	850
Sunriver Resort	Sunriver	Resort	841
Mt. Bachelor, Inc.	Bend (seasonal)	Resort	800
Eagle Crest Partners, Ltd.	Redmond (seasonal)	Resort	660
Beaver Motor Coaches	Bend	RV Manufacturer	575
Pozzi Window Company	Bend	Door/Window Manufacturer	500
Clear Pine Moldings, Inc.	Prineville	Molding Manufacturer	500

Source: Economic Development for Central Oregon (EDCO).

Other aerospace firms have moved to the region because of its outstanding workforce and strategic location between the industry's manufacturing centers in Southern California and Washington's Puget Sound. These include Precise Flight, Inc. (manufacturers aircraft safety modification parts), Composite Hobbies (a fabrication supplier to Lancair), Airframes Inc. (a sub-assembler of aircraft airframes), and Electronics International (recently relocated from the Portland-Metro area) which produces electronics systems for general aviation aircraft.

INCOME

Table 1J summarizes historical per capita personal income (PCPI), adjusted for 1996 dollars, for Deschutes County, the State of Oregon, and the United States. In 1990, the County's PCPI was just above that of the State's. However, over the next ten years the average annual growth rate for the Deschutes County PCPI was 1.1 percent, while the State averaged an annual growth rate of 1.9 percent. This resulted in a lower PCPI for the County than the State in the year 2000. The Nation's PCPI has remained consistently above both the County and the State since 1990.

Projections of PCPI were obtained from the 2003 Complete Economic and Demographic Data Source (CEDDS) by Woods & Poole Economics, Inc. The forecasts indicate that PCPI for Deschutes County will continue to remain below that of the State and the Nation.

TABLE 1J
Personal Income Per Capita (1996$)

	HISTORICAL			FORECAST			
Area	**1990**	**2000**	**Avg. Ann. Increase (1990-2000)**	**2008**	**2013**	**2023**	**Avg. Ann. Increase (2000-2023)**
Deschutes Co.	$21,970	$24,630	1.1%	$25,900	$27,200	$30,100	0.9%
State of Oregon	$21,300	$25,740	1.9%	$28,000	$29,400	$32,500	1.0%
United States	$22,860	$27,430	1.8%	$30,000	$31,700	$35,500	1.1%

Source: Complete Economic and Demographic Data Source (CEDDS) 2003.

SUMMARY

The information discussed on the previous pages provides a foundation upon which the remaining elements of the planning process will be constructed. Information on current airport facilities and utilization will serve as a basis, with additional analysis and data collection, for the development of forecasts of aviation activity and facility requirement determinations. The inventory of existing conditions is the first step in the process of determining those factors which will meet projected aviation demand in the community and the region.

ROBERTS FIELD
Redmond, Oregon

Chapter Two
FORECASTS

Chapter Two

FORECASTS

This chapter will provide forecasts of aviation activity through the year 2023. Forecasts of annual enplanements, based aircraft, based aircraft fleet mix, annual aircraft operations, peak hour operations, and annual instrument approaches will serve as the basis for facility planning.

The resulting forecast may be used for several purposes including facility needs assessments, airfield capacity evaluation, and environmental evaluations. The forecasts will be reviewed and approved by the Federal Aviation Administration (FAA) to ensure that they are reasonable projections of aviation activity. The intent is to permit the City of Redmond to make the necessary planning adjustments to ensure the facility meets projected demands in an efficient and cost-effective manner.

Because aviation activity can be affected by many influences at the local, regional and national levels, it is important to

remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to unforeseen facility needs.

NATIONAL AVIATION TRENDS

Each year, the FAA publishes its national aviation forecast. Included in this publication are forecasts for air carriers, regional/commuters, general aviation, air cargo, and military activity. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the

aviation industry, and by the general public. The current edition when this chapter was prepared was FAA *Aerospace Forecasts-Fiscal Years 2004-2015*, published in March 2004. The forecasts use the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets.

In the seven years prior to the September 11 terrorist attacks, the U.S. commercial and general aviation community achieved a period of unprecedented growth in both the demand for aviation services and profitability. The impact of the terrorist attacks on the airlines was immediate, significant, and worldwide, although the greater impact occurred in the United States. Commercial air carriers sharply reduced capacity in the months following the events of September 11. Although capacity has recovered from the low levels flown in the months immediately following the terrorist attacks, capacity has yet to return to pre-September 11 levels.

Despite these economic hardships, the numbers are slowly, but steadily increasing in favor of aviation. The U.S. and international economies are expected to expand rapidly over the next two years. Moderate growth thereafter is expected through 2015. The large air carriers and regionals/commuters are projected to grow at an annual rate of 4.3 percent over the forecast period. Passenger demand will return to pre-September 11 levels by 2005 and the number of passengers is forecast to climb above one billion by 2014. International and domestic markets will recover strongly over the next two years. The growth of regional/ commuter passenger traffic in the U.S. will continue to outpace that of its larger domestic counterparts; 6.4 percent compared to 3.6 percent annually. It is expected that low-cost carriers and regionals/commuters could account for more than half of all domestic passengers by the end of the 12-year forecast period. The forecast for air cargo and general aviation indicates growth as well.

REGIONAL/COMMUTER AIRLINES

The regional/commuter airline industry, defined as air carriers providing regularly scheduled passenger service and fleets composed primarily of aircraft having 70 seats or less, continues to be the strongest growth sector of the commercial air carrier industry. Dramatic growth in code-sharing agreements with the major carriers, followed by a wave of air carrier acquisitions and purchases of equity interests, has resulted in the transfer of large numbers of short-haul jet routes to their regional partners, fueling the industry's growth.

Although regional/commuter carriers were impacted by the events of September 11, the negative impact was of relatively short duration, and most of the impact since appears to have been largely positive. This is due, in large part, to the fact that the regionals/commuters have been the beneficiary of the restructuring and downsizing that is taking place among their larger code-sharing partners.

Industry growth is expected to outpace that of the larger commercial air carriers. The introduction of new state-of-the-art aircraft, especially high-speed turboprops and regional jets with ranges of 1,000 miles (or greater), is expected to open up new opportunities for growth in non-traditional markets. The regional airline industry will also continue to benefit from continued integration with the larger air carriers. The further need for larger commercial air carriers to reduce costs and fleet size will insure that these carriers continue to transfer smaller, marginally profitable routes to the regional air carriers.

Likewise, the increased use of regional jets is expected to lead to another round of route rationalization by the larger commercial carriers, particularly on low-density routes in the 500-mile range. Regional jet aircraft can serve these markets with the speed and comfort of a large jet, while at the same time providing greater service frequency that is not economically feasible with a large jet. According to the FAA *Aerospace Forecasts,* this transfer of routes is expected to be one of the major drivers of growth during the early years of the forecast.

Regional/commuter revenue passenger miles (RPMs) are expected to increase 26.4 percent in 2004 (to 50.9 billion), 15.8 percent in 2005 (to 58.9 billion), and 9.8 percent in 2006 (to 64.7 billion). The high growth rates reflect the longer stage lengths being flown by the large number of regional jets entering the fleet during these years. Between 2007 and 2015, regional RPMs are expected to increase at an average annual rate of 5.7 percent. Over the 12-year forecast period, the average annual rate of growth in RPMs is 8.4 percent, for a total of 106.4 billion by 2015. Domestic passenger miles are forecast to be 63.2 billion in 2006, a 63.2 percent increase from 2003 levels. Over the latter years of the forecast (2007 through 2015), the average annual growth rate is projected to be 5.7 percent.

Regional/commuter passenger enplanements are projected to increase by 18.4 percent in 2004 (to 128.7 million), 11.6 percent in 2005 (to 143.6 million), and 7.2 percent in 2006 (to 153.9 million). The strong growth rate during this three-year period reflects the transfer of additional routes from the larger air carriers and the addition of regional jet aircraft to their fleet. Between 2007 and 2015, enplanements are forecast to grow at an average rate of 4.4 percent annually for a total of 226.2 million in 2015.

Over the 12-year forecast period, the regional/commuter passenger fleet is projected to net an average annual increase of 136 aircraft, going from 2,672 aircraft in 2003, to 4,303 aircraft in 2015. During this same period, the overall fleet of turboprop aircraft will decrease by 240 aircraft. For the first three years of the forecast, 5.4 regional jet aircraft will enter the fleet for every one turboprop aircraft retired. **Exhibit 2A** depicts passenger enplanements and fleet mix forecasts for the U.S. regional/commuter market.

GENERAL AVIATION

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994 (federal legislation which limits the liability on general aviation aircraft to 18 years from the date of manufacture). This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance was a major factor in the decision by many U.S. aircraft manufacturers to slow or discontinue the production of general aviation aircraft.

However, this continued growth in the general aviation industry slowed considerably in 2001 and 2002, negatively impacted by the events of September 11. This, in addition to the economic recession already taking place in 2001-02, has had a profoundly negative impact on the general aviation industry.

General aviation activity is expected to continue to experience slow growth in 2004 and return to more normal growth patterns beginning in 2005, as the U.S. economy reaches the peak of its recovery. The forecast assumes that the regulatory environment affecting general aviation will not change dramatically. The forecast also assumes that the fractional ownership market will continue to expand and bring new operators and shareholders into business aviation.

The active general aviation aircraft fleet is expected to increase at an average annual rate of 1.2 percent over the 13-year forecast period, increasing from 211,244 in 2002, to 246,415 in 2015. This growth includes the addition of a new aircraft category; light sport aircraft, which is expected to enter the active fleet in 2004 and to account for 20,915 aircraft in 2015. Excluding these light sport aircraft, growth averages only 0.5 percent over the 13-year forecast period.

Exhibit 2B depicts the FAA forecast for active general aviation aircraft in the United States. The number of single-engine piston aircraft is projected to reach 148,450 in 2015, which represents an average annual growth rate of 0.3 percent. During this same time, the number of active multi-engine piston aircraft fleet is expected to decline by 0.5 percent. The number of turboprop aircraft is expected to increase at an average annual rate of 1.3 percent over the 13-year forecast period, while turbojet aircraft are forecast to increase on average by 4.9 percent annually. The rotorcraft fleet is forecast to grow only 0.6 percent annually through 2015, and the number of experimental aircraft is projected to increase at an average annual rate of 0.4 percent. Gliders and lighter-than-air aircraft are forecast to increase approximately 0.3 percent annually over the 13-year forecast period.

The declines in the aircraft utilization rates experienced in 2000 (down 3.2 percent) and 2001 (down 7.2 percent) were due, in part, to higher fuel prices

03MP11-2B-3/29/04

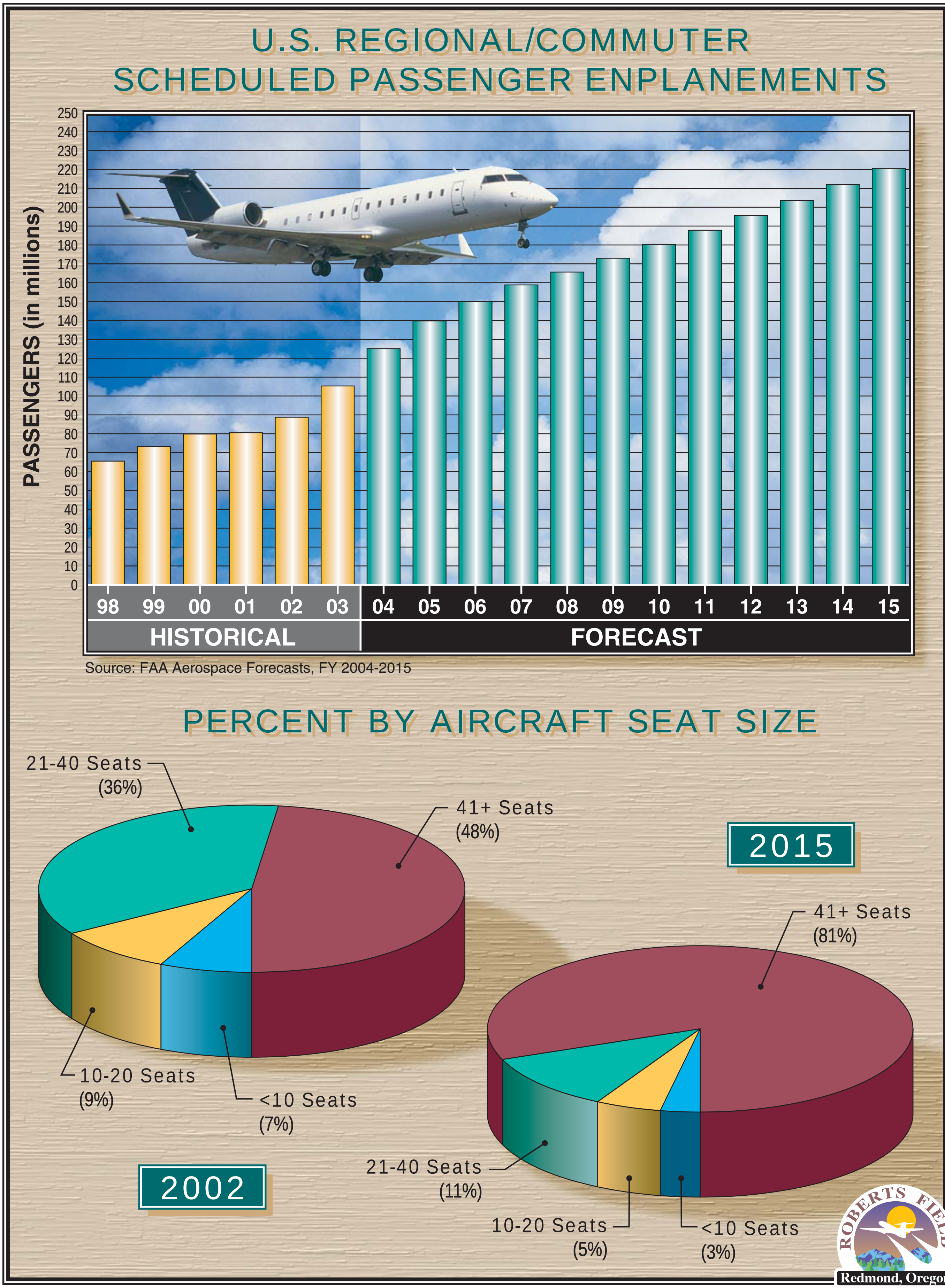
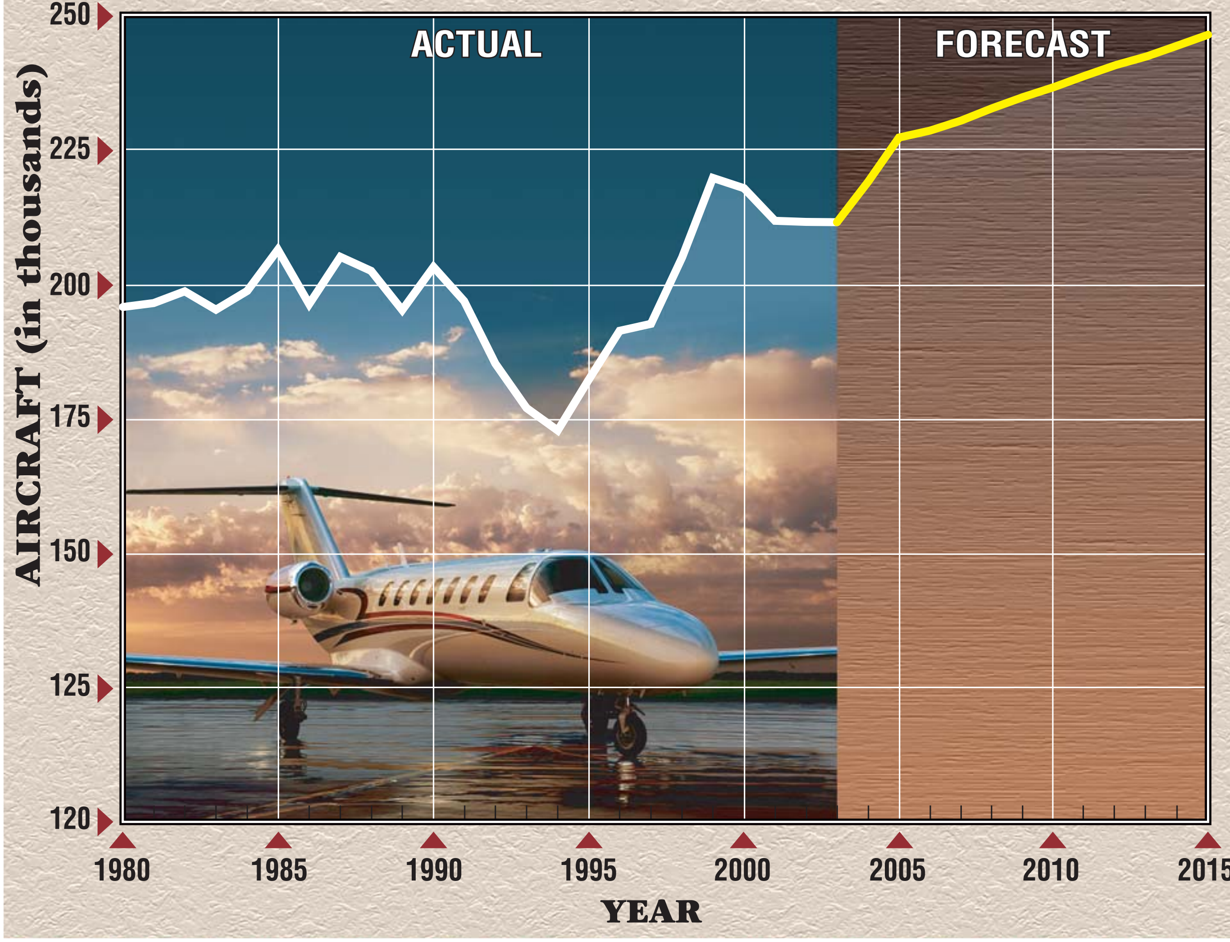


Exhibit 2A
U.S. REGIONAL/COMMUTER FORECASTS

03MP11-2B-4/1/04

U.S. ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING				ROTORCRAFT					
	PISTON		TURBINE							
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	Experimental	Sport Aircraft	Other	Total
2003 (Est.)	143.4	17.5	6.9	8.5	2.4	4.3	22.0	N/A	6.4	211.2
2005	143.5	17.3	7.0	9.0	2.4	4.3	22.1	15.5	6.4	227.6
2010	146.2	16.9	7.6	12.0	2.6	4.4	22.7	18.1	6.5	236.9
2015	148.5	16.5	8.1	15.5	2.7	4.5	23.1	20.9	6.6	246.4

Source: FAA Aerospace Forecasts, Fiscal Years 2004-2015.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

ROBERTS FIELD
Redmond, Oregon

Exhibit 2B
U.S. ACTIVE GENERAL AVIATION AIRCRAFT FORECASTS

and the U.S. economic recession. However, the restrictions placed on general aviation in the aftermath of the September 11 events, contributed heavily to the decline in utilization in 2001. The strong recovery in the U.S. economy in 2004 and 2005, should lead to increased utilization rates for most categories of general aviation aircraft.

The total pilot population is projected to increase from an estimated 625,011 in 2003, to 777,730 by 2015, which represents an average annual growth rate of 1.6 percent. This includes the certification of 16,100 new sport pilots. The student pilot population increased 1.5 percent in 2003 and is forecast to increase at an annual rate of 1.9 percent (almost 1,800 students annually) over the 12-year forecast period, reaching a total of 108,430 in 2015. Growth rates for the other pilot categories over the forecast period are as follows: airline transport pilots, up 1.6 percent; recreational pilots, up 0.8 percent; rotorcraft only, up 1.0 percent; and glider only, up 0.2 percent.

Over the past several years, the general aviation industry has launched a series of programs and initiatives whose main goals are to promote and assure future growth within the industry. "No Plane, No Gain" is an advocacy program created in 1992 by the General Aviation Manufacturers Association (GAMA) and the National Business Aircraft Association (NBAA) to promote acceptance and increased use of general aviation as an essential, cost-effective tool for businesses. Other programs are intended to promote growth in new pilot starts and introduce people to general aviation. "Project Pilot" sponsored by the Aircraft Owners and Pilots Association (AOPA) promotes the training of new pilots in order to increase and maintain the size of the pilot population. The "Be a Pilot" program is jointly sponsored and supported by more than 100 industry organizations. The NBAA sponsors "AvKids," a program designed to educate elementary school students about the benefits of business aviation to the community, and career opportunities available to them in business aviation. Over the years, programs such as these have played an important role in the success of general aviation and will continue to be vital to its growth in the future.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/time-series projections, correlation/regression analysis, and market share analysis.

Trend line/time-series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical data, then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of direct relationship between two separate sets of historic data. Should there be a reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

Regression analysis measures statistical relationships between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the changes in the dependent variable and the independent variable(s). If the "r-squared" value (coefficient determination) is greater than 0.95, it indicates good predictive reliability. A value less than 0.95 may be used, but with the understanding that the predictive reliability is lower.

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections, but can provide a useful check on the validity of other forecasting techniques.

It is important to note that one should not assume a high level of confidence in forecasts that extend beyond five years. Facility and financial planning usually require at least a 10-year preview, since it often takes more than five years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

AIRPORT SERVICE AREA

The service area of an airport is defined by its proximity to other airports providing similar services. The service area may be examined from a commercial service perspective, which will reflect passenger demand for scheduled commercial airline service. Roberts Field is the only commercial service airport in the Central Oregon area providing scheduled passenger services. The nearest commercial service airport is Mahlon Sweet Field, which is located approximately 126 statute miles (s.m.) west in Eugene, Oregon, although most residents of the area will generally drive to Portland (146 s.m.) for alternative air service.

While the passenger service area may extend outside the boundaries of Deschutes, Jefferson, and Crook Counties, these three counties generally make up the geographic boundaries of the Central Oregon area, and provide the source for the majority of locally originating passengers.

Roberts Field is classified as a non-hub (commercial service) airport, enplaning less than 0.05 percent of the total passenger enplanements reported nationally, and functions as a commuter service airport, feeding passengers into the Portland, Seattle, and San Francisco hubs.

The general aviation service area is affected by the number of nearby airfields which also have the ability to base and serve general aviation aircraft. There are six public-use airports within a 30 nautical mile (nm) radius of Roberts Field. Five of these airports have a runway 5,000 feet or greater, which is generally preferred by corporate aviation departments operating turbine aircraft.

Other factors affect the decision to base at a given airport, including availability of hangars (and rates), services offered (including fuel), access to major highways, and instrument capabilities. Services provided at many of these airports include major airframe and powerplant repair, aircraft maintenance, aircraft rental/ sales, flight training, aerial tours, fuel, pilot supplies, aircraft hangars, tie-downs, courtesy transportation, and catering.

AVIATION ACTIVITY FORECASTS

The following forecast analysis examines each of the aviation demand categories expected at Roberts Field over the next 20 years. Each segment will be examined individually, and then collectively, to provide an understanding of the overall aviation activity at the airport through 2023.

The need for airport facilities at Roberts Field can best be determined by accounting for forecasts of future aviation demand. Therefore, the remainder of this chapter presents the forecasts for airport users, and includes the following:

- COMMERCIAL SERVICE
  - Annual Enplaned Passengers
  - Operations and Fleet Mix
  - Peak Activity
  - Annual Instrument Approaches

- AIR CARGO
  - Annual Operations

- AIR TAXI AND MILITARY
  - Annual Operations

- GENERAL AVIATION
  - Based Aircraft
  - Based Aircraft Fleet Mix
  - Local and Itinerant Operations
  - Peak Activity
  - Annual Instrument Approaches

COMMERCIAL SERVICE

Scheduled air service is currently provided by two regional air carriers; Horizon Air and United Express (operated by SkyWest Airlines), with direct flights to Seattle/Tacoma International Airport (SEA), Portland International Airport (PDX), and San Francisco International Airport (SFO). Together, these two airlines offer 16 daily departures each weekday and 14 daily departures on Saturday and Sunday.

To determine the types and sizes of facilities necessary to properly accommodate present and future airline activity, two elements of commercial service must be forecast; annual enplaned passengers and annual aircraft operations. Of these, the number of annual enplaned passengers is the most basic indicator of demand for commercial service activity. From a forecast of annual enplanements, operations and peak period activity can be projected based on the specific characteristics of passenger demand at the airport.

The term "enplanement" refers to a passenger boarding an airline flight. Enplaning passengers are then described in terms of "originating" or "transfer." Originating passengers are those who board and depart in a commercial service aircraft from an airport. Transfer passengers are all others, including those who have departed from another location and are aboard aircraft using the airport as an intermediate stop.

Passenger Enplanements

Historical passenger enplanements and the annual percentage change are presented in **Table 2A**. Roberts Field has experienced an average annual growth rate of 6.4 percent since 1993. In 2000, the airport experienced a record 161,713 enplanements. However, over the next two years the airport experienced a loss of more than 17,000 enplanements, down 10.6 percent. This significant loss of enplanements can be attributed to the events of September 11, 2001, along with the already slowing economy. The airport has since rebounded, with 147,106 enplanements reported in 2003, up 1.7 percent from 2002.

TABLE 2A
Historical Passenger Enplanements
Roberts Field

Year	Total Enplanements	Annual % Change
1993	78,983	-
1994	92,732	17.4%
1995	105,774	14.1%
1996	107,530	1.7%
1997	111,450	3.6%
1998	127,296	14.2%
1998	145,740	14.5%
2000	161,713	11.0%
2001	158,670	-1.9%
2002	144,582	-8.9%
2003	147,106	1.7%

Source: Airport records

Several analytical techniques have been used to examine trends in passenger growth, including several time-series and regression analyses, as well as market share analyses. Forecasts included in the FAA *Terminal Area Forecasts* (TAF), the 2000 *Oregon Aviation Plan*, and the previous master plan (1998) were also examined.

The first forecast method used to project enplanements at Roberts Field was a time-series analysis. This analysis examined the time period 1993-2003, which yielded a correlation coefficient (r2 value) of 0.84. As previously mentioned, if the "r2" value is greater than 0.95, it indicates good predictive reliability. A second time-series analysis, using the time period 1990-2000, was also conducted to represent the airport's growth trend before the impacts of September 11, 2001. The second time-series analysis yielded a higher correlation coefficient of 0.93.

In addition to the time-series analyses, several regression analyses were performed using socioeconomic data pertaining to population, employment, and income. These regression analyses used historic socioeconomic data for the Central Oregon region to analyze their correlation to historical enplanements at the airport. Correlation coefficients ranging from 0.87 to 0.90 were obtained, but were too low to be used in developing accurate forecasts.

Additional forecasting methods were also used to project future enplanements at Roberts Field. One method examined the airport's historic market share of U.S. domestic enplanements. National forecasts of U.S. domestic enplanements are compiled each year by the FAA and consider the state of the economy, fuel prices, and prior year developments. According to the most recent publication, FAA *Aerospace Forecasts, Fiscal Years 2004-*2015, domestic passenger enplanements are forecast to increase at an average annual rate of 3.4 percent over the 12-year forecast period.

As shown in **Table 2B**, the airport's market share of U.S. domestic passenger enplanements has increased from 0.017 percent in 1993, to 0.031 percent in 2003. From this historical information, two projections of enplanements were developed for the airport using market share data. The first, a constant market share forecast, was prepared using 2003's market share of 0.031 percent as an indicator of future market share, and then applying that share to the forecasted U.S. domestic enplanements. This method yields 299,600 annual enplanements at Roberts Field by the year 2023.

The second market share forecast, an increasing market share, was developed to represent the historical trend at the airport over the past ten years. This increasing market share forecast assumes that the airport will continue to increase its market share of U.S. domestic passenger enplanements and yields 338,200 enplanements by the year 2023. These market share forecasts are presented in **Table 2B**.

As previously mentioned, the commercial service area for Roberts Field covers the geographic areas of Deschutes, Jefferson, and Crook Counties. Per capita ratios were determined between the population of the tri-county region and the number of reported enplanements. As shown in **Table 2C**, there were 0.68 enplanements per capita in 1993. This ratio has since increased, with 0.89 enplanements per capita in the year 2003.

TABLE 2B Market Share Enplanements Forecasts Roberts Field (RDM)			
Year	RDM Enplanements	U.S. Domestic Passenger Enplanements (Millions)	RDM Market Share of U.S.
1993	78,983	470.4	0.017%
1994	92,732	511.3	0.018%
1995	105,774	531.1	0.020%
1996	107,530	558.1	0.019%
1997	111,450	577.8	0.019%
1998	127,296	524.7	0.024%
1999	145,740	537.8	0.027%
2000	161,713	561.5	0.029%
2001	158,670	546.3	0.029%
2002	144,582	485.9	0.030%
2003	147,106	482.2	0.031%
Constant Market Share Projection			
2008	181,100	584.3	0.031%
2013	213,200	687.9	0.031%
2023	299,600	966.4	0.031%
Increasing Market Share Projection			
2008	187,000	584.3	0.032%
2013	227,000	687.9	0.033%
2023	338,200	966.4	0.035%
Source: Historical enplanements at RDM – airport records; Historical and forecast U.S. domestic enplanements – FAA Aerospace Forecasts – Fiscal Years 2004-2015, FAA Long-Range Aerospace Forecasts – Fiscal Years 2015, 2020, and 2025			

Based on historical trends, two projections of enplanements were developed. The first projection assumes that enplanements per capita will remain static at 0.89, resulting in 217,900 annual enplanements by the year 2023. A second forecast assumes the airport's ratio will increase, as was the overall trend between 1993 and 2003. This increasing ratio projection yields 269,300 annual enplanements by the year 2023. The forecasts of enplanements per capita are presented in **Table 2C**.

Previous forecasts of passenger enplanements were also examined for this study. The FAA *Terminal Area Forecast* (TAF) presents enplanement projections for all commercial service airports in the United States. The FAA TAF used an estimate of 132,481 enplanements in 2002 as the base year for their forecasts. The FAA TAF projects 250,569 annual enplanements by the year 2020. Extrapolation of this forecast yields 272,300 annual enplanements by the year 2023 (average annual growth of 3.5 percent).

TABLE 2C Enplanements Per Capita Forecast Roberts Field (RDM)			
Year	**RDM Enplanements**	**Tri-County Population**	**Enplanements Per Capita**
1993	78,983	115,877	0.68
1994	92,732	120,624	0.77
1995	105,774	125,567	0.84
1996	107,530	130,718	0.82
1997	111,450	136,083	0.82
1998	127,296	141,672	0.90
1999	145,740	147,493	0.99
2000	161,713	153,558	1.05
2001	158,670	157,546	1.01
2002	144,582	161,643	0.89
2003	147,106	165,851	0.89
Constant Ratio Projection			
2008	167,100	187,800	0.89
2013	186,100	209,100	0.89
2023	217,900	244,800	0.89
Increasing Ratio Projection			
2008	178,400	187,800	0.95
2013	209,100	209,100	1.00
2023	269,300	244,800	1.10
Source: Historical enplanements – airport records; Historical population – U.S. Census Bureau; Forecast population – Deschutes County Coordinated Population Forecast			

Forecasts included in the 2000 *Oregon Aviation Plan* were also examined. These forecasts were developed by the Oregon Department of Transportation, Aeronautics Division. The plan used actual enplanement totals from 1994 (92,732) as the base year and projects 283,000 annual enplanements by the year 2018. Extrapolation of this forecast yields 346,600 annual enplanements by the year 2023 (average annual growth of 4.7 percent).

The spread within the high and low forecasts is a reasonable window within which actual enplanements may fall in the future, based upon several factors: number of local airlines, frequency of flights, equipment, fares, non-stop destinations, and the local economy. For planning purposes, a mid-range forecast is generally chosen if it provides a reasonable growth rate. The preferred planning forecast is an average of the forecasts and is as follows: 186,000 annual enplanements by 2008; 220,000 annual enplanements by 2013; and 300,000 annual enplanements by the year 2023 (average annual growth of 3.6 percent). **Table 2D** and **Exhibit 2C** summarize the passenger enplanement forecasts developed for Roberts Field, as well as the preferred planning forecast.

TABLE 2D
Summary of Passenger Enplanement Forecasts
Roberts Field

	2003	2008	2013	2023
Time Series Analysis 1990-2000 (r2=0.93)		220,300	264,800	353,800
Market Share of U.S. Domestic Enplanements				
Constant Share Projection		181,100	213,200	299,600
Increasing Share Projection		187,000	227,000	338,200
Enplanements Per Capita (Tri-County Region)				
Constant Ratio Projection		167,100	186,100	217,900
Increasing Ratio Projection		178,400	209,100	269,300
FAA *Terminal Area Forecast*		172,700	205,200	272,300[2]
2000 Oregon Aviation Plan		188,600[1]	231,000[1]	346,000[2]
1998 Airport Master Plan		190,700[1]	221,600[1]	299,500[2]
Preferred Planning Forecast	**147,106**	**186,000**	**220,000**	**300,000**

[1]Interpolated/[2]Extrapolated

Fleet Mix and Operations Forecast

The fleet mix defines a number of key parameters in airport planning, including critical aircraft, stage length capabilities, and terminal gate configurations. Changes in equipment, airframes, and engines have always had a significant impact on airlines and airport planning. There are many on-going programs by the manufacturers to improve performance characteristics. These programs are focusing on improvements in fuel efficiency, noise suppression, and the reduction of air emissions. A fleet mix projection for Roberts Field has been developed by reviewing the aircraft historically used by airlines serving the airport.

As previously mentioned, Roberts Field receives scheduled air service from two regional airlines: Horizon Air and United Express (SkyWest Airlines). SkyWest Airlines' fleet, currently serving Roberts Field, consists of the 30-seat Embraer Brasilia 120, while Horizon Air's fleet consists of the 37-seat Bombardier Q-200. Each of these carriers are transitioning to regional jets, while Horizon Air is also adding the 70-seat Q-400 turboprop to their fleet. Other regional airlines are also transitioning to regional jets with 50 or more seats. The local fleet mix is expected to steadily transition to larger aircraft over the next decade.

The fleet mix projections have been used to calculate the average seats per departure, which, after applying a load factor, were used to project annual departures. Similar to the national trend, the boarding load factor for Roberts Field is expected to increase slightly over the planning period, reaching 68 percent in the long-term. Annual operations were then calculated based on the boarding load factors. **Table 2E** summarizes the fleet mix operations forecast for the airlines.

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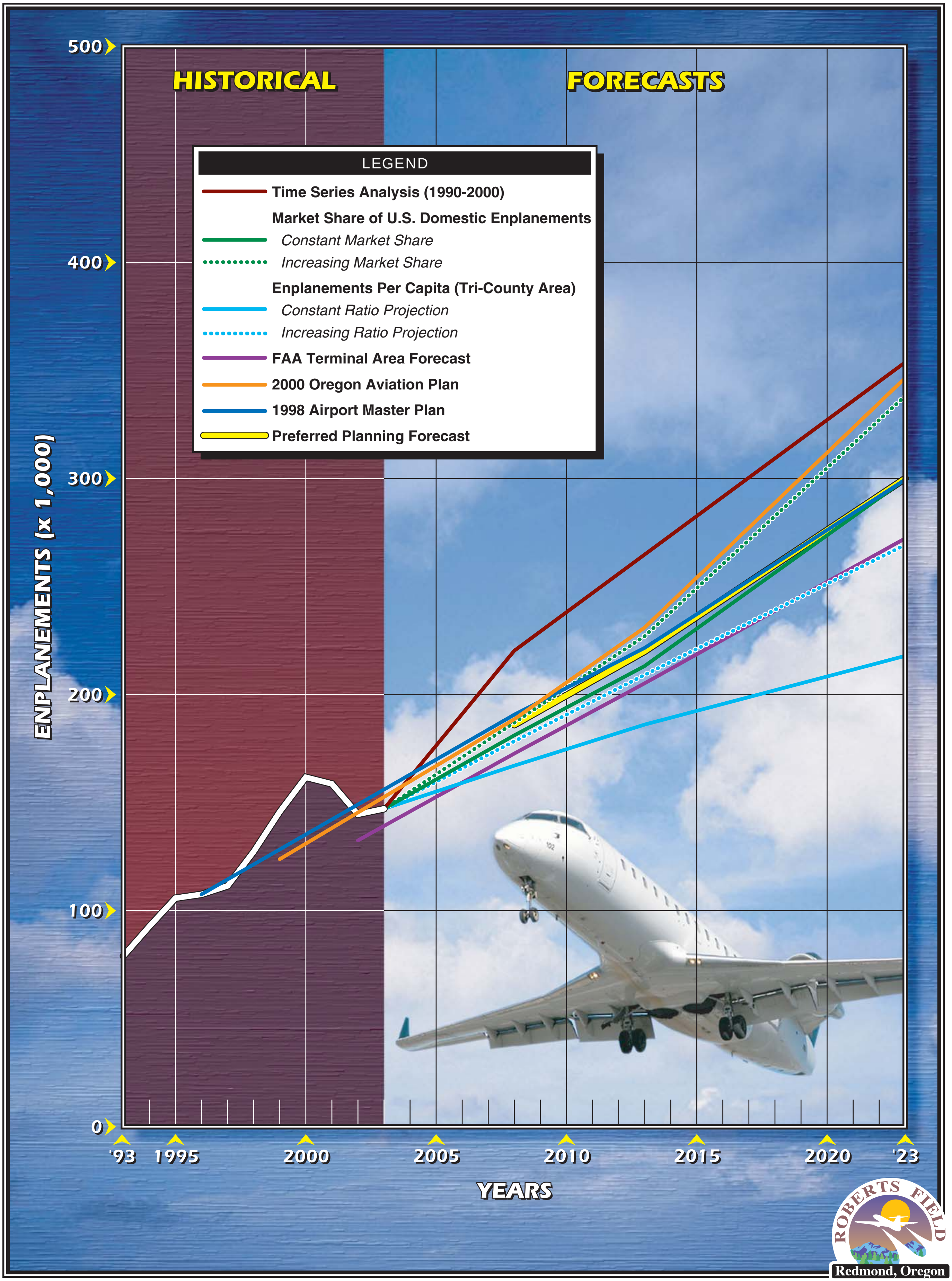

Exhibit 2C
ENPLANEMENT FORECAST SUMMARY

TABLE 2E Airline Fleet Mix and Operations Forecast Roberts Field				
		FORECAST		
Fleet Mix Seating Capacity	**2003**	**2008**	**2013**	**2023**
< 50 seats (33 average) (EMB 120, Q-200)	100%	50%	20%	0%
50-70seats (60 average) (ERJ-145, CRJ, Q-400)	0%	50%	80%	100%
Totals	100%	100%	100%	100%
Average Seats Per Departure	37	45	50	60
Boarding Load Factor	62%	62%	64%	67%
Enplanements Per Departure	23	28	32	40
Annual Enplanements	147,106	186,000	220,000	300,000
Annual Departures	6,400	6,650	6,900	7,500
Annual Operations	12,800	13,300	13,800	15,000
Source: Coffman Associates Analysis				

AIR CARGO

As mentioned in Chapter One, daily air cargo service is provided at Roberts Field by Airborne Express (AirPac), UPS (Ameriflight), and FedEx (Empire). These carriers operate piston and turboprop aircraft, including Cessna Caravans, Piper Senecas and Chieftains, and Beech 99s to provide feeder services to Portland. According to airport records, annual air cargo operations totaled 2,770 in 2003.

With strong growth in the air cargo area continuing domestically and internationally, it is anticipated that the level of activity at the airport will continue to grow throughout the planning period. Forecasts of air cargo operations were projected using an average annual growth rate of 3.5 percent, which is consistent with national trends. As shown in **Table 2F**, applying this growth rate yields 5,500 cargo operations by 2023. The fleet mix is expected to remain in multi-engine piston and turboprop aircraft. However, the cargo companies are achieving larger turboprop aircraft which have been retired from commercial passenger service to complement their fleets.

TABLE 2F Air Cargo Operations Roberts Field Airport	
Year	**Annual Operations**
2003	2,770
Forecast	
2008	3,300
2013	4,000
2023	5,500
Source: Historical - Airport Records	

UNITED STATES FOREST SERVICE – REDMOND AIR CENTER

The United States Forest Service (USFS) – Redmond Air Center is a hub for the Pacific Northwest Region, which includes Oregon and Washington. Their mission is to provide timely, cost-effective, logistical support to any Federal, State, and designated cooperator incidents in the Pacific Northwest, such as wild land fires, floods, earthquakes, and other natural disasters. The heaviest aircraft in the air tanker fleet mix includes DC-7s and C-130s. A review of landing fee reports indicates a mixture of several other aircraft, including P2V, SP2M, DC-4, DC-6, P2, P3 Orion, and PB4Y2. While the C-130 had previously been targeted as the fleet replacement aircraft, recent grounding of the fleet has created uncertainty in future fleet composition. The P3 Orion is likely to be part of the future fleet.

In 2003, the USFS recorded a total of 750 operations at Roberts Field. The consultants examined a five-year activity period and found that 2003 represented an average year. For planning purposes, a static level of 750 annual air tanker operations has been assumed through the planning period.

AIR TAXI AND MILITARY OPERATIONS

Air taxi activity is independently recorded by the airport traffic control tower. Locally, the majority of air taxi operations recorded at the tower are performed by the commercial airlines. However, this category also includes the cargo operations and "for-hire" general aviation operators, and can also include operations by Part 135 operators and Part 121 operators (less than 60 seats).

Since the commercial airline and cargo operations have been handled in previous sections of this chapter, the only remaining portion of the air taxi category to be considered is "for-hire", which has been estimated as ten percent of total air taxi operations. This percentage was applied to forecasts by the FAA of future air taxi operations at Roberts Field and yield 2,200 "for-hire" operations by the year 2023.

According to the FAA TAF, there were an estimated 500 total military operations (400 itinerant and 100 local) at Roberts Field in 2003. Forecasts by the FAA project military operations at civilian airports to remain relatively stagnant throughout the planning period. This plan will assume the same static projection. **Table 2G** presents the forecasts for the military and "for-hire" air taxi operations.

TABLE 2G
Air Taxi & Military Operations
Roberts Field

Year	"For-Hire" Air Taxi Ops	Military Ops
2003	1,430	500
FORECAST		
2008	1,620	500
2013	1,820	500
2023	2,220	500

Source: Historical operations – FAA TAF

GENERAL AVIATION

General aviation is defined as that portion of civil aviation which encompasses all portions of aviation, except commercial operations. To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of this activity must be forecast. These indicators of general aviation demand include: based aircraft, aircraft fleet mix, and annual operations.

Based Aircraft

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft, the growth of aviation activities at the airport can be projected. In 1993, Roberts Field reported 77 based aircraft. Over the next few years, the number of based aircraft increased, reaching a high of 103 in 1996. The number fell to 91 the following year, but has since rebounded. According to airport records, there are currently 110 based aircraft at Roberts Field. Because of this fluctuation, time-series and regression analyses were not performed, as they would not provide useful projections of based aircraft numbers. Instead, other methods were used to forecast based aircraft at Roberts Field.

The first method used to project based aircraft examined registered aircraft in The Tri-County region (Deschutes, Crook, and Jefferson Counties), which is the local service area for the airport. A forecast of registered aircraft for the Tri-County region had to be determined first. According to the FAA, there are currently 765 total aircraft registered in the three counties. An average annual growth rate of 2.0 percent, which is consistent with national trends, was applied to the forecast years to project registered aircraft. This yields 870 registered aircraft by 2008; 960 registered aircraft by 2013; and 1,170 registered aircraft by 2023.

The next step was to examine the airport's market share of registered aircraft in the Tri-County region. As shown in the table, the airport captured 16 percent of aircraft registered in three counties in 1993. Since then, the airport's market share has remained fairly constant and is currently at 14 percent. Forecasts of based aircraft were developed based on registered aircraft projections and the airport's market share. The first forecast assumes the airport's market share will remain constant at 14 percent, yielding 164 based aircraft by 2023. The second forecast assumes the airport's market share will begin to increase and return to previous levels, yielding 211 based aircraft by the year 2023. These market share forecasts are presented in **Table 2H**.

Projections of based aircraft were also made in comparison to the percentage of U.S. active general aviation aircraft based at Roberts Field. In 1993, based aircraft at the airport represented 0.043 percent of U.S. active general aviation aircraft. This percentage increased over the following years and is currently at 0.052 percent. A constant share projection was first developed. This forecast assumes the airport's share of U.S. active general aviation aircraft will remain constant at 0.052 percent, which yields 123 based aircraft by the year 2023. The second forecast assumes the airport's market share will increase, as it has historically. This increasing market share projection yields 166 based aircraft by the year 2023. These market share projections are presented in **Table 2J**.

TABLE 2H
Based Aircraft Market Share of Registered Aircraft (Tri-County Region)
Roberts Field

Year	Roberts Field Based Aircraft	Tri-County Registered Aircraft	Market Share of Registered Aircraft
1993	77	478	16%
1994	77	513	15%
1995	86	565	15%
1996	103	595	17%
1997	91	617	15%
1998	91	634	14%
1999	98	654	15%
2000	98	662	15%
2001	99	715	14%
2002	110	723	15%
2003	110	765	14%
Constant Market Share			
2008	122	870	14%
2013	134	960	14%
2023	164	1,170	14%
Increasing Market Share			
2008	131	870	15%
2013	154	960	16%
2023	211	1,170	18%

Source: Historical Based Aircraft – FAA TAF; Registered Aircraft – Census of U.S. Civil Aircraft (1993-1994), Aviation Goldmine CD (1995-2000), Avantex Aircraft & Airmen CD (2001-2003)

TABLE 2J
Based Aircraft Market Share of U.S. Active General Aviation (GA) Aircraft
Roberts Field

Year	Roberts Field Based Aircraft	U.S. Active GA Aircraft	% of U.S. Active GA Aircraft
1993	77	177,719	0.043%
1994	77	172,936	0.045%
1995	86	188,089	0.046%
1996	103	191,129	0.054%
1997	91	192,414	0.047%
1998	91	204,711	0.044%
1999	98	219,464	0.045%
2000	98	217,533	0.045%
2001	99	211,447	0.047%
2002	110	211,244	0.052%
2003	110	211,190	0.052%
Constant Market Share			
2008	112	215,800	0.052%
2013	116	223,100	0.052%
2023	123	236,600[1]	0.052%
Increasing Market Share			
2008	121	215,800	0.056%
2013	134	223,100	0.060%
2023	166	236,600[1]	0.070%

Source: Historical Based Aircraft – FAA TAF; Historical and Forecast U.S. Active Aircraft – FAA Aerospace Forecasts, Fiscal Years 2004-2015
[1] Extrapolated by Coffman Associates

The population of Deschutes, Crook, and Jefferson counties has also been used as a comparison with based aircraft at Roberts Field. The forecast examined the airport's historical based aircraft as a ratio of 1,000 residents in the Tri-County region. As shown in **Table 2K**, the 2003 estimated population of the three counties is 165,851, which equals 0.66 based aircraft per 1,000 residents. A constant ratio of 0.66 based aircraft per 1,000 residents was first completed to represent the overall trend at the airport since 1993 and yields 162 based aircraft by 2023. Assuming the ratio of based aircraft per 1,000 residents increases gradually throughout the planning period, yields 171 based aircraft at Roberts Field by 2023. These projections are shown in **Table 2K**.

TABLE 2K
Based Aircraft Per 1,000 Residents
(Deschutes, Crook, and Jefferson Counties)
Roberts Field

Year	Roberts Field Based Aircraft	Tri-County Population	Based Aircraft Per 1,000 Residents
1993	77	115,877	0.66
1994	77	120,624	0.64
1995	86	125,567	0.68
1996	103	130,718	0.79
1997	91	136,083	0.67
1998	91	141,672	0.64
1999	98	147,493	0.66
2000	98	153,558	0.64
2001	99	157,546	0.63
2002	110	161,643	0.68
2003	110	165,851	0.66
Constant Share Projection			
2008	124	187,800	0.66
2013	138	209,100	0.66
2023	162	244,800	0.66
Increasing Share Projection			
2008	126	187,800	0.67
2013	142	209,100	0.68
2023	171	244,800	0.70

Source: Historical Based Aircraft – FAA TAF; Historical Population – U.S. Census Bureau; Forecast Population – Interpolated from Deschutes County Coordinated Population Forecast

The historical growth rate of based aircraft between 1993 and 2003 was also examined. As previously mentioned, there were 77 aircraft based at Roberts Field in 1993. The number of based aircraft in 2003, as reported by the airport, stands at 110. This represents an average annual growth rate of 3.6 percent. Applying this growth rate to the forecast years, yields 131 based aircraft by 2008; 157 based aircraft by 2013; and 223 based aircraft by 2023.

Previous forecasts were also examined. The FAA *Terminal Area Forecast* (TAF) used a base year of 2002 (110 based aircraft) and projects 215 based aircraft at Roberts Field by the year 2020. Extrapolation of this forecast yields 236 based aircraft by the year 2023.

The *2000 Oregon Aviation Plan*, which used 1994 as the base year for its forecasts, with a reported 61 based aircraft, projects 75 based aircraft at Roberts Field by 2014. This forecast was considered irrelevant since the current number of based aircraft (110) already exceeds this amount. The selected planning forecast in the *1998 Airport Master Plan* assumed the number of based aircraft would double over the planning period, reaching 170 by 2017.

The preferred planning forecast for Roberts Field is a mid-range of all the forecasts and yields 130 based aircraft by 2008; 150 based aircraft by 2013; and 190 based aircraft by 2023. **Table 2L** and **Exhibit 2D** summarize the based aircraft forecasts developed for Roberts Field, as well as the preferred planning forecast.

TABLE 2L
Summary of Based Aircraft Forecasts
Roberts Field

	2008	2013	2023
Market Share of Registered Aircraft (Tri-County Region)			
Constant Market Share	122	134	164
Increasing Market Share	131	154	211
Market Share of U.S. Active General Aviation Aircraft			
Constant Market Share	112	116	123
Increasing Market Share	121	134	166
Aircraft Per 1,000 Population (Tri-County Region)			
Constant Ratio Projection	124	138	162
Increasing Ratio Projection	126	142	171
Historical Growth Rate (1993-2003) 3.6%	131	157	223
FAA *Terminal Area Forecast*	144	172	236[2]
1998 Airport Master Plan	124[1]	148[1]	210[2]
Preferred Planning Forecast	**130**	**150**	**190**

[1] Interpolated by Coffman Associates, [2] Extrapolated by Coffman Associates

Based Aircraft Fleet Mix

According to airport records, the fleet mix consists of the following: 84 single-engine aircraft, 21 multi-engine aircraft, three jets, one helicopter, and one glider. While the number of general aviation aircraft based at Roberts Field is projected to increase, it is important to know the fleet mix of the

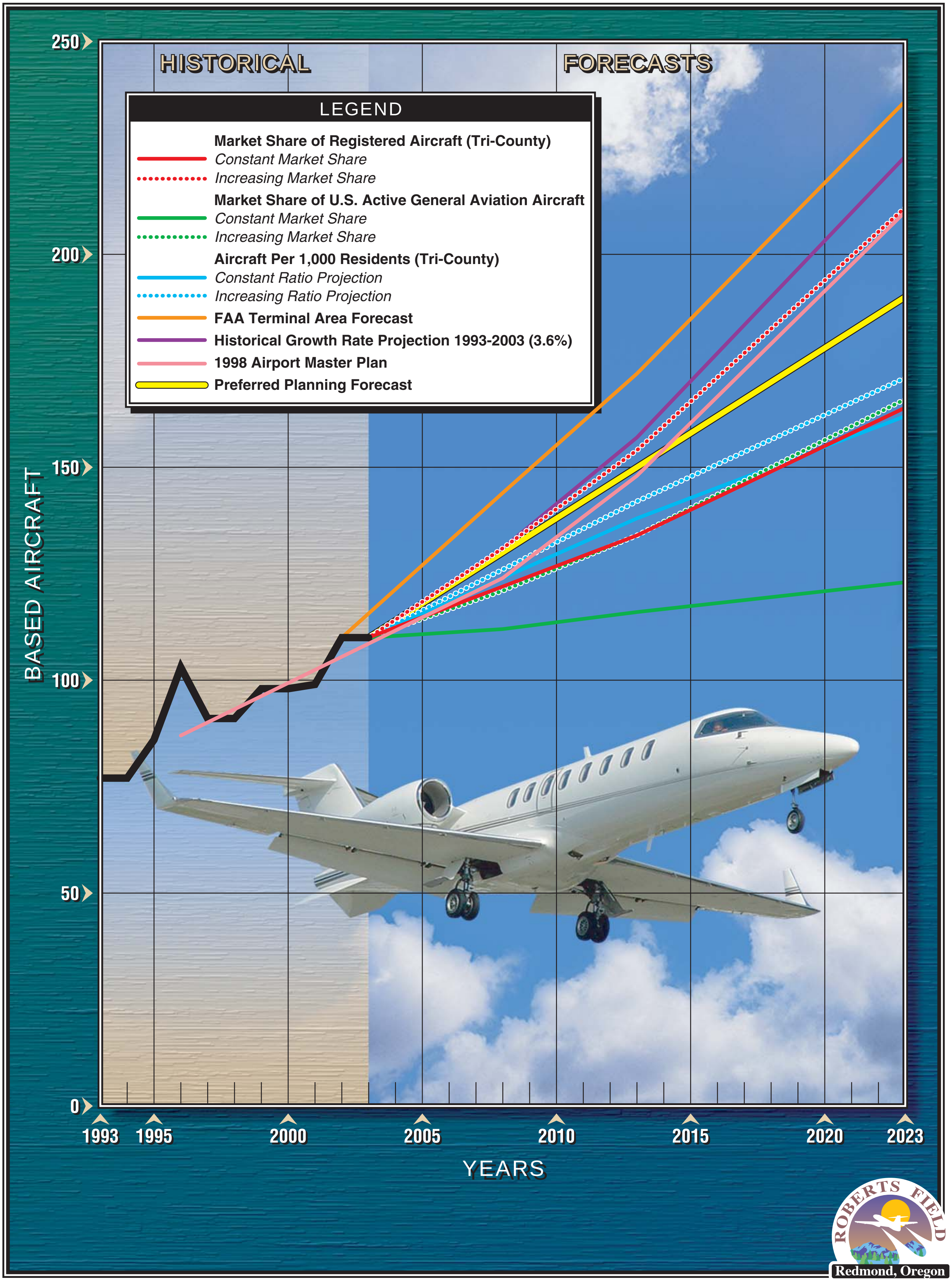

Exhibit 2D
BASED AIRCRAFT FORECAST SUMMARY

aircraft expected to use the airport. This will ensure the placement of proper facilities in the future.

The forecast mix of based aircraft was determined by comparing existing and forecast U.S. general aviation trends. The trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet. This is reflected in an increasing percentage of jets and multi-engine aircraft in the mix. However, the mix of helicopters and gliders are also expected to increase as a percentage of total aircraft. The general aviation fleet mix projections for Roberts Field are presented in **Table 2M**.

TABLE 2M
General Aviation Fleet Mix Forecast
Roberts Field

	EXISTING		FORECAST					
Type	**2003**	%	**2008**	%	**2013**	%	**2023**	%
Single-Engine	84	76.4%	94	73.0%	104	69.5%	120	63.0%
Multi-Engine	21	19.1%	27	20.5%	33	22.0%	48	25.5%
Jets	3	2.7%	5	3.5%	7	4.5%	12	6.5%
Helicopters	1	0.9%	2	1.5%	3	2.0%	5	2.5%
Gliders	1	0.9%	2	1.5%	3	2.0%	5	2.5%
Total	**110**	**100.0%**	**130**	**100.0%**	**150**	**100.0%**	**190**	**100.0%**

*Multi-engine category includes turboprops.

General Aviation Operations

General aviation operations are classified as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use, since business aircraft are operated on a high frequency.

Previous forecasts were first examined, including the *1998 Airport Master Plan* and the FAA *Terminal Area Forecast* (TAF). Forecasts included in the 1998 plan used 1996's total of 47,800 operations as a base number for projections through the year 2017. Extrapolation of this plan yields 76,100 operations by the year 2023. Forecasts included in the FAA TAF used 2002 as the base year for its projections, with an estimated 38,221 operations that year. Forecasts included in the FAA TAF were provided through the year 2020. Extrapolation of the FAA TAF yields 57,000 annual general aviation operations by the year 2023.

The historical growth rate of general aviation operations at Roberts Field was also examined. Between 1997 and 2003, the airport experienced an average annual growth rate of 4.5 percent. This percentage was applied to the forecast years and yields 87,100 annual general aviation operations by the year 2023.

In order to develop an updated forecast, the FAA's projections for operations at towered airports were examined, along with the airport's general aviation operations and market shares. As shown in **Table 2N**, the airport's market share has increased since 1997. Two market share forecasts were developed; a constant market share and an increasing market share. These projections yield 48,100 annual operations and 67,400 annual operations respectively, by the year 2023.

TABLE 2N
General Aviation Operations Forecasts
Roberts Field (RDM)

Year	Itinerant Operations	Local Operations	Total Operations	GA Operations (U.S.) at Towered Airports	RDM Market Share %
1997	15,629	12,189	27,818	36,800,000	0.08%
1998	17,311	11,275	28,586	38,000,000	0.08%
1999	16,726	13,612	30,338	40,000,000	0.08%
2000	16,001	19,959	35,960	39,900,000	0.09%
2001	16,777	19,033	35,810	37,600,000	0.10%
2002	17,033	20,705	37,738	37,600,000	0.10%
2003	15,510	20,618	36,128	35,500,000	0.10%
Constant Market Share Projection					
2008	17,100	22,600	39,700	39,700,000	0.10%
2013	18,200	24,100	42,300	42,300,000	0.10%
2023	20,700	27,400	48,100	48,100,000[1]	0.10%
Increasing Market Share Projection (Selected Forecast)					
2008	18,800	24,900	43,700	39,700,000	0.11%
2013	21,800	28,900	50,700	42,300,000	0.12%
2023	29,000	38,400	67,400	48,100,000[1]	0.14%

Source: GA Operations at Roberts Field – FAA TAF; GA Operations at Towered Airports – FAA Aerospace Forecasts, Fiscal Years 2004-2015
[1]Extrapolated by Coffman Associates.

A summary of the general aviation operations projections at Roberts Field is presented in **Table 2P**. As previously mentioned, a mid-range forecast is generally chosen. The preferred planning forecast for Roberts Field is the increasing market share forecast. This forecast, which yields 67,400 annual general aviation operations by 2023, falls in the mid-range of all the forecasts and is consistent with increasing utilization assumptions by the FAA. Itinerant operations are estimated to account for approximately 43 percent of total operations, while local operations were estimated to account for approximately 57 percent.

TABLE 2P
Summary of General Aviation Operations Forecasts
Roberts Field

	2003	2008	2013	2023
1998 Airport Master Plan		59,900	64,900[1]	76,100[2]
FAA *Terminal Area Forecast*		41,800	46,800	57,000[2]
Historical Growth Rate (1997-2003 = 4.5%)		45,000	56,100	87,100
Market Share of GA Ops at Towered Airports				
Constant Market Share				
Increasing Market Share (Selected		39,700	42,300	48,100
Forecast)	**36,128**	**43,700**	**50,700**	**67,400**

[1]Interpolated/[2]Extrapolated

PEAKING CHARACTERISTICS

Most facility planning relates to levels of peak activity. The following planning definitions apply to the peak periods:

- Peak Month – The calendar month when peak aircraft operations occur.
- Design Day – The average day in the peak month.
- Busy Day – The busy day of a typical week in the peak month.
- Design Hour – The peak hour within the design day.

It is important to note that only the peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive.

The design day is normally derived by dividing the peak month operations or enplanements by the number of days in the month. However, commercial activity is often heavier on weekdays, which may require an adjustment to reflect peak weekday activity.

Airline Peaks

Historical airport records were examined to determine the peak month for passenger enplanements at Roberts Field. Since 1993, the peak month at the airport has typically been August, when the airport captured an average of 10.0 percent of total enplanements for each year. This percentage has been applied to the forecasts of design hour operations at the airport. Other months with high levels of passenger enplanements included June and July, which is typical of these two months. Design day enplanements were calculated by dividing the number of enplanements in the peak month by the number of days in the month. Design hour enplanements were estimated at 15 percent of the design day.

According to airport records, the peak month for airline operations in 2003 was July, when the airport captured approximately 10.0 percent of annual operations. According to the current airlines schedules, the peak hourly period represents 20 percent of design day activity. This percentage has been applied to the forecast years. A summary of the forecasts for airline enplanements and operations is presented in **Table 2R**.

General Aviation Peaks

According to the FAA tower records, the peak month for general aviation operations in 2003 was August and represented 10.0 percent of total general aviation operations that year. Forecasts of peak activity have been developed by applying this percentage to the forecasts of annual operations. As previously mentioned, design day operations were calculated by dividing the total number of operations in the peak month by the number of days in the month. The design hour was estimated at 15 percent of the design day operations. Busy day operations were calculated as 1.25 times the design day activity. **Table 2R** summarizes the general aviation peak activity forecasts.

TABLE 2R
Peak Period Forecasts
Roberts Field

		FORECASTS		
	2003	**2008**	**2013**	**2023**
Airline Enplanements				
Annual	147,106	186,000	220,000	300,000
Peak Month (10.0%)	14,082	18,600	22,000	30,000
Design Day	454	600	710	968
Design Hour (15.0%)	68	90	106	145
Airline Operations				
Annual	12,800	13,300	13,800	15,000
Peak Month (10.0%)	1,280	1,330	1,380	1,500
Design Day	41	43	45	48
Design Hour (15.0%)	6	6	7	7
General Aviation Operations				
Annual	36,128	43,700	50,700	67,400
Peak Month (10.0%)	3,613	4,370	5,070	6,740
Design Day	117	141	164	217
Busy Day	146	176	204	272
Design Hour (15.0%)	17	21	25	33

ANNUAL INSTRUMENT APPROACHES

Forecasts of annual instrument approaches (AIAs) provide guidance in determining an airport's requirements for navigational aid facilities. An instrument approach is defined by the FAA as "an approach to an airport with the intent to land by an aircraft in accordance with an instrument flight rule (IFR) plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude."

In 2003, the airport reported 860 AIAs, which accounted for 5.5 percent of total itinerant operations. While AIAs can be partially attributed to weather, they may be expected to increase as transient operations and operations by more sophisticated aircraft increase throughout the planning period. Therefore, AIAs as a percentage of itinerant operations are expected to remain constant throughout the planning period. The projections of AIAs for Roberts Field are summarized in **Table 2S**.

TABLE 2S
Annual Instrument Approaches (AIAs)
Roberts Field

Year	Annual Instrument Approaches	Itinerant Operations	AIAs % of Itinerant Operations
2003	860	33,460	2.6%
FORECAST			
2008	1,060	40,810	2.6%
2013	1,170	45,170	2.6%
2023	1,440	55,470	2.6%

Source: Airport Records

SUMMARY

This chapter has provided forecasts for each sector of aviation demand anticipated over the planning period. **Exhibit 2E** presents a summary of the aviation forecasts developed for Roberts Field. The airport is expected to experience an increase in total based aircraft, annual operations, and annual enplaned passengers throughout the planning period. The next step in this study is to assess the capacity of the existing facilities to accommodate forecast demand and determine what types of facilities will be needed to meet these demands. This is considered a preliminary draft until submitted and approved by the FAA.

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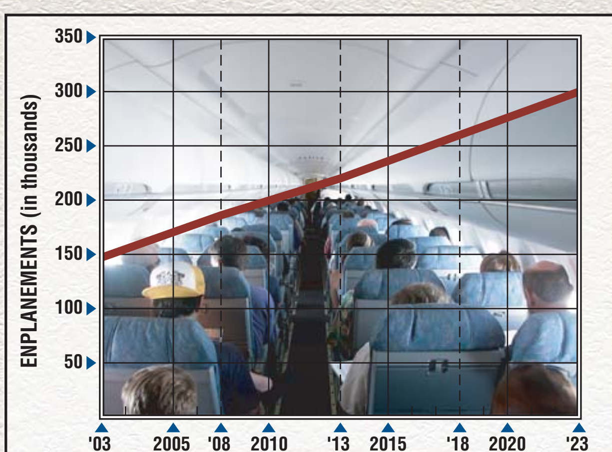
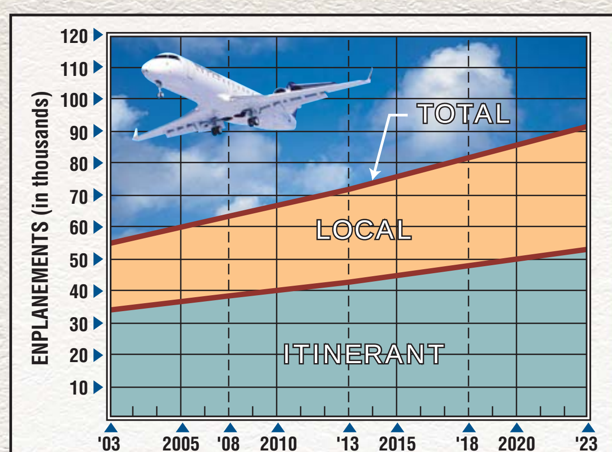
CATEGORY	HISTORICAL 2003	FORECASTS 2008	FORECASTS 2013	FORECASTS 2023
ANNUAL ENPLANEMENTS				
Airport Total	**147,106**	**186,000**	**220,000**	**300,000**
ANNUAL OPERATIONS				
ITINERANT				
Air Carrier	12,800	13,300	13,800	15,000
Air Cargo	2,770	3,300	4,000	5,500
U.S. Forest Service	750	750	750	750
General Aviation	15,510	18,800	21,800	29,000
Air Taxi	1,430	1,620	1,820	2,220
Military	400	400	400	400
Total Itinerant Operations	***33,660***	***38,170***	***42,570***	***52,870***
LOCAL				
General Aviation	20,618	24,900	28,900	38,400
Military	100	100	100	100
Total Local Operations	***20,718***	***25,000***	***29,000***	***38,500***
Total Operations	**54,378**	**63,170**	**71,570**	**91,370**
ANNUAL INSTRUMENT APPROACHES (AIAs)				
Airport Total	**860**	**1,060**	**1,170**	**1,440**
BASED AIRCRAFT				
Single Engine	84	94	104	120
Multi-Engine	21	27	33	48
Jet	3	5	7	12
Helicopter	1	2	3	5
Glider	1	2	3	5
Total Based Aircraft	**110**	**130**	**150**	**190**

ENPLANEMENT FORECAST



OPERATIONS FORECAST



ROBERTS FIELD
Redmond, Oregon

Exhibit 2E
FORECAST SUMMARY

Chapter Three
FACILITY REQUIREMENTS

FACILITY REQUIREMENTS

To properly plan for the future of Roberts Field, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve this identified demand. This chapter uses the results of the forecasts conducted in Chapter Two, as well as established planning criteria to deter-mine the airfield (i.e., runways, taxiways, navi-gational aids, marking and lighting) and landside (i.e., hangars, terminal building, cargo buildings, aircraft parking apron) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities, outline what new facilities may be needed, and when these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

The cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than on a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established for Roberts Field that take into consideration the reasonable range of aviation demand projections prepared in Chapter Two. It is important to consider that the actual activity at the airport may be higher or lower than projected activity levels.

By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

TABLE 3A
Planning Horizon Activity Levels
Roberts Field

	Current Levels	Short Term	Intermediate Term	Long Term
Passenger Enplanements	147,106	186,000	220,000	300,000
Annual Operations	54,178	65,870	74,170	93,970
Based Aircraft	110	130	150	190

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. These facilities are comprised of the following items:

- Runways (including safety areas)
- Taxiways
- Navigational Aids
- Airfield Lighting and Marking

The selection of appropriate Federal Aviation Administration (FAA) design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These standards must be determined now since the relocation of these facilities will likely be extremely expensive at a later date.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This code, the airport reference code (ARC), has two components. The first component, depicted by a letter, is the aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while aircraft wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADG's used in airport planning are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

In order to determine facility requirements, an ARC should first be determined, and then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Roberts Field. **Exhibit 3A** provides a listing of typical aircraft and their associated ARC.

The FAA recommends designing runways and taxiways to meet the requirements of the most demanding ARC for that airport. Roberts Field currently accommodates a wide variety of civilian aircraft use. Aircraft using the airport include small single and multi-engine aircraft (which fall within approach categories A and B and airplane design group I) and business turboprop and jet aircraft (which fall within approach categories B, C, and D and airplane design groups I and II).

The airport is also used by jet and prop-jet aircraft for transporting passengers in scheduled service by the two airlines operating at the airport; Horizon Air and United Express (Skywest Airlines). SkyWest Airlines's fleet, currently serving Roberts Field, consists of the 30-seat Embraer Brasilia 120, while Horizon Air's fleet consists of the 37-seat Bombardier Q-200.

As determined by the fleet mix forecast in Chapter Two, service by aircraft with an average of 33 seats is expected through the intermediate term. However, each of these carriers is transitioning to regional jets, while Horizon Air is also adding the 70-seat Q-400 turboprop aircraft to their fleet.

Other regional airlines are also transitioning to regional jets with 50 or more seats. Regional jets offer increased operating range over turboprops and their higher speeds can shorten trip times, resulting in lower operating costs. It should also be noted that no significant increase in noise exposure would result with the upgrade from turboprop to jet aircraft.

The three air cargo operators at Roberts Field operate piston and turboprop aircraft, including Cessna Caravans, Piper Senecas and Chieftans, and Beech 99s. While the cargo operators may be expected to upgrade to larger turboprop aircraft in the future, they are not expected to transition to jets at Roberts Field.

As mentioned in the previous chapter, Roberts Field is a hub for the United States Forest Service (USFS), Pacific Northwest Region. The most demanding in the USFS fleet mix include the DC-7 and the Lockheed C-130, which fall within ADG IV. While the C-130 had previously been targeted as the fleet replacement aircraft, recent grounding of the fleet has created uncertainty in future fleet composition. The most demanding aircraft currently operating at Roberts Field (with at least 500 annual operations) fall within ADG IV. It is recommended that the primary runway be designed to ARC C-IV, while the secondary runway is designed to ARC B-III.

AIRFIELD DESIGN STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions that could affect the safe operation of aircraft. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ).

The RSA is “a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or an excursion from the runway.” An object free area is an area on the ground centered on the runway, taxiway, or centerline, provided to enhance the safety of aircraft operations, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. An obstacle free zone is a volume of airspace that is required to be clear of objects, except for frangible items required for navigation of aircraft. It is centered along the runway and extended runway centerline. The RPZ is defined as an area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The dimensions of an RPZ are a function of the runway ARC and approach visibility minimums.

Table 3B summarizes the design requirements of these safety areas by airport reference code for both runways. The FAA expects these areas to be free from obstructions. As shown in the table, Runway 4-22 meets the required ARC C-IV standards for an Instrument Land System (ILS) approach with one statute mile visibility mini-

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A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Piper Archer
- Piper Seneca

C-I, D-I

- **Lear** 25, **35**, 55
- Israeli Westwind
- HS 125

B-I less than 12,500 lbs.

- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

C-II, D-II

- **Gulfstream** II, III, **IV**
- Canadair 600
- Canadair Regional Jet
- Lockheed JetStar
- Super King Air 350

B-II less than 12,500 lbs.

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

C-III, D-III

- Boeing Business Jet
- B 727-200
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

B-I, II over 12,500 lbs.

- Super King Air 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation** II, **III**, IV, V
- Saab 340
- Embraer 120

C-IV, D-IV

- **B-757**
- B-767
- DC-8-70
- DC-10
- MD-11
- L1011

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

D-V

- **B-747** Series
- B-777

Note: Aircraft pictured is identified in bold type.

ROBERTS FIELD
Redmond, Oregon

Exhibit 3A
AIRPORT REFERENCE CODES

mum, and Runway 10-28 meets the ARC B-III standards for a Global Positioning System (GPS) approach with one statute mile visibility minimum. This will be sufficient through the planning period.

TABLE 3B
Airfield Safety Area Dimensional Standards (feet)
Roberts Field

	Runway 4-22	ARC C-IV Standards	Runway 10-28	ARC B-III Standards
Runway Safety Area (RSA)				
Width	500	500	300	300
Length Beyond Runway End	1,000	1,000	600	600
Runway Object Free Area (OFA)				
Width	800	800	800	800
Length Beyond Runway End	1,000	1,000	600	600
Runway Obstacle Free Zone (OFZ)				
Width	400	400	400	400
Length Beyond Runway End	200	200	200	200
Runway Protection Zone (RPZ)				
Inner Width	1,000	1,000	500	500
Outer Width	1,750	1,750	1,000	700
Length	2,500	2,500	1,800	1,000

Source: FAA Airport Design Computer Program, Version 4.2D.

AIRFIELD CAPACITY

An airport's airfield capacity is expressed in terms of its annual service volume (ASV). Annual service volume is a reasonable estimate of the maximum number of operations that can be accommodated in a year. Annual service volume accounts for annual differences in runway use, aircraft mix, and weather conditions. The airport's annual service volume was examined utilizing FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

Exhibit 3B graphically represents the various factors included in the calculation of an airport's annual service volume. These include airfield characteristics, meteorological conditions, aircraft mix, and demand characteristics (aircraft operations). These factors are described below.

Airfield Characteristics

The layout of the runways and taxiways directly affect an airfield's capacity (as does radar coverage). This not only includes the location and orientation of the runways, but the percentage of time that a particular runway or combination of runways is in use. Additional airfield characteristics include the length, width, load bearing strength, and instrument approach capability of each runway at the airport, which determine the type of aircraft that may operate on the runway and if operations can occur during poor weather conditions.

- RUNWAY CONFIGURATION

The existing runway configuration at Roberts Field consists of two intersecting runways: Primary Runway 4-22 and Crosswind Runway 10-28. Runway 10-28 intersects Runway 4-22 2,800 feet from the Runway 4 threshold. A full-length parallel taxiway is available to each runway.

- RUNWAY USE

Runway use relates to the type of aircraft operating on that runway and the amount of time that runway is in use. Aircraft operations to a particular runway are determined by the load bearing strength of the runway, instrument approach capability, and wind conditions. Wind conditions are examined for both visual and inclement weather conditions.

Runway 4-22 is equipped with an instrument approach to the Runway 22 end and has a load bearing strength capable of accommodating the full range of aircraft currently using the airport. A GPS approach is available to Runway 10 with one statute mile visibility. Ideally, maximum runway capacity is achieved when all runways at an airport are able to accommodate the entire fleet mix of aircraft. While Runway 10-28 has a similar length to Runway 4-22, the width and load bearing capacity limit its use to general aviation, small business jet, and regional airline aircraft. Therefore, the capacity of the existing runway system is less than if these aircraft could operate on both runways.

Runway use is normally dictated by wind conditions. The number of takeoffs and landings are generally determined by the speed and direction of the wind. It is generally safest for aircraft to takeoff and land into the wind, avoiding crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations. Prevailing winds at Roberts Field are in a northeast-southwest direction, leading to greater use of Runway 4-22. However, during light wind conditions or situations when the crosswind to Runway 4-22 exceeds allowable thresholds, Runway 10-28 is used simultaneously with Runway 4-22.

- EXIT TAXIWAYS

Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determines the occupancy time of an aircraft on the runway. The airfield capacity analysis gives credit to exits located within a prescribed range (3,000 to 5,500 feet) from a runway's threshold. This range is based upon the mix index of the aircraft that use the runway. The exits must be at least 750 feet apart to count as separate exits. Under these criteria, Runway 4-22 is credited with three exits and Runway 10-28 is credited with two exits.

Meteorological Conditions

Weather conditions have a significant affect on airfield capacity. Airfield capacity is usually highest in clear

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Exhibit 3B
AIRFIELD CAPACITY
FACTORS

weather, when flight visibility is at its best. Airfield capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period. Consequently, this reduces overall airfield capacity.

There are three categories of meteorological conditions, each defined by the reported cloud ceiling and flight visibility. Visual flight rule (VFR) conditions exist whenever the cloud ceiling is greater than 1,000 feet above ground level and visibility is greater than three statute miles. VFR flight conditions permit pilots to approach, land, or takeoff by visual reference and to see and avoid other aircraft.

Instrument flight rule (IFR) conditions exist when the reported cloud ceiling is less than 1,000 feet above ground level and/or visibility is less than three statute miles. Under IFR conditions, pilots must rely on instruments for navigation and guidance to the runway. Safe separations between aircraft must be assured by following air traffic control rules and procedures. This leads to increased distances between aircraft, which diminishes airfield capacity. The third category, poor visibility conditions (PVC), exists when cloud ceilings are less than 500 feet above ground level and visibility is less than one mile.

According to wind data reported in the previous master plan, VFR conditions have occurred approximately 94 percent of the time, whereas IFR conditions have occurred five percent of the time. PVC conditions have occurred one percent of the time and have been included as part of IFR weather conditions in determining airfield capacity for Roberts Field.

Aircraft Mix

Aircraft mix refers to the speed, size, and flight characteristics of aircraft operating at the airport. As the mix of aircraft operating at an airport increases to include larger aircraft, airfield capacity begins to diminish. This is due to larger separation distances that must be maintained between aircraft of different speeds and sizes.

Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of single and multi-engine aircraft weighing less than 12,500 pounds. Aircraft within these classifications are primarily associated with general aviation operations, but this classification also includes some air taxi and regional airline aircraft (i.e., Cessna Caravan used for air cargo service). Class C consists of multi-engine aircraft weighing between 12,500 pounds and 300,000 pounds. This broad classification includes turboprops, business jets, and large commercial airline aircraft. All scheduled airline, cargo, and USFS aircraft operating at Roberts Field are included within Class C. All aircraft over 300,000 pounds are in Class D, including wide-body and jumbo jets. There are no Class D aircraft operating at the airport.

For the capacity analysis, the percentage of Class C and D aircraft operating at the airport is critical in determining the annual service volume, as these classes include the larger and faster aircraft in the operational mix. The existing and projected operational fleet mix for the airport is summarized in **Table 3C**. Consistent with projections prepared in the previous chapter, the operational fleet mix at the airport is expected to increase its percentage of Class C aircraft as regional airline operations increase and the business and corporate use of general aviation aircraft increases at the airport. The percentage of Class C aircraft is higher during IFR conditions as some general aviation operations are suspended during poor weather conditions.

TABLE 3C
Aircraft Operational Mix
Roberts Field

Weather	Year	A&B	C	D
VFR (Visual)	Existing (2004)	75%	25%	0%
	Short Term	73%	27%	0%
	Intermediate Term	70%	30%	0%
	Long Term	60%	40%	0%
IFR (Instrument)	Existing (2004)	55%	45%	0%
	Short Term	50%	50%	0%
	Intermediate Term	45%	55%	0%
	Long Term	35%	65%	0%

Demand Characteristics

Operations, not only the total number of annual operations, but the manner in which they are conducted, have an important effect on airfield capacity. Peak operational periods, touch-and-go operations, and the percent of arrivals impact the number of annual operations that can be conducted at the airport.

- PEAK PERIOD OPERATIONS

For the airfield capacity analysis, average daily operations during the peak month is calculated based upon data recorded by the air traffic control tower. These peak operational levels were calculated in Chapter Two for existing and forecast levels of operations. Typical operational activity is important in the calculation of an airport's annual service level, as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times through the year.

- TOUCH-AND-GO OPERATIONS

A touch-and-go operation involves an aircraft making a landing and an immediate takeoff without coming to a full stop or exiting the runway. These operations are normally associated with general aviation training operations and are included in local operations data recorded by the air traffic control tower.

Touch-and-go activity is counted as two operations as there is an arrival and a departure involved. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time than individual operations. Touch-and-go operations are recorded by the air traffic control tower and currently estimated to account for approximately 30 percent of annual operations.

- PERCENT OF ARRIVALS

The percentage of arrivals as they relate to the total number of operations in the design hour is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. Except in unique circumstances, the aircraft arrival-departure split is typically 50-50. At Roberts Field, traffic information indicated no major deviations from this pattern, and arrivals were estimated to account for 50 percent of design period operations.

CALCULATION OF ANNUAL SERVICE VOLUME

The preceding information was used in conjunction with the airfield capacity methodology developed by the FAA to determine airfield capacity for Roberts Field.

Hourly Runway Capacity

The first step in determining annual service volume involves the hourly capacity of each runway configuration in use. The percentage use of each runway configuration in VFR and IFR weather, the amount of touch-and-go training activity, and the number and locations of runway exits become important factors in determining the hourly capacity of each runway configuration.

Considering the existing and forecast mix and the additional factors discussed above, the hourly capacity of each runway configuration was computed. The use of both runways during VFR weather conditions results in the highest hourly capacity of the airfield. The 1998 Airport Master Plan estimated this to be 67 hourly operations by 2017.

As the mix of aircraft operating at an airport changes to include an increasing percentage of Class C aircraft, the hourly capacity of the runway system is also reduced. This is because larger aircraft require longer utilization of the runway for takeoffs and landings, and because the greater approach speeds of the aircraft require increased separation. This contributes to a slight reduction in the hourly capacity of the runway system over the planning period.

Annual Service Volume

Once the weighted hourly capacity is known, the annual service volume can be determined. Annual service volume is calculated by the following equation:

Annual Service Volume = C x D x H
C = Weighted hourly capacity D = Ratio of annual demand to average daily demand during the peak month H = Ratio of average daily demand to peak hour demand during the peak month

The 1998 Airport Master Plan compared the annual service volume to existing and forecast operational levels. The estimated total of 64,890 operations in 1996 represented 44 percent of the existing ASV. Using the projected number of 104,810 annual operations by the year 2017, the ASV as a percentage of capacity was projected to reach 72 percent. Considering the additional runway exits added since the last master plan, the ASV was re-examined. Using the projected number of 91,370 annual operations by the year 2023, the ASV as a percentage of capacity is projected to reach 74 percent in the long term.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), indicates that improvements for airfield capacity purposes should be considered when operations reach 60 percent of the annual service volume. While small increases in airfield capacity have been achieved with the development of an additional taxiway exit and through better radar coverage, the best means to accommodate forecast demand at the airport will be with the construction of an additional runway. Typically, this involves the development of a parallel runway, as recommended in the previous master plan. This will be discussed further in the following chapter.

AIRSIDE FACILITIES

Airside facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. These components include:

- Runways
- Taxiways
- Navigational Approach Aids and Instrument Approaches
- Airfield Lighting, Marking, and Signage

RUNWAY ORIENTATION

For the operational safety and efficiency of an airport, it is desirable for the primary runway of an airport's runway system to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA design standards specify that additional runway configurations are needed when the primary runway configuration provides less than 95 percent wind coverage at specific crosswind components. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5

knots for small aircraft weighing less than 12,500 pounds and from 13 to 20 knots for aircraft weighing over 12,500 pounds.

Table 3D summarizes the wind coverage for Roberts Field. As shown in the table, the combined wind coverage exceeds 95 percent for all crosswind components. Therefore, based on this analysis, the runway system at the airport is properly oriented to prevailing wind flows and aircraft operational safety is maximized. No new runway orientations are needed at the airport.

TABLE 3D
All-Weather Wind Coverage
Roberts Field

Runways	10.5 knots	13 knots	16 knots	20 knots
Runway 10-28	94.73%	97.09%	99.13%	99.78%
Runway 4-22	90.90%	96.24%	99.07%	99.88%
Runways Combined	97.58%	99.40%	99.88%	99.98%

Source: NOAA National Climatic Center – Observations taken at Redmond, Oregon 1993-2002.

Runway Length

Runway length is the most important consideration when evaluating the facility requirements for Regional Jets (RJs) at Roberts Field. Runway length requirements are based upon five primary elements: airport elevation, the mean maximum daily temperature of the hottest month, runway gradient, critical aircraft type expected to use the runway, and the stage length of the longest non-stop trip destination.

Aircraft performance declines as elevation, temperature, and runway gradient factors increase. For calculating runway length requirements at Roberts Field, elevation is 3,081 feet above mean sea level (MSL); the mean maximum daily temperature of the hottest month is 86 degrees Fahrenheit. Runway end elevations vary by 20 feet (Runway 4-22) and 36 feet (Runway 10-28) across the airfield.

In examining runway length requirements at the airport, the primary runway should be designed to accommodate the most demanding aircraft currently serving the airport, as well as aircraft expected to serve the airport in the future.

The FAA's design software was used to verify generalized aircraft runway length requirements, which are summarized in **Table 3E**. If 100 percent of larger aircraft are to be accommodated on long stage lengths, 10,000 feet should be included in long range planning. If only 75 percent of the fleet is to be accommodated, then lengths of 8,300 feet should be considered. With the current uncertainty in the future composition of the USFS tanker fleet, future planning should assume a broad range of future runway length requirements.

TABLE 3E
Runway Length Requirements
Roberts Field

AIRPORT AND RUNWAY DATA	
Airport elevation	3,081 feet
Mean daily maximum temperature of the hottest month	86° F
Maximum difference in runway centerline elevation	36 feet
Length of haul for airplanes of more than 60,000 pounds	1,000 miles
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3,570 feet
95 percent of these small airplanes	4,430 feet
100 percent of these small airplanes	4,890 feet
Small airplanes with 10 or more passengers seats	4,900 feet
Large airplanes of 60,000 pounds or less	
75 percent of large airplanes at 60 percent useful load	5,920 feet
75 percent of large airplanes at 90 percent useful load	8,260 feet
100 percent of large airplanes at 60 percent useful load	7,250 feet
100 percent of large airplanes at 90 percent useful load	9,450 feet
Airplanes of more than 60,000 pounds	7,230 feet

Reference: FAA's airport design computer software utilizing Chapter Two of AC 150/5325-4A, *Runway Length Requirements for Airport Design*, no changes included.

Consideration should be given to providing available runway length on Runway 4-22 of up to 8,300 feet to handle 75 percent of the fleet. This length will also benefit many business jet operators and USFS aircraft on hot days, allowing them greater operational flexibility. The alternatives analysis to be conducted in the following chapter will consider the potential for extending Runway 4-22 to provide useable runway length of 8,300 feet.

Since the airfield capacity analysis has identified the need to plan for a parallel runway, an additional runway length analysis was undertaken. For short term planning, adequate length should be provided for "75 percent of aircraft at 60 percent useful load," for aircraft of 60,000 pounds or less. This results in a runway length of at least 5,900 feet. For long range planning, consideration should be given to providing as much as 8,000 feet in length. The parallel runway should be planned at a minimum of 2,500 feet in separation to avoid wake turbulence factors, and 3,400 feet to avoid the need for special radar and/or divergent approaches.

Runway Width

Runway width is primarily determined by the planning ARC for the particular runway. FAA design standards specify a minimum width of 150 feet for Runway 4-22's design group (IV), while a minimum of 100 feet should be provided for Runway 10-28's design group (III). Each runway currently meets the standard established by the FAA and should satisfy future needs with normal maintenance.

Pavement Strength

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. The current strength rating on Runway 4-22 is 68,000 pounds single wheel loading (SWL), 110,000 pounds dual wheel loading (DWL), and 200,000 pounds dual tandem wheel loading (DTWL). Runway 10-28 has a current strength rating of 28,000 pounds SWL and 40,000 pounds DWL. The current strength ratings on Runway 4-22 is sufficient for the fleet of aircraft currently serving, and expected to serve, the airport in the future. However, consideration should be given to increasing the strength rating on Runway 10-28 to satisfy the requirements of aircraft up to 60,000 pounds.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

Design standards for separation between the runways and parallel taxiways are based upon the wingspan of the critical aircraft using the runway. Since this varies between the two runways, different standards apply. Runway 4-22 is served by a full-length parallel Taxiway F. The runway/taxiway centerline separation of 400 feet meets the requirements for ARC C-IV. Taxiway F is only 50 feet in width, which falls short of the ARC C-IV standard, however, critical aircraft on the airfield do not justify widening to 75 feet. It is recommended that the width of this taxiway remain at 50 feet until it requires major maintenance, then be considered for potential widening.

The design standard for Runway 10-28 (B-III) was also examined. The current width of parallel Taxiway G (50 feet) meets this standard, as does the 400-foot runway/taxiway separation. Consideration may need to be given in the future for widening some of the entrance/exit and access taxiways on the airfield.

The type and frequency of runway entrance/exit taxiways can affect the efficiency and capacity of the runway system. Right-angled exits require an aircraft to be nearly stopped before exiting the runway. Acute-angled (high speed) exits allow aircraft to slow to a safe speed, without stopping, before exiting the runway. A right-angled exit (Taxiway N) was recommended in the last master plan and has since been added to Runway 4-22.

AIRFIELD MARKING, LIGHTING, AND SIGNAGE

In order to facilitate the safe movement of aircraft about the field, airports use pavement markings, lighting, and signage to direct pilots to their destinations. Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular 150/5340-1H, *Marking of Paved Areas on Airports*, provides the guidance necessary to design airport markings.

Runway 4-22 has the necessary markings for the ILS approach which serves the runway, while nonprecision instrument markings exist on Runway 10-28. The markings on both of these runways will suffice through the planning period.

Taxiway and apron areas also require marking. Yellow centerline stripes are currently painted on all taxiway surfaces at the airport to provide this guidance to pilots. The apron areas also have centerline markings to indicate the alignment of taxilanes within these areas. Besides routine maintenance of the taxiway striping, these markings will be sufficient through the planning period.

Airport lighting systems provide critical guidance to pilots during nighttime and low visibility operations. Runway 4-22 is equipped with high intensity runway lighting (HIRL), while Runway 10-28 is equipped with medium intensity runway lighting (MIRL). These will be adequate through the planning period.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. Medium intensity taxiway lighting (MITL) is installed on some taxiways, with edge lighting or reflectors in use on taxilanes. The existing airfield lighting systems, while adequate in intensity, will require routine maintenance and upgrades during the planning period.

Airfield signage provides another means of notifying pilots as to their location on the airport. A system of signs placed at several airfield intersections on the airport is the best method available to provide this guidance. Signs located at intersections of taxiways provide crucial information to avoid conflicts between moving aircraft. Directional signage instructs pilots as to the location of taxiways and terminal aprons. At Roberts Field, all signs installed at the taxiway and runway intersections are lit.

NAVIGATIONAL AND APPROACH AIDS

Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of the airport and provide additional safety to passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by commercial pilots when visibility is good.

There are currently six published instrument approaches to Roberts Field.

Instrument approaches are categorized as either precision or nonprecision. Precision instrument approach aids provide an exact alignment and descent path for an aircraft on final approach to a runway, while nonprecision instrument approach aids provide only runway alignment information. Most existing precision instrument approaches in the United States are instrument landing systems (ILS). At Roberts Field, Runway 22 is equipped with a precision instrument approach, while Runway 10-28 is equipped with a nonprecision instrument approach.

With the advent of the Global Positioning System (GPS), stand-alone instrument assisted approaches that provide vertical guidance down to visibility minimums currently associated with precision runways, will eventually be established. As a result, airport design standards that formerly were associated with a type of instrument procedure (precision/ nonprecision) are now revised, to relate instead to the designated or planned approach visibility minimums.

Existing Instrument Approaches

As previously mentioned, a precision instrument approach is available to Runway 22. Utilizing this approach, a properly equipped aircraft can land at the airport with 200-foot cloud ceilings and one-half mile visibility for aircraft in any category. The ILS Runway 22 approach can also be utilized as a localizer only or circling approach. When using only the localizer portion of the ILS (for course guidance only), the cloud ceilings increase to 400 feet above ground level for all aircraft categories and the visibility minimums increase to ¾ statute mile for aircraft in category D.

When using the ILS approaches to land at a different runway end (defined as a circling approach), the cloud ceilings increase to 500 feet above ground for aircraft in categories A and B and 600 feet for aircraft in categories C and D. The visibility minimums increase to ¾ statute mile for aircraft in category D.

Global Positioning System

The advent of technology has been one of the most important contributing factors in the growth of the aviation industry. Much of civil aviation and aerospace technology has been derived and enhanced from the initial development of technological improvements for military purposes. The use of orbiting satellites to confirm an aircraft's location is the latest military development to be made available to the civil aviation community.

The FAA has already approved the publication of thousands of "overlay" GPS instrument approach procedures. Stand-alone GPS approaches using the Wide-Area Augmentation System (WAAS) will gradually be phased in to provide Category I approaches, while Local Area Augmentation Systems (LAAS) will provide Category I/II/III approaches. Approach lighting and runway lighting systems in use today will continue to be required for the desired approaches.

Visual Approach Aids

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. A four-light precision approach path indicator (PAPI-4L) is installed on the approach ends of Runways 22 and 28, while a four light visual approach slope indicator (VASI-4L) is installed on the approach ends of Runways 4 and 10.

As most airports are replacing older VASIs with the PAPI system, consideration should be given to replacing the existing VASI-4L on the approach ends of Runways 4 and 10 with a PAPI-4L, which is less costly to maintain and operate.

Approach Lighting

Approach lighting systems provide the basic means to transition from instrument flight to visual flight for landing. The approach end of Runway 22 is equipped with a medium intensity approach lighting system (MALS) with runway alignment indicator lights (RAIL), or (MALSR). The existing MALSR at the end of Runway 22 should be sufficient throughout the planning period.

Runway end identifier lights (REILs) are flashing lights that facilitate identification of the runway end. REILs are installed on both ends of Runway 10-28, as well as the end of Runway 4. These existing REILs are sufficient and should be maintained throughout the planning period.

Weather Reporting

The airport is equipped with an Automated Surface Observation System (ASOS), which provides automated aviation weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. The ASOS system reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for temperature).

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling aircraft, passengers, and freight while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs.

TERMINAL AREA REQUIREMENTS

Components of the terminal area complex include the terminal apron, vehicle parking area, and the various functional elements within the terminal building. This section identifies the terminal area facilities required to meet the airport's needs throughout the planning period.

The requirements for the various terminal complex functional areas were determined with the guidance of FAA Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities* and FAA Advisory Circle 150/5360-9, *Planning and Design of Airport Terminal Facilities at Non-hub Locations*. The consultant's database for space requirements was also considered.

Facility requirements were developed for the planning period based upon the forecast enplanement levels. It should be noted that actual need for construction of facilities will be based upon enplanement levels rather than a forecast year. It is also important to note the impact that increased security is placing on facility requirements. Future requirements will include increased areas for the queuing of passengers and additional security screening equipment.

Exhibit 3C, which summarizes passenger terminal building functional area requirements for forecast enplanement levels, depicts the need for additional terminal area in the short term. The various functional areas of the terminal building are summarized as follows:

- **Ticketing -** includes estimates of the space necessary for the queuing of passengers at ticket counters, the linear footage of ticket counters, and the space necessary to accommodate baggage make-up and airline ticket offices.

- **Departure Facilities -** includes estimates of the space necessary for departure holdroom and the number of aircraft gate positions. Holdroom space and gate positions in excess of the requirements presented in the exhibit are frequently necessary to accommodate individual airline demands.

- **Baggage Claim -** includes estimates of the linear footage of baggage claim needed and space for passengers to claim baggage.

- **Rental Cars -** includes estimates of space necessary for the queuing of passengers at rental car counters, the space necessary for rental car offices, and the linear footage for rental car counters.

- **Concessions -** includes estimates of the space necessary to provide adequate concession services such as restaurant and retail facilities.

- **Security Screening -** includes estimates of the amount of space required to accommodate passenger screening devices, the queuing of passengers, and security officers' office area.

- **Public Waiting Lobby -** includes estimates of the amount of space to accommodate arriving and departing passengers.

- **Terminal Area Automobile Parking -** space required for long-term and short-term public parking, employee parking, and rental car parking.

- **Terminal Curb Frontage** - includes estimates of the linear footage of curb required to accommodate the queuing of enplaning and deplaning passenger vehicles. At Roberts Field, the length of the terminal curb frontage is a function of the length of the terminal building.

Terminal Gate Capacity

Several methods for estimating the number of required aircraft gate positions were used to determine future gate requirements at the airport. Using figures 4.1- 4.4 in Advisory Circular 150/5360-13, these methods estimated the required number of gates based on peak hour utilization, daily utilization, and annual utilization. By examining airline flight schedules, peak hour operations were estimated at seven operations. Using these formulas, 10 and 20-year forecasts (of both low and high utilization) were determined. It was estimated that four gates will be needed at Roberts Field by the end of the planning period. However, the high number of overnighting (R.O.N.) aircraft will require greater numbers of parking positions on the ramp. The exact number will vary depending on the number of carriers and hub destinations.

GENERAL AVIATION REQUIREMENTS

The purpose of this section is to determine the landside space requirements for general aviation hangar and apron parking facilities during the planning period. In addition, the total surface area needed to accommodate general aviation activities throughout the planning period is estimated.

HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is towards more sophisticated aircraft (and, consequently, more expensive aircraft); therefore, many aircraft owners prefer enclosed hangar space to outside tiedowns.

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, hangar development should be based upon actual demand trends and financial investment conditions. While a majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft will still tie-

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	ENPLANEMENTS			
	CURRENTLY AVAILABLE	186,000	220,000	300,000
TICKETING				
Counter Length (l.f.)	85	90	90	95
Counter Area (s.f.)	850	900	900	1,000
Ticket Lobby (s.f.)	950	2,200	2,200	2,400
Airline Operations/Bag Make-up (s.f.)	3,700	3,900	4,100	5,400
DEPARTURE FACILITIES				
Aircraft Gates	3	4	4	4
Holdroom Area (s.f.)	2,050	3,900	4,700	6,400
BAGGAGE CLAIM				
Claim Display (l.f.)	80	90	110	150
Claim Lobby Area (s.f.)	1,300	2,400	2,900	3,900
TERMINAL SERVICES				
Rental Car				
Counter Length (l.f.)	30	50	60	70
Office Area (s.f)	600	1,500	1,700	2,000
Lobby (s.f.)	160	500	600	700
Food/Beverage (s.f.)	2,000	3,300	3,900	5,300
Retail (s.f.)	400	1,600	1,900	2,600
Restrooms (s.f.)	950	1,100	1,300	1,800
PUBLIC LOBBY				
Greeting Lobby/Seating (s.f.)	3,100	6,000	7,100	9,600
Security Queuing Area (s.f.)	450	2,700	3,200	4,300
AIRPORT ADMINISTRATION				
Offices/Conference Room (s.f.)	1,100	2,900	3,200	4,000
TOTAL PROGRAMMED TERMINAL AREA (Excludes maintenance, storage, misc. areas).	**17,610**	**32,900**	**37,700**	**49,400**
AUTO PARKING				
Public				
Short Term/Long Term	557	610	720	980
Rental Car	105	120	140	190
Employee	60	90	110	150

Source: Coffman Associates Analysis

ROBERTS FIELD
Redmond, Oregon

Exhibit 3C
PASSENGER TERMINAL
BUILDING REQUIREMENTS

down outside (due to the lack of hangar availability, hangar rental rates, and/or operational needs). Therefore, enclosed hangar facilities should not be planned for each based aircraft. At Roberts Field, approximately 80 percent of the based aircraft are currently stored in enclosed hangar facilities. It is estimated that the percentage of based aircraft stored in hangars will remain near 80 percent through the planning period.

Approximately 50 percent of the hangared aircraft at Roberts Field are currently stored in T-hangars. The majority of aircraft currently stored in these hangars are single-engine. A planning standard of 1,200 square feet per based aircraft has been used to determine future requirements.

The remaining 50 percent of hangared aircraft are stored in executive/conventional hangars, which are designed for multiple aircraft storage. As the trend towards more sophisticated aircraft continues throughout the planning period, it is important to determine the need for more conventional/executive hangars. For executive/conventional hangars, a planning standard of 1,200 square feet was used for single-engine aircraft, while a planning standard of 3,000 square feet was used for multi-engine, jet, and helicopters. These planning standards recognize that some of the larger business jets require a greater amount of space.

Since portions of executive/conventional hangars are also used for aircraft maintenance, and servicing, requirements for maintenance/service hangar area were estimated using a planning standard of approximately 15 percent of the total hangar space needs.

Future hangar requirements for the airport are summarized in **Table 3F**. As shown in the table, additional maintenance area will be required in the short term and additional T-hangar space will be required in the intermediate term. Chapter Four, Airport Development Alternatives, will examine the options available for hangar development at the airport and determine the best location for each type of hangar facility.

Building space requirements for the sorting and transfer of air cargo was also examined. As mentioned in Chapter One, three all-cargo operators (Airborne Express, Fed Ex and UPS) offer air service at Roberts Field. Because the air cargo sorting is handled in the general aviation areas, a planning standard of 800 pounds of enplaned air cargo per square foot was used to determine building requirements. This should be easily absorbed in the overall general aviation space needs. Separate air cargo sorting facilities are not anticipated.

TABLE 3F Aircraft Storage Requirements Roberts Field		Future Requirements		
	Currently Available	Short Term	Intermediate Term	Long Term
Aircraft to be Hangared	88	104	120	152
Single-Engine Positions	75	86	96	114
Multi-Engine Positions	13	18	24	38
Hangar Area Requirements (s.f.)				
T-Hangar Area	56,800	53,700	64,800	85,200
Executive/Conventional Hangar Area	180,800	82,200	104,400	150,600
Maintenance Area	9,600	20,400	25,400	35,400
Total Hangar Area (s.f.)	247,200	156,300	194,600	271,200

AIRCRAFT PARKING APRON

A parking apron should provide for the number of locally-based aircraft that are not stored in hangars, and for those aircraft used for air taxi and training activity. Parking should be provided for itinerant aircraft (passenger and air freight) as well. As mentioned in the previous section, approximately 80 percent of based aircraft at Roberts Field are currently stored in hangars. It is estimated that the percentage of based aircraft stored in hangars will be near 80 percent by the end of the planning period.

For planning purposes, 25 percent of the based aircraft total will be used to determine the parking apron requirements of local aircraft, due to some aircraft requiring both hangar storage and parking apron. Since the majority of locally-based aircraft are stored in hangars, the area requirement for parking of locally-based aircraft is smaller than for transient aircraft. Therefore, a planning criterion of 650 square yards per aircraft was used to determine the apron requirements for local aircraft.

Along with based aircraft parking needs, transient aircraft parking needs must also be considered when determining apron requirements. A planning criterion of 800 square yards was used for single and multi-engine itinerant aircraft, and 1,600 square yards for itinerant jets.

Total aircraft parking apron requirements for general aviation are presented in **Table 3G**. Currently, apron area at the airport totals approximately 62,000 square yards, with approximately 100 total tie-down positions, which will be sufficient through the end of the planning period.

TABLE 3G
General Aviation Aircraft Parking Apron Requirements
Roberts Field

	Currently Available	Short Term	Intermediate Term	Long Term
Single, Multi-Engine Transient Aircraft Positions		13	15	21
Apron Area (s.y.)		10,700	12,400	16,500
Transient Jet Aircraft Positions		3	4	5
Apron Area (s.y.)		5,300	6,200	8,200
Locally-Based Aircraft Positions		33	38	48
Apron Area (s.y.)		21,100	24,400	30,900
Total Positions	100	50	57	74
Total Apron Area (s.y.)	62,000	37,100	43,000	55,600

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation areas have also been identified. These other areas provide certain functions related to the overall operation of the airport, and include aircraft rescue and firefighting, fuel storage, and airport maintenance facilities.

AIRCRAFT RESCUE AND FIREFIGHTING

Requirements for aircraft rescue and firefighting (ARFF) services at an airport are established under Federal Aviation Regulations (FAR) Part 139, which applies to the certification and operation of land airports served by any scheduled or unscheduled passenger operation of an air carrier using an aircraft with more than 9 seats.

Paragraph 139.315 establishes ARFF index ratings, based on the length of the largest aircraft with an average of five or more daily departures. Roberts Field has been classified with Index B requirements, which apply to airports servicing aircraft less than 126 feet. Specifications have been developed for the trucks in terms of dry chemicals, water, and foam application agents they are required to carry. The ARFF equipment is located in a three-bay building located east of Redmond Air, along Taxiway G. This facility meets Index B requirements (with equipment and personnel).

AIRPORT MAINTENANCE/ STORAGE FACILITIES

Currently, Roberts Field has a 7,200 square-foot maintenance/storage building, which is located northwest of the ARFF facilities and a 2,400 square-foot maintenance garage, which is located north of the Runway 10 end. Although portions of conventional hangars are also used for maintenance purposes, the aircraft storage requirements indicated a need for additional maintenance area. Therefore, adequate area needs to be reserved in an alternate location.

FUEL STORAGE

All aircraft fuel storage facilities at the airport are privately owned and operated. Butler Aircraft owns and operates four above-ground fuel storage tanks; two 10,000-gallon tanks for 100LL (located at the west end of the apron) and two 12,000-gallon tanks for Jet A (located near their large aircraft storage hangar). Redmond Air owns and operates two 12,000-gallon fuel storage tanks (one each for 100LL and Jet A), which are located along Taxiway A, north of Taxiway G. Aircraft refueling is provided from several fueling trucks.

Storage requirements are normally based upon two-week usage requirements. Generally, fuel tanks should be of adequate capacity to accept a full refueling tanker, which is approximately 8,000 gallons, while maintaining a reasonable level of fuel in the storage tank.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for the airport through the planning horizon. The next step is to develop a direction for implementation that will best meet these projected needs. The remainder of the master plan will be devoted to outlining this direction, its schedule, and costs.

Chapter Four
AIRPORT DEVELOPMENT ALTERNATIVES

AIRPORT DEVELOPMENT ALTERNATIVES

In the previous chapter, airside and landside facility needs that would satisfy projected demand over the planning period were identified. The next step in the master planning process is to evaluate the various ways these facilities can be provided. In this chapter, the facility needs will be applied to a series of airport development alternatives. The possible combination of alternatives can be endless, so some intuitive judgment must be applied to identify the alternatives which have the greatest potential for implementation. The alternatives analysis is an important step in the planning process since it provides the underlying rationale for the final master plan recommendations.

The alternatives presented in this chapter provide a series of options for meeting short and long-range facility needs. Since the levels of commercial and general aviation activity can vary from forecast levels, flexibility must be considered in the plan. If activity levels vary significantly within a five-year period, the City of Redmond should consider updating the plan to reflect the changing conditions.

Since the combination of alternatives can be endless and the budgeted time for alternative evaluation is limited, only the more prudent and feasible alternatives were examined. The alternatives presented in this chapter will be reviewed with the Citizens Advi-

sory Committee to allow for further refinement. Then, a master plan concept will be recommended and subjected to environmental reviews. Following environmental reviews, updated airport layout plan drawings and a capital improvement program will be developed. However, a final decision with regard to pursuing a particular development plan which meets the needs of commercial and general aviation users rests with the City of Redmond.

While the evaluation of airport development alternatives may always include the "no action" or "no build" alternative, this alternative will eventually reduce the quality of services provided to the public and potentially affect the area's ability to accrue additional economic growth.

While this study does not deal with the potential relocation of services to other airports, this option also exists. It would be difficult to duplicate the services and convenience of the current facility at a nearby airport and the economic and environmental costs of new site development are generally far greater than the cost of developing the existing site. It is sometimes possible to relocate, or encourage the relocation, of some services. However, most of the services which local users find attractive are not easily met at nearby airports. Therefore, the master planning process must attempt to deal with the facility needs which have been identified in the previous chapter, providing a logical decision path which the City of Redmond can follow in meeting projected needs.

BACKGROUND

Prior to presenting airport development alternatives, it is helpful to review some of the previous airport planning efforts and the development that has occurred during the intervening years. Recounting recent (or ongoing) improvements will assist with the identification of current issues affecting future development options. Following completion of the last master plan in January 1998, the City pursued the following projects:

- Construction of Taxiway N (entrance/exit taxiway)
- Reconstruction of Taxiway F (full-length)
- Reconstruction and expansion of air carrier ramp (8 positions/Q-400)
- Removal of a hill in front of the U.S. Forest Service (U.S.F.S.)
- Expansion of the air carrier terminal parking lots
- Construction of a new Aircraft Rescue and Firefighting Facility (ARFF)
- Construction of a new airport maintenance facility
- Construction of new executive hangars
- Construction of new facilities for the U.S.F.S.

This updated master plan will identify new demands at the airport while continuing to preserve the long term recommendations of the 1998 Airport Master Plan.

INITIAL DEVELOPMENT CONSIDERATIONS

Upon completion of the facility needs evaluation and a subsequent meeting with the Citizens Advisory Committee for the master plan study, a number of airport development considerations were outlined. These considerations, which have been grouped into airside, terminal/access, and general aviation categories, have been summarized in **Exhibit 4A**.

While many of these development considerations are demand driven (as scheduled passengers, based aircraft, or operational levels increase at the airport), several are somewhat more general in nature, but remain as important considerations in the master planning process.

NO ACTION ALTERNATIVE

In analyzing and comparing costs and benefits of various development alternatives, it is important to consider the consequences of no further development. The "no action" alternative essentially considers keeping the airfield in its present condition, and not providing for any improvements to existing facilities. The primary result of this alternative, as in any growing air transportation market, would be the eventual inability of the airport to satisfy the increasing demands of the airport service area.

As operations increase and the airport exceeds 60 percent of its capacity, the efficiency of the airfield system will deteriorate and delays for all airport users will increase. Based upon the aviation demand forecasts, the airport is expected to reach 74 percent of its capacity during the 20-year planning period. The efficiency of the airfield will diminish over time without enhancements.

The ramifications of the "no action" alternative extend into impacts on the economic well being of the region. If facilities are not maintained and improved so that the airport maintains a pleasant experience to the visitor or business traveler, of if delays become unacceptable, then these individuals may consider doing their business elsewhere.

Thus, the "no action" alternative is inconsistent with the long term transportation system goals of the City of Redmond, which are to enhance local and interstate commerce. A policy of "no action" would be considered an irresponsible approach, affecting not only the long term viability of the airport and the investment that has been made in it, but also the economic growth and development of the airport's service area. Therefore, the "no action" alternative was not considered as prudent or feasible.

AIRFIELD ALTERNATIVES

Airfield facilities are, by their very nature, a focal point of the airport complex. Because of their role, and the fact that they physically dominate a great deal of the airport's property, airfield facility needs are often the most critical factor in the determination of viable airport development alternatives. In particular, the runway system requires the greatest influence on the identification and development of other airport facilities. Furthermore, due to the number of aircraft operations, there are a number of FAA design criteria that must be considered when looking at airfield improvements. These criteria, depending upon existing constraints around the airport, can have a significant impact on the viability of various alternatives which are designed to meet airfield needs.

RUNWAY CONSIDERATIONS

The facility needs evaluation completed in the previous chapter identified the potential need for greater runway length due to aircraft flown by the United States Forest Service (U.S.F.S.). Since only Runway 4-22 has a strength rating to handle aircraft operated by the U.S.F.S. (or larger turboprop or jet aircraft), and this runway provides 99.07 percent wind coverage (at 16 knots) for larger aircraft, runway length requirements for these aircraft were evaluated only for Runway 4-22.

The U.S.F.S. and Bureau of Land Management (BLM) canceled 2004 firefighting contracts for 33 large airtankers in May 2004, siting National Transportation Safety Board (NTSB) recommendations stemming from three wing-loss accidents. After all 33 airtankers were effectively grounded via contract cancellation, congressional hearings spurred the FAA, USFS, and BLM to jointly draft criteria for returning the aerial airtankers to service. Airtanker operators were asked to submit information packages designed to satisfy this criteria.

Orion P-3A airtankers will be among the first reviewed, and it is believed that these aircraft will have a reasonable chance of being returned to service quickly. Assessments of other tanker types will follow as soon as possible. Meanwhile, federal agencies are handling fires with single-engine airtankers, helicopters, and waterscoopers, and without the aid of the "heavy" airtankers.

The previous master plan recommended an ultimate runway length of 8,700 feet on Runway 4-22 (a 1,660-foot extension to the Runway 4 end). However, based upon the type of airtankers which may be used by the U.S.F.S. in the future, a lesser extension may be considered in short-term planning. A useable runway length of 8,000-8,700 feet was initially considered. **Exhibit 4B** depicts an initial 1,460-foot extension to the Runway 4 end, which will lengthen the runway to 8,500 feet.

Runway 4-22 has also been examined for the possibility of an ultimate length of 10,000 feet, which could be achieved with a 1,500-foot extension to the Runway 22 end. This alternative is also shown on **Exhibit 4B**. With any proposed runway extension, the airport sponsor will be required to submit adequate justification for the project to the FAA. This may include letters from individual operators, itemizing aircraft types, stage lengths, and typical loads.

03MP11-4A-6/14/04

AIRSIDE CONSIDERATIONS

- Provision for perimeter road on Runway 10 end
- Provision for an ultimate length of 10,000 feet on Runway 4-22 and upgrade to a Category II approach on Runway 22
- Realignment of Highway 126 to remove from RPZ and/or allow for Runway 4-22 extension
- Realignment of Veterans Way/Airport Way intersection to remove from RPZ on Runway 10 end
- Provisions for a new 7,000' x 150' runway (parallel to Runway 4-22), maintaining adequate separation for simultaneous operations (with capability for 8,000')
- Extension of Taxiway C to a full-length parallel taxiway
- Upgrade of taxiways/exits to meet current design standards
- Placement of new airport surveillance radar (ASR) on airport property

TERMINAL/ACCESS CONSIDERATIONS

- Terminal building and parking lot expansion
- Entrance road realignment
- Provision for segregated air cargo facilities
- Planning for long-term midfield terminal location

GENERAL AVIATION CONSIDERATIONS

- Provide additional hangar capacity
- Provide leasable parcels for general aviation development

ROBERTS FIELD
Redmond, Oregon

Exhibit 4A
DEVELOPMENT ALTERNATIVE CONSIDERATIONS

03MP11-4B-8/31/04

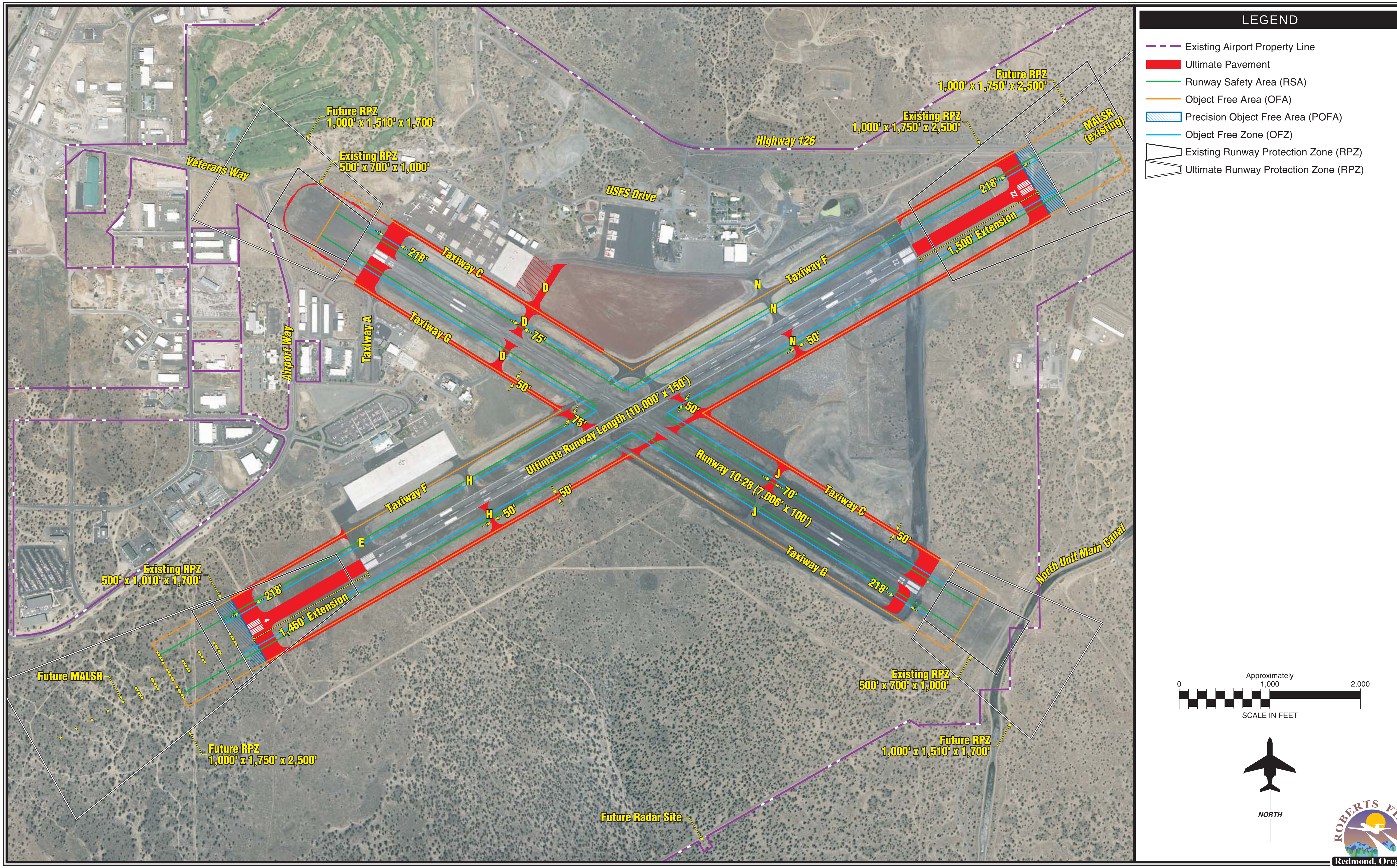

Exhibit 4B
AIRFIELD ALTERNATIVE A

Whenever an airport master plan study is undertaken, an evaluation of land uses in the Runway Protection Zone (RPZ) should be a normal consideration, especially if there are existing objects in the RPZ, including roads. The FAA *Advisory Circular 150/5300-13* states that the function of the RPZ is "to enhance the protection of people and property on the ground." The RPZ includes the Runway Safety Area (RSA), the standard runway Object Free Area (OFA), and if applicable, the OFA Extension and Obstacle Free Zone (OFZ), as well as any stopway, clearway, threshold obstacle surface, or navaid critical area.

The Airports Division, Northwest Mountain Region, has a policy (Land Policy 97-02) on the long term use of obligated airport land in the RPZ or land acquired for approach protection. In the past, land beyond present RPZ dimensions was acquired for "clear zone" and "approach protection." Many airports in this region acquired this land with federal funds and agreed to a special condition that required the land to be cleared. While each grant must be checked for the exact language, in most cases the special condition stated "the sponsor agrees to prevent the erection or creation of any structure or place of public assembly in the approach and transition zone, except for navaids that are fixed by their functional purposes or any other structure approved by the FAA. Any existing structures or uses within the approach and transition zone will be cleared or discontinued unless approved by the FAA."

Highway 126 lies within the existing and ultimate RPZ of the Runway 22 end (and an extension of the runway). Therefore, the highway should be considered for relocation. A possible highway realignment is depicted on **Exhibit 4C**.

The secondary crosswind runway, Runway 10-28, should adequately serve users at its existing length of 7,006 feet. However, the Veterans Way/Airport Way intersection currently lies within the current and future RPZ of the Runway 10 end. **Exhibit 4D** presents two possible scenarios for the realignment of these roads to clear the future RPZ.

Both alternatives relocate Veterans Way to the north, while Airport Way is shifted west. Alternative A depicts a "T" intersection with a left turn only lane onto Veterans Way and through traffic onto Airport Way. Alternative B depicts a triangle intersection, allowing traffic to merge in either direction.

Exhibit 4D also depicts the Object Free Area (OFA) and the OFA Extension. The OFA dimensional standards for a B-III runway specify a length of 600 feet beyond the runway end and a width of 800 feet (centered on the runway line). Extension of the OFA beyond the standard length to the maximum extent feasible is encouraged.

TAXIWAY CONSIDERATIONS

Taxiways are primarily constructed to facilitate aircraft movements to and from the runway system. The availability of entrance and exit taxiways can affect the overall airfield efficiency. Taxiway considerations for Roberts Field have been depicted on **Exhibit 4B** and are discussed in the following paragraphs.

Several provisions for existing taxiways are planned and include the following: the reconstruction of Taxiways A (design underway now), B, and C; widening Taxiway D to 75 feet and straightening a portion of Taxiway D (north of Taxiway C); the reconstruction of a portion of Taxiway G (north of Runway 4-22) and widening a portion of Taxiway G (between Taxiway F and Runway 4-22) to 75 feet to accommodate the U.S.F.S. aircraft exiting Runway 4-22; the extension of Taxiway H (south of Runway 4-22); the reconstruction of a portion of Taxiway J (north of Runway 10-28); and the extension of Taxiway N (south of Runway 4-22).

The extension of Taxiway C to a full-length parallel taxiway was recommended in the previous chapter. Taxiways serving Runway 10-28 should meet a 50-foot width standard.

Exhibit 4B also depicts the addition of a full-length parallel taxiway (50 feet wide) on the south side of Runway 4-22, which will allow access for future development. Standards require a 400-foot separation between the taxiway centerline and the runway centerline.

PROPOSED PARALLEL RUNWAY

The airfield capacity analysis in the previous chapter also identified the need to plan for a new parallel runway. For short term planning, adequate length should be provided for the critical commercial aircraft (the regional jet or Q-400). This results in a runway length of approximately 7,000 feet and a width of 150 feet. Long term planning should consider an extension to 8,000 feet to meet the needs of a greater percentage of the fleet. **Exhibit 4E** presents three different layouts for the proposed parallel runway.

The first alternative depicts the layout presented in the 1998 Master Plan, which recommended an ultimate length of 8,700 feet for Runway 4-22, and a future parallel runway (Runway 4R-22L) with a length of 6,900 feet. A 3,400-foot separation was recommended between the parallel runways to provide simultaneous Instrument Flight Rule (IFR) capability, although simultaneous IFR capability at this separation (based upon standards at the time) required special FAA approval and radar equipment. The minimum separation has since been reduced to 3,000 feet (with special approvals and radar).

When runway spacing is less than 3,400 feet, but not less than 3,000 feet, the localizer azimuth stations in the close runway pair must be aligned at least 2 1/2° divergent from each other, but not more than 3° and an electronically scanned (E-Scan) radar with an updated interval of 1.0 second must be deployed.

Simultaneous non-radar departures require a parallel runway centerline separation of at least 3,500 feet. How-

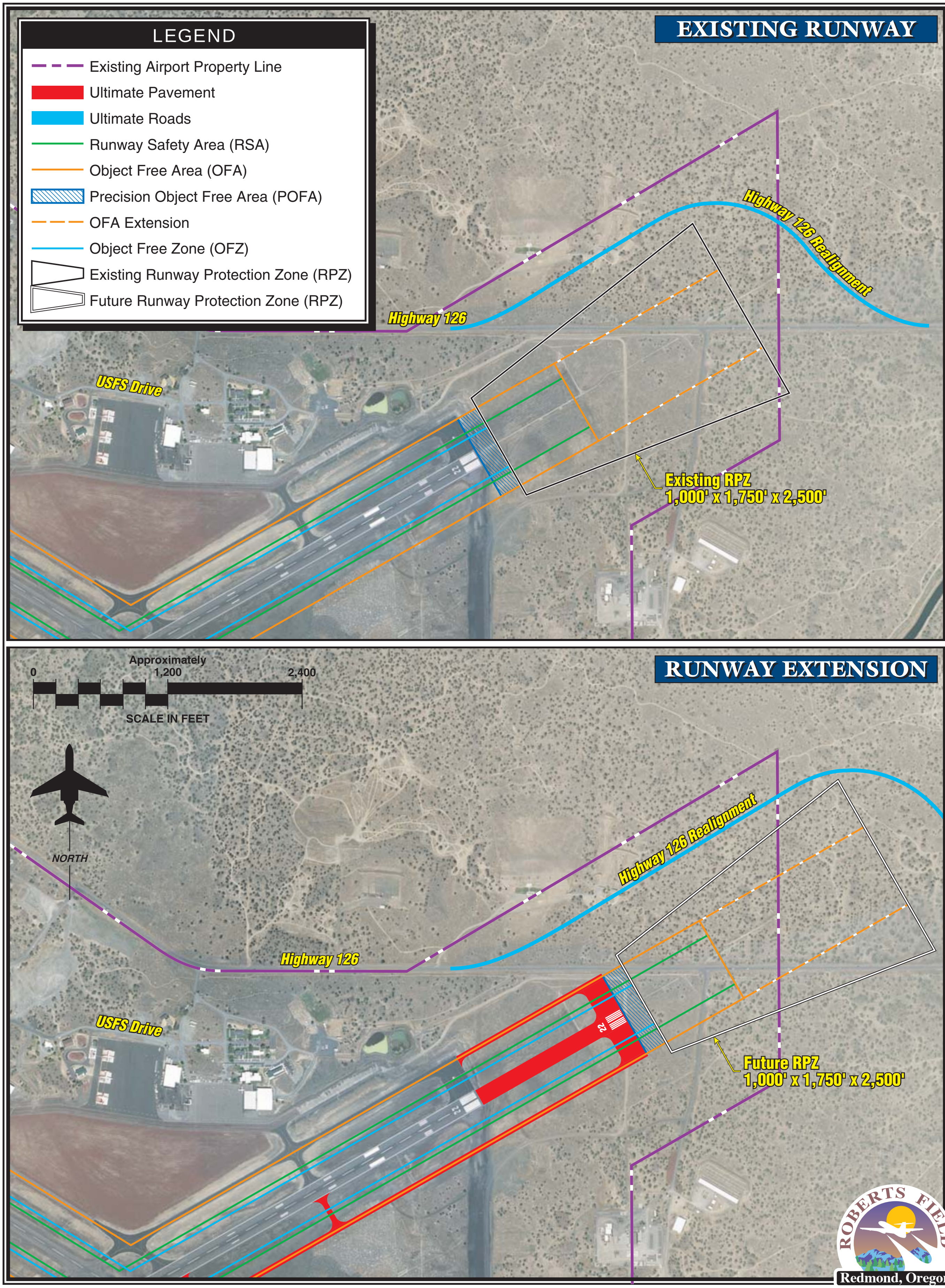

Exhibit 4C
HIGHWAY 126 REALIGNMENT
ALTERNATIVE

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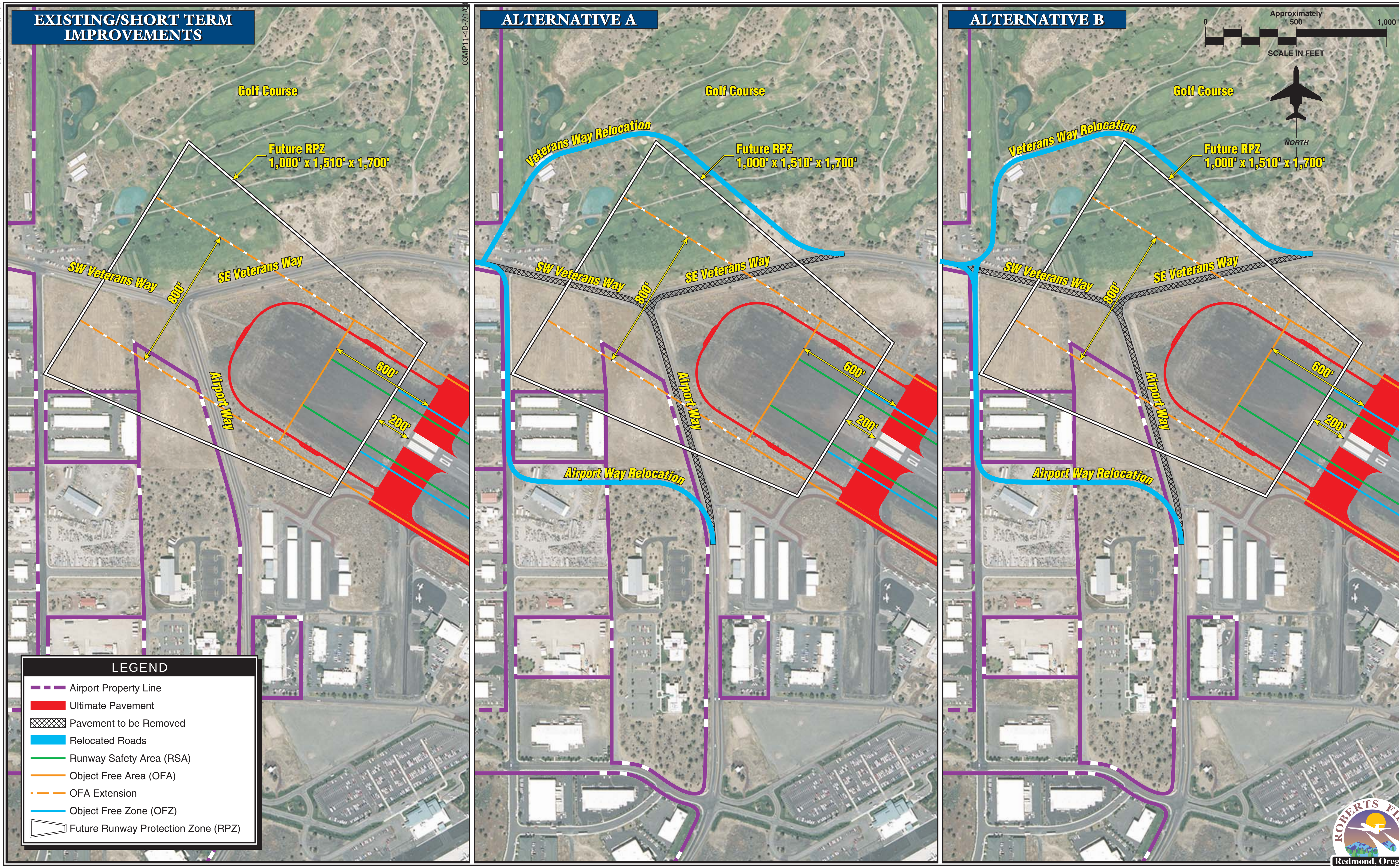

Exhibit 4D
VETERANS WAY/
AIRPORT WAY REALIGNMENT

03MP11-4E-9/7/04

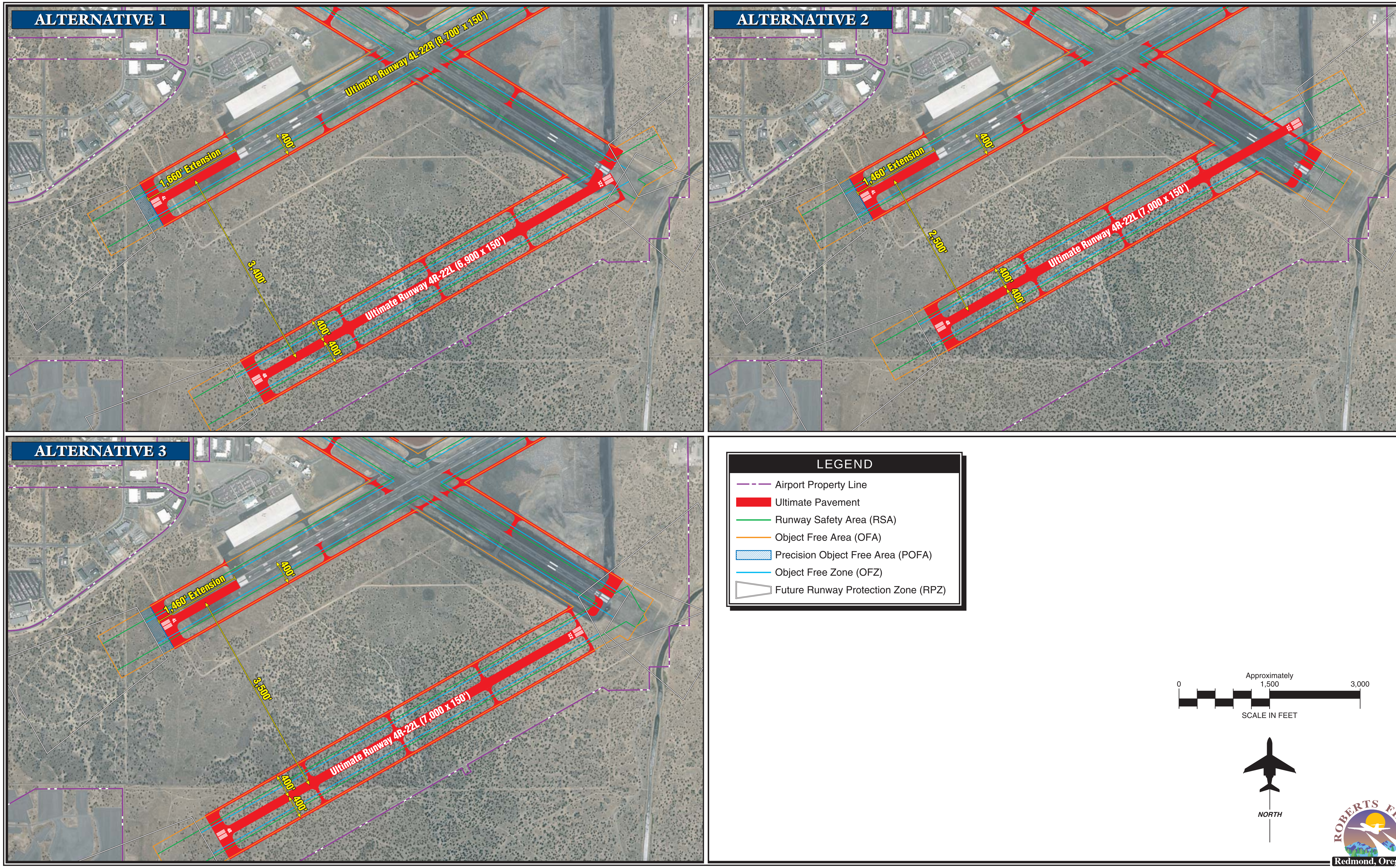

Exhibit 4E
AIRFIELD ALTERNATIVE B -
PARALLEL RUNWAY

ever, the airport is in the process of installing B16 radar, which will decrease the parallel runway centerline separation standard to 2,500 feet, which is presented in the second alternative. This layout depicts the Runway 4R end flush with the 1,460-foot extension to the Runway 4 (future Runway 4L) end, allowing the opposite end to intersect with Runway 10-28.

The third alternative shows a 3,500-foot separation between the parallel runways. While the addition of the radar will decrease the runway centerline separation standard to 2,500 feet, this greater separation allows for more potential development between the parallel runways.

Initially, a parallel taxiway on the inside of the proposed runway is recommended. Ultimately, a parallel taxiway could be added to the outside based upon landside development needs. Design standards indicate a 400-foot separation between the runway centerline and the parallel taxiway centerline. Exit taxiways have been reflected at intervals to maximize airfield capacity.

TERMINAL ALTERNATIVES

Five alternatives for expansion of the existing terminal facilities have been developed by the terminal architect. These alternatives were presented to the Citizens Advisory Committee at the meeting held on July 15, 2004. Following the meeting, a refined alternative for the terminal expansion was developed. A series of drawings has been included in an appendix to this master plan.

AIR CARGO FACILITIES

Currently, air cargo operators serving the airport use existing pavement for parking and transfer onto trucks while the airlines handle air cargo at the terminal. Generally, air cargo facilities should be segregated from commercial air carrier or general aviation facilities. The amount of truck and delivery van traffic which can be generated from an air cargo complex is an important consideration, as is the ability to expand apron buildings. Due to the limited area available in the terminal for handling cargo, it would be desirable to provide a segregated area for air cargo facilities.

Exhibit 4F depicts the proposed location of an air cargo facility southwest of the terminal building. This location would segregate the cargo activity from other activities on the airport. A small building could be provided here, with adequate area adjacent to the building for truck court and passenger vehicle needs.

Traffic generated by cargo vans and trucks should be segregated from other airport traffic. From this location, truck traffic could be routed directly onto Airport Way. However, development in this area will first require the extension of utilities and the construction of new roads.

GENERAL AVIATION FACILITIES

The facility needs evaluation projected the need for as many as 80 additional storage positions, for both small and large aircraft. Most of the hangar development in the past has occurred on the east ramp and in the area west of Taxiway A. Limited building area remains in these locations and other areas will need to be considered. The potential locations for hangar development in these and other areas have been identified on **Exhibit 4F**.

The exhibit depicts a row of seven individual hangars west of and parallel to Taxiway A. FBO expansion and maintenance building/area expansion is also depicted along Taxiway G.

The area west of the U.S.F.S. facilities is also another option for hangar development. **Exhibit 4F** depicts four rows of T-hangars in this area, which could provide storage for approximately 40 aircraft. An extension of Taxiway D would provide access to this area. A conventional hangar is also depicted on this exhibit, west of the Taxiway D extension. The apron could also be extended southeast to reach Taxiway D.

Another potential location for future general aviation development is the area north of the Runway 10 end. The exhibit depicts a configuration of large box hangars, as well as a row of box hangars in this location which could provide storage for an additional 20-25 aircraft. An additional apron area could also be provided in front of these hangars. A conventional hangar is also depicted on this exhibit, west of the Taxiway D extension. The apron could also be extended southeast to reach Taxiway D. An additional maintenance area could be provided in a building northeast of the terminal facilities.

The area east of the Runway 4-22 and Runway 10-28 intersection should be reserved for future large hangar development. A portion of this area has already been filled with material that was removed from the hill in front of the U.S.F.S. facilities. However, the rest of this area would need to be filled, then utilities and roads extended into the area.

NAVIGATIONAL AND APPROACH AIDS

Electronic and visual guidance to arriving and departing aircraft enhance safety and utilization of the airfield. Such facilities are vital to the operational success of the airport and enhance the safety of passengers using the airport. While instrument approach aids are especially helpful during poor weather, they often are used by commercial pilots when visibility is above instrument flight rule conditions.

Instrument Approach Aids

The existing instrument approach aids at Roberts Field include a precision instrument approach to one runway end. Runway 22 has a Category I Instrument Landing System (CAT I ILS), consisting of a glide slope, local-

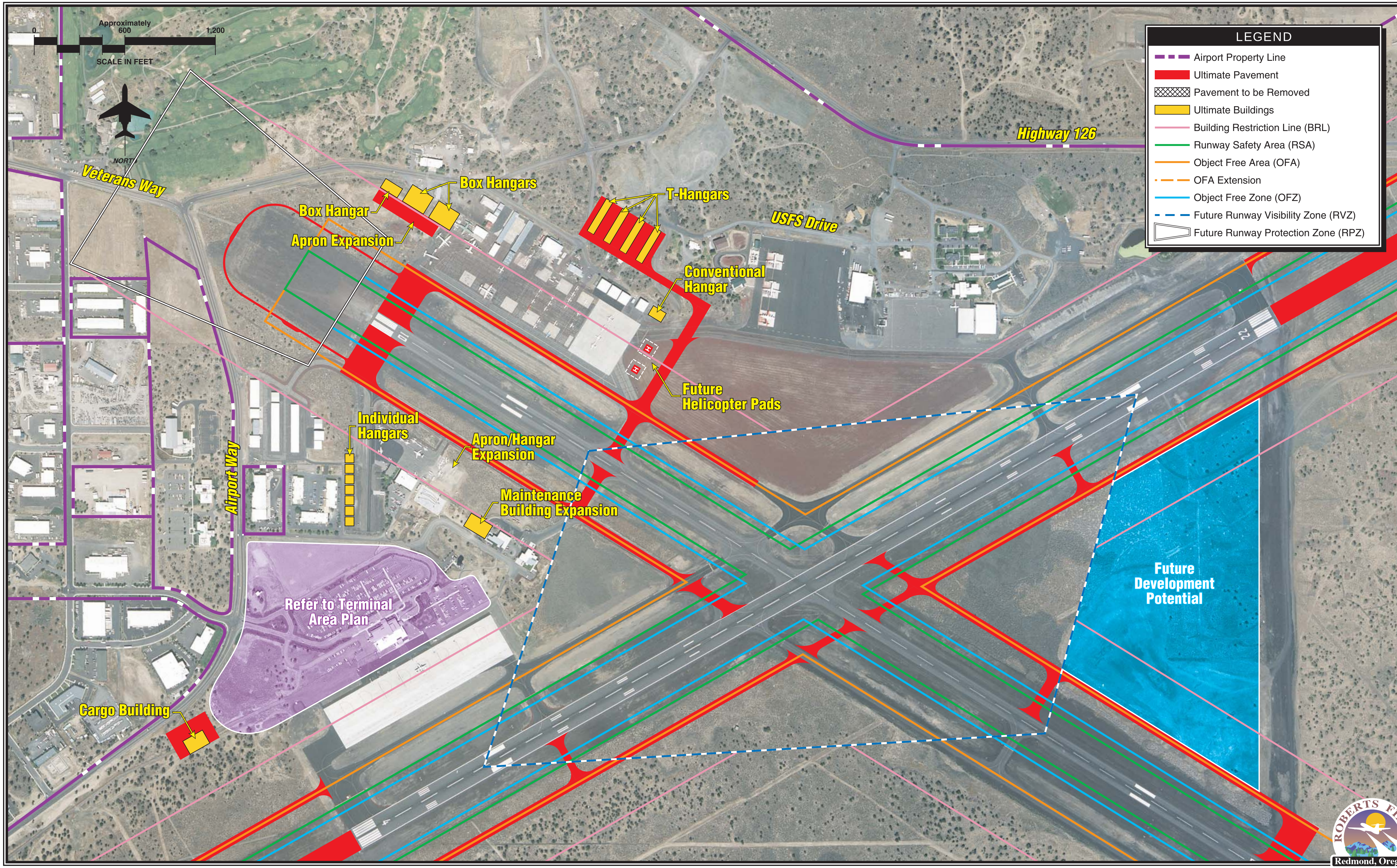

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Exhibit 4F
LANDSIDE ALTERNATIVE

izer, middle marker, and outer marker. Runway 22 is also equipped with a medium intensity approach lighting system with runway alignment indicator lights (MALSR). In addition, the approach is supplemented by a Runway Visual Range (RVR) system to provide information on the runway visibility. The minimums for use of CAT I ILS approaches are 200-foot cloud ceilings and one-half mile visibility (2,400 RVR). A Category II ILS approach is recommended on Runway 22.

A Category II instrument approach has the potential to reduce the minimums to 100-foot ceilings and one-fourth mile visibility (1,200 RVR). A Category II ILS upgrades a CAT I system through the addition of dual electronic equipment, an inner marker beacon, upgraded marking and lighting systems, and one or more additional runway visual ranges. In addition, the glideslope may need to be relocated and the localizer performance improved in order to achieve FAA specifications for Category II authorization.

The following requirements must be met for any Category II establishment or upgrade of an existing ILS:

- The candidate must meet all appropriate FAA technical standards and requirements, which can be found in FAA *Advisory Circular 150/5300-13*, Appendix 16.

- The airport must install and maintain the required facilities and equipment necessary to supplement the CAT II approach.

- The air carrier(s) which will utilize the CAT II facilities must be able to provide CAT II approved crews and equipment.

- The airport must have reached 2,500 air carrier actual annual instrument approaches (AIAs) for the past three fiscal years.

- CAT II systems to be procured under FAA *Facilities and Equipment* for runways meeting the previous four conditions must be validated by a benefit/cost analysis by the Office of Aviation Policy and Plans.

For visibility minimums of less than three-fourth statute miles, a precision object free area (POFA) is required. A POFA is defined as an object free area centered on the runway centerline, beginning at the runway threshold, 200 feet long and 800 feet wide.

Nonprecision instrument approaches are available to Runway 10-28, which will be sufficient through the planning period.

Visual Approach Aids

Currently, a four-light precision approach path indicator (PAPI-4L) is installed on the approach ends of Runways 22 and 28, while a four-box visual approach slope indictor (VASI-4L) is installed on the approach ends of Runways 4 and 10. As mentioned in the previous chapter, most airports are replacing older VASIs with the PAPI system. Consideration should be given to replacing the existing VASIs on Runways 4 and 10 with PAPIs, which are less costly to maintain and operate. PAPIs are also recommended on both ends of the proposed parallel runway.

Airfield Marking And Lighting

Runway markings are designed according to the type of approach available on the runway. FAA *Advisory Circular 150/5340-1H*, *Standards for Airport Markings*, provides the guidance necessary to design an airport's markings. The precision markings on Runway 4-22 and the nonprecision markings on Runway 10-28 should be adequate for the future uses of these runways. The proposed parallel runway should be marked with precision markings. Taxiway markings will need to be added to all taxiway additions, as well as to any new apron areas.

Airport lighting systems provide critical guidance to pilots during nighttime and/or poor visibility. Runway 4-22 is equipped with high intensity runway lighting (HIRL) and Runway 10-28 is equipped with medium intensity runway lighting (MIRL). All taxiways at the airport are equipped with medium intensity taxiway lighting (MITL). HIRL should be installed on the proposed parallel runway and MITL should be installed on all taxiway additions.

DEVELOPMENT OF NON-AVIATION PROPERTIES

Roberts Field provides the region with several functions: commercial, air freight, and general aviation services; aerial fire support through the U.S. Forest Service; medical and law enforcement air support; and development sites for the commercial/ industrial sector. While all but the last of these functions are directly dependent on the ability of Roberts Field to provide facilities which meet their respective need, economic development is not specifically dependent upon the operational capabilities of the airport.

While proximity or access to airport services may be desirable for some industrial firms, most of the potential tenants will not have an aviation connection. In addition, firms would be required to pay fair market rental value. The airport may provide a site and support services as an alternative location within the overall availability of properties that are zoned and master planned for commercial/industrial uses in the Redmond area. In that sense, the airport sites may compete with other locations that are developed by private firms, individuals, non-profit foundations, and other municipal agencies.

The City can support a wide variety of discretionary uses on the airport, including: airport-related commercial service businesses; aviation-related business; aviation/aerospace manufacturers; non-aviation industrial/ commercial uses; and low-density uses in approach/transition areas.

AIRPORT-RELATED COMMERCIAL SERVICE BUSINESSES

The airport can offer location advantages for commercial businesses that neither support the airport operations nor provide services to users of the airport, such as motels, restaurants, car rental agencies, service stations, and small executive offices that provide services and facilities for business travelers. In many locations, these businesses are accommodated in off-airport locations, especially where air transportation plays a relatively minor role in the overall commercial activity of the area. The location of the airport adjacent to Highways 97 and 126 makes it suitable for many of these uses.

AVIATION-ORIENTED BUSINESSES

Roberts Field has played a key role in providing a location for this type of business. These firms generally require direct access to the airfield, although some firms (such as parts suppliers and avionics repair shops) often operate from locations not directly accessible to the airfield. However, through-the-fence operations should not be allowed, and the City should enact an ordinance to prevent such proposals from being considered in the future.

There is also a wide variety of companies that prefer to locate on airports because they have an orientation to aviation through their products, markets, or operations. These include many firms that operate their own aircraft in addition to using commercial air services. Several successful commercial airparks have been developed around the country on airport property.

AVIATION/AEROSPACE MANUFACTURERS

Consolidation of the industry in recent years has created fewer options for aviation/aerospace manufacturers. With the recent resurgence of general aviation aircraft manufacturing, several of these companies have opened new manufacturing plants, although these facilities are frequently located at general aviation airports (not commercial services airports). Typically, these companies will locate in areas with an aviation-oriented labor base. Many manufacturers of specialized parts or components do not require sites on an airport, but their aviation orientation makes a general aviation airport a preferred location.

NON-AVIATION INDUSTRIAL/ COMMERCIAL USES

While the City should give priority consideration in its real estate policy to firms that are aviation- oriented, it should not preclude using their available properties to attract other industrial/commercial activities. Creating strong business activities near the airport will create beneficial effects and a favorable climate for the potential attraction of aviation-related companies.

ROBERTS FIELD BUSINESS CENTER

The City completed a development plan for the Roberts Field Business Center in June 1999. The initial phase of the plan was developed to collect and evaluate data on the 86.11-acre site within the airport area, provide an objective analysis regarding the site, identify suitable uses (including commercial and light industrial), identify cost estimates of infrastructure improvements needed to make the site "market ready," and create a conceptual development plan for the park. A committee was established to oversee the planning study and to make recommendations.

This site is located in the southeastern portion of the City of Redmond along Highway 126 and within the airport property. Access to the site is provided from Highway 97 via Airport Way and Veterans Way. The Juniper Golf Course abuts the site to the west and the U.S.F.S. Redmond Air Center development abuts the site to the east. To the north is Highway 126 and vacant property zoned *Open Space* by the City. The Burlington Northern/Santa Fe main line is located to the west of the golf course, approximately 3,000 feet from the site. Rail service to the business park is not anticipated.

The site is relatively flat and vegetation within the site consists mainly of grasses and sage brush. The site is zoned *General Commercial* by the City of Redmond and it does not lie within the floodplain. Plans for the site development include a policy relating to the development of a Campus Industrial Park, with *Campus Industrial* zoning standards, for new industry in a park-like setting. As depicted on **Exhibit 4G**, commercial/industrial development is recommended for the site with a combination of aviation and non-aviation related development.

Water is provided by the City of Redmond. The site is currently served by a 12-inch main located along Veterans Way. The City's water plan identifies a future 12-inch main extension from the airport to the north. Because of the substantial costs to provide a looped water connection to the north, the initial phase of development should utilize the existing 12-inch main along Veterans Way. Continued development or a large water user will require the extension to the north.

Sanitary sewer collection and treatment is also provided by the City of Redmond. An existing eight-inch gravity main located in Veterans Way currently serves the site, as well as adjacent airport property to the south. The City has indicated that there is about 100,000 gallons per day available capacity from this eight-inch water line. The topography of this site will allow for the extension from the existing sewer to serve about 40-50 percent of the site area. The remainder of the site would need to pump to gravity lines extended from Veterans Way or gravity drain to the north and west. New mains, as proposed by the City's sewer master plan, would have to be constructed north and west to accomplish this.

Stormwater drainage in the area is by infiltration. However, the typical

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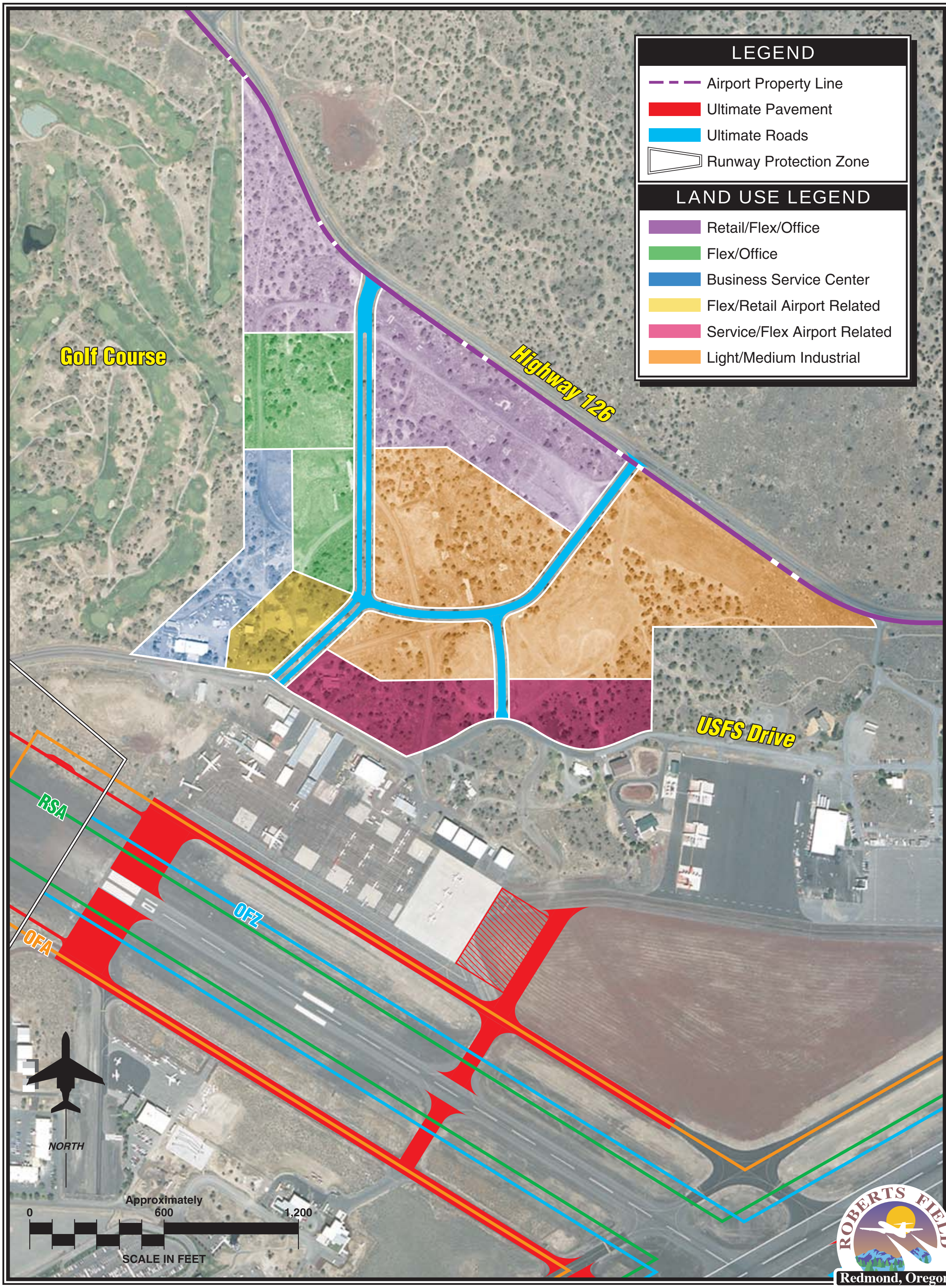


Exhibit 4G
ROBERTS FIELD BUSINESS CENTER

method of infiltration is through drywells and it is anticipated that development of this site will require construction of storm drains and drywells.

Phase II of the Roberts Field Business Center project was completed in May 2000. The purpose of Phase II was to objectively review the possibility of further integrating the adjacent golf course into the development of the business center. Phase II of the project builds on the information and master plan developed in Phase I of the project and focuses on the refinement of the development plan and feasibility of the golf course/business park consolidation.

SUMMARY

The process utilized in assessing airside and landside development alternatives involved an analysis of long-term requirements and growth potential. Current airport design standards were reflected in the analysis of runway and taxiway needs, with consideration given to the safety areas required by the FAA at runway ends. As design standards may change in the future, revisions may need to be made in the plan which could affect future development options.

Upon review of this chapter by the City of Redmond and Citizens Advisory Committee, a final master planning concept will be developed which fulfills the 20-year demands of the planning period. As any good long-range planning tool, it should remain flexible to unique opportunities which may be presented to the airport. The remaining portions of the master plan will be directed towards the refinement of the final concept, the preparation and phasing of a detailed capital improvement program, and an evaluation of funding options currently available to the City of Redmond for implementation of the plan.

Chapter Five
AIRPORT PLANS & LAND USE COMPATIBILITY

ROBERTS FIELD
Redmond, Oregon

AIRPORT PLANS & LAND USE COMPATIBILITY

The airport master planning process for Roberts Field has evolved through the development of forecasts of future demand, facility needs assessments, and the evaluation of airport development alternatives. The planning process has included the development of four working papers, distributed to a Citizens Advisory Committee (CAC) and discussed at coordination meetings held throughout the study process. The coordination of the planning effort has allowed the direct input of each of these representatives into the ongoing planning effort, which has resulted in the development of a master plan concept. The purpose of this chapter is to present the master planning concept in narrative and graphic form. The planning process will include one additional coordination meeting with the CAC. At that time, a draft final master plan report will be prepared and presented to the City of Redmond. Upon approval of the final master plan document, a final technical report will be prepared for the study.

RECOMMENDED MASTER PLAN CONCEPT

The recommended master plan concept, depicted on **Exhibit 5A**, provides for anticipated airside and landside needs over the twenty-year planning period (the aerial photograph used in this exhibit was taken in July 2004). This will allow the facility to meet the growing demands of commercial, air cargo, and general aviation users. While a mid-field area (between the

parallel runways) has been reserved for long-term commercial terminal and related aviation-use areas, it should be recognized that planning studies are underway to provide for an expansion of the existing terminal building which will be reflected in this plan.

AIRFIELD DESIGN STANDARDS

The Federal Aviation Administration (FAA) has established design criteria to define the physical dimensions of runways and taxiways, and the imaginary clearance surfaces surrounding the runway system. The design standards also define the separation criteria for the placement of landside facilities. As discussed earlier in Chapter Three, FAA design criterion is a function of the critical design aircraft or "family" of aircraft which conduct a minimum of 500 or more itinerant operations (landings and takeoffs) each year. The design category is measured by the wingspan of the aircraft, and their approach speed.

As a commercial service airport, Roberts Field must also comply with the requirements of Federal Aviation Regulation (F.A.R.) Part 139, *Certification of Airports*. This regulation prescribes the rules governing the certification and operation of land airports which serve scheduled or unscheduled passenger operations of an air carrier that is conducted with an aircraft having a seating capacity of more than nine passengers. Under F.A.R. Part 139, the airport must complete (and maintain) a certification manual which outlines their compliance under each provision of the regulation. The compliance level required is dependent on the airport's design standards and the size and frequency of the aircraft in scheduled service. The master plan and airport layout drawings provide a means to present this information.

The certification manual contains information on the following topics:

- General Information
- Organization and Management
- Airport Information
- Maintenance and Inspection Program
- Operational Safety
- Hazardous Materials
- Aircraft Rescue and Firefighting
- Snow and Ice Control
- Airport Emergency Plan
- Wildlife Hazard Management
- Maintenance of Certification Manual

The airport will need to continually monitor their compliance with Part 139 in each of the aforementioned areas. The capital program (to be presented in the following chapter) will include items which are necessary to maintain compliance with Part 139 and are reimbursable under the Airport Improvement Program (AIP).

As with many airports, runways, taxiways, and landside development areas are designed to differing design standards. The primary airport runway (4-22) and associated parallel and connecting taxiways are currently designed to airport reference code (ARC) C-IV standards. The crosswind secon-

03MP11-5A-7/21/04

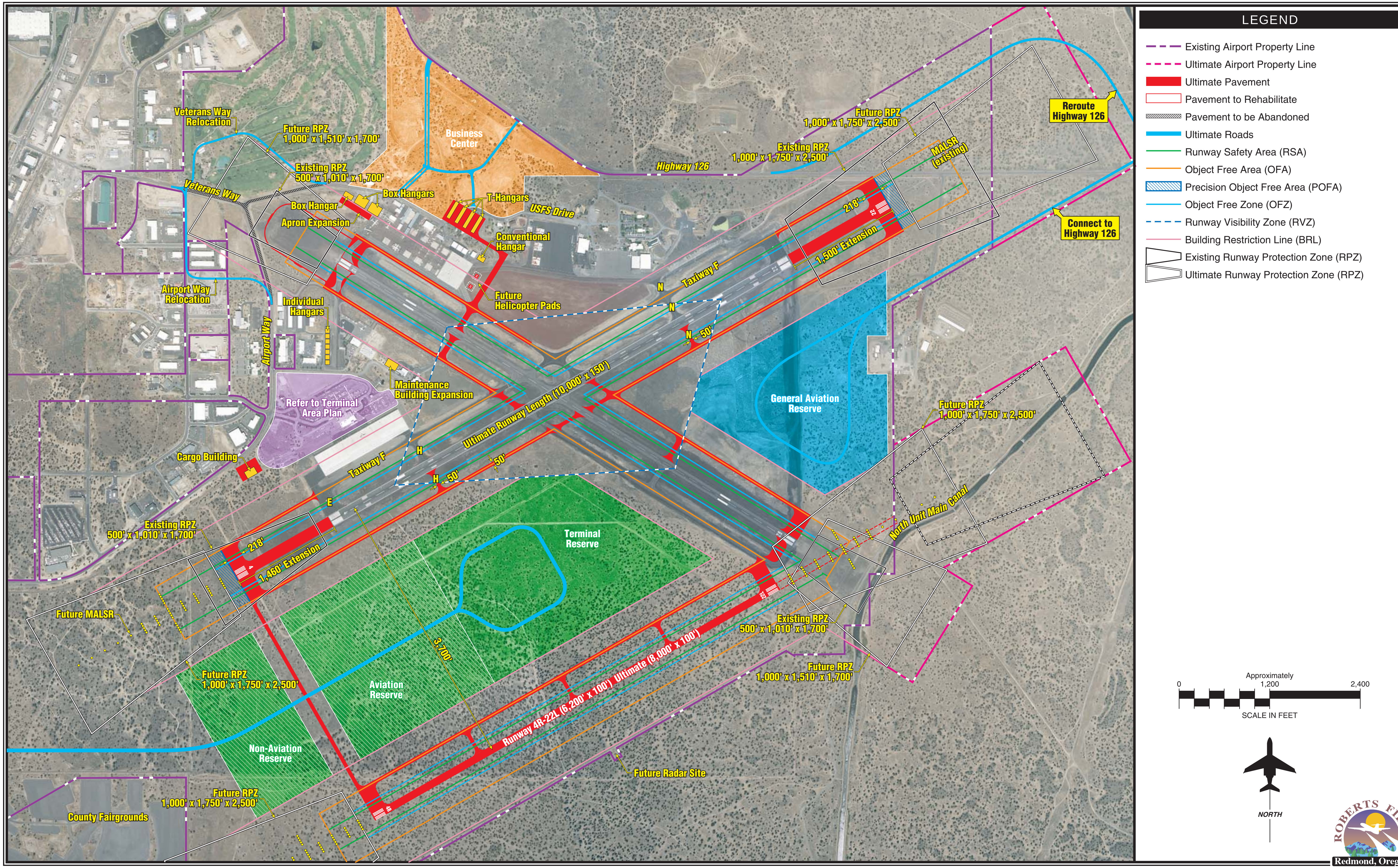


Exhibit 5A
MASTER PLAN CONCEPT

dary runway (10-28) is designed to a B-III standard. The future parallel runway is designed to a C-III standard. While aircraft in higher ARCs may occasionally use the airport, their use is not expected to result in an upgrade to the airport/runway ARC. Air carrier and air cargo areas are designed to airplane design group (ADG) III standards, USFS areas are designed to ADG IV standards, and general aviation areas are generally designed to lesser ADG II standards. Dimensional standards for safety, including runway/taxiway safety areas, runway protection zones, and other general physical planning requirements, have been included as an appendix to this document.

AIRFIELD RECOMMENDATIONS

The recommended master plan concept includes a series of improvements on the airfield to provide additional operational capability and taxiway access to areas which may be developed during the planning period.

Runway extension projects are planned on each end of Runway 4-22, 1,460 feet (southwest) and 1,500 feet (northeast), providing an ultimate length of 10,000 feet. An extension of the runway to the northeast will require the relocation of Highway 126. Runway 4 will ultimately have a precision instrument approach and approach light system. A parallel runway is planned at a separation of 3,700 feet, south of the existing runway. This runway will be 6,200 feet long, with a connecting taxiway to the existing runway. Precision instrument approaches with approach lighting systems have been reflected on each runway approach. All runways will have full-length parallel taxiways added as development dictates their need. A straightening of Taxiway D will improve access onto the north ramp and future hangar areas.

To clear runway protection zones, road realignments have been shown for Veterans Way and Highway 126. Future road extensions have been shown into the mid-field terminal reserve area between the parallel runways and to the east side of the airport property, which will be reserved for future general aviation development.

AIR CARGO RECOMMENDATIONS

Future demand for air cargo transfer and automobile parking will need to be met southwest of the existing terminal area on Airport Way. By constructing a separate building and parking area in this location, air cargo activities can be segregated from the commercial passenger operations. Initially, this is proposed for exclusive use by Horizon Air.

GENERAL AVIATION RECOMMENDATIONS

Individual storage hangars will continue to infill on the west side, adjacent to Taxiway A, while new areas will be created on the north side following the extension of Taxiways C and D. Facilities requiring a larger footprint will be directed to the undeveloped area on the east side of the airfield. However, utilities and roadways will first need to be extended into the area.

LAND USE RECOMMENDATIONS

As an airport facility, a large land area needs to be reserved for airfield operations, landside development, and approach protection. This area must include the runway-taxiway system, critical areas for navaids, runway visibility zones, runway protection zones, and building setbacks. The remaining property may then be designated for specific development categories.

Terminal, aviation, non-aviation, and general aviation areas have been depicted on the plan for each of these specific uses. The general boundaries for the business center have been depicted on the north side of the airport. The USFS operations area consumes the remaining property on the north side not dedicated to general aviation or the business center. The existing terminal area expansion is noted by reference to the terminal area plan for added detail.

LAND USE COMPATIBILITY

Noise contours have been created for existing and future (five-year) conditions. Noise levels are measured in decibels of day-night average sound levels or DNL. This measurement is then translated to contours, which depict the areas within the various DNL levels. Federal Aviation Regulation (FAR) Part 150 provides guidelines for compatible land uses around an airport based upon DNL. These guidelines have been included as **Table 5A**. The Oregon Department of Environmental Quality (DEQ) defines noise-sensitive uses as property normally used for sleeping or used as schools, churches, hospitals, or public libraries. Residential uses usually present the most prevalent noise-sensitive use in a study area. Based upon the noise contours presented on **Exhibits 5B, 5C, and 5D**, existing and future contours of significance (65 DNL and above) remain nearly entirely on airport property. Detailed assumptions used in the derivation of the noise contours have been included as an appendix to this document.

AIRPORT LAYOUT PLAN DRAWINGS

The remainder of this chapter provides a brief description of the airport layout drawings that will be submitted to the FAA for review and approval. These drawings have been prepared to graphically depict the ultimate airport layout, facility development, safety areas, and imaginary surfaces that extend beyond each runway end. The set includes:

- Title Sheet
- Airport Layout Plan
- Airport Layout Data Summaries
- Airport Airspace Drawing (multiple sheets)
- Airport Airspace Profiles

03MP11-5B-9/29/04

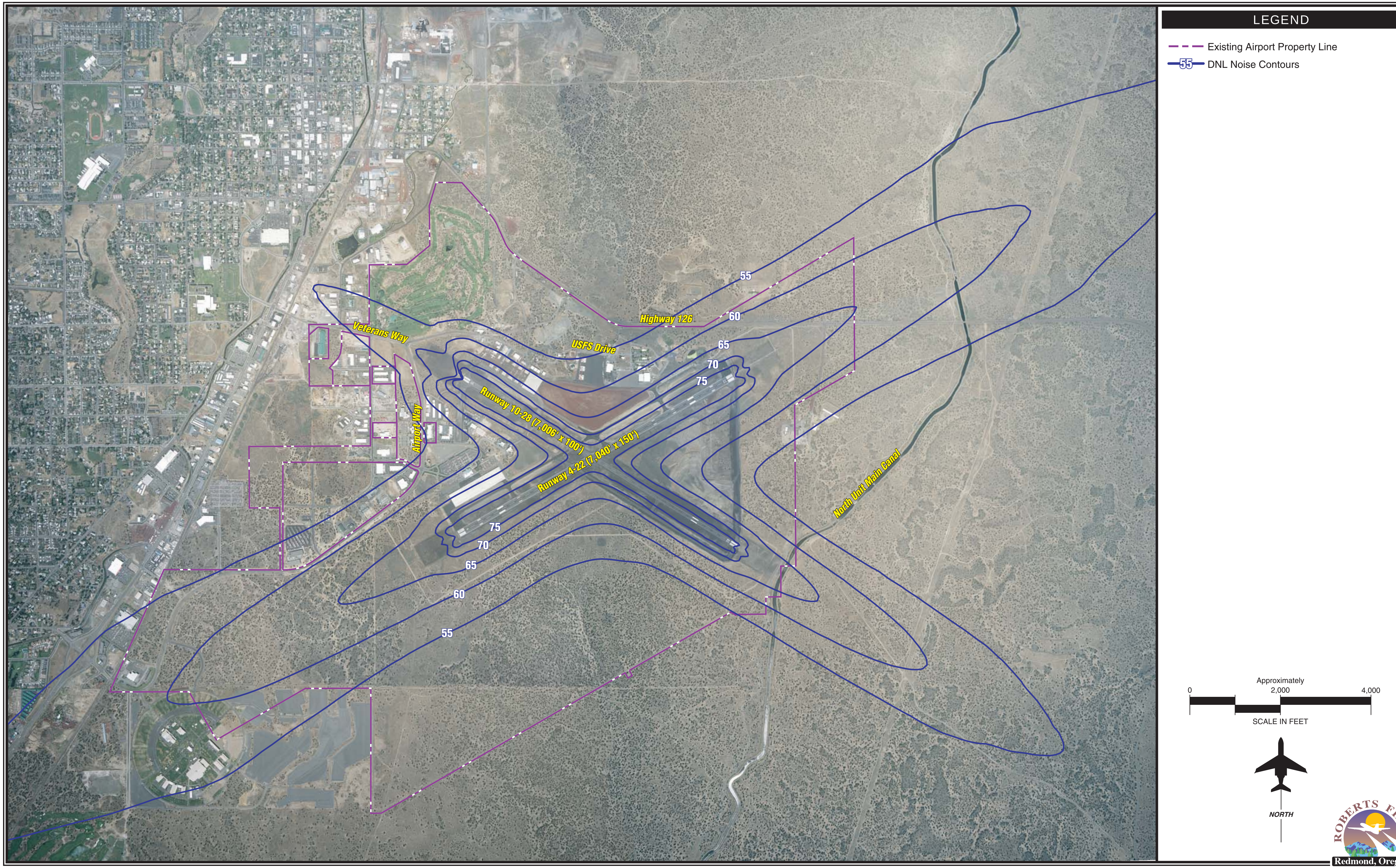


Exhibit 5B
EXISTING NOISE CONTOURS

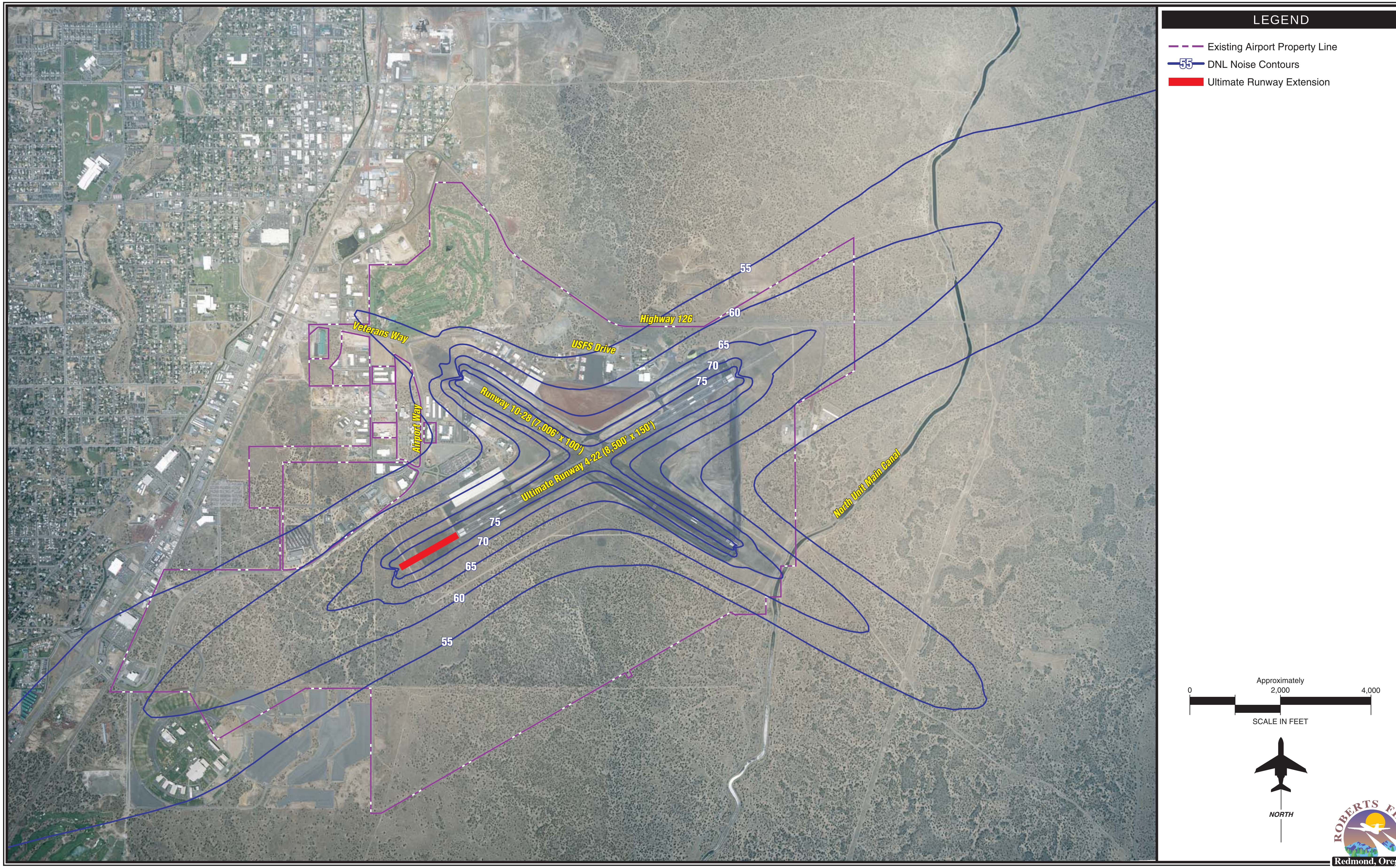


Exhibit 5C
INTERMEDIATE NOISE CONTOURS

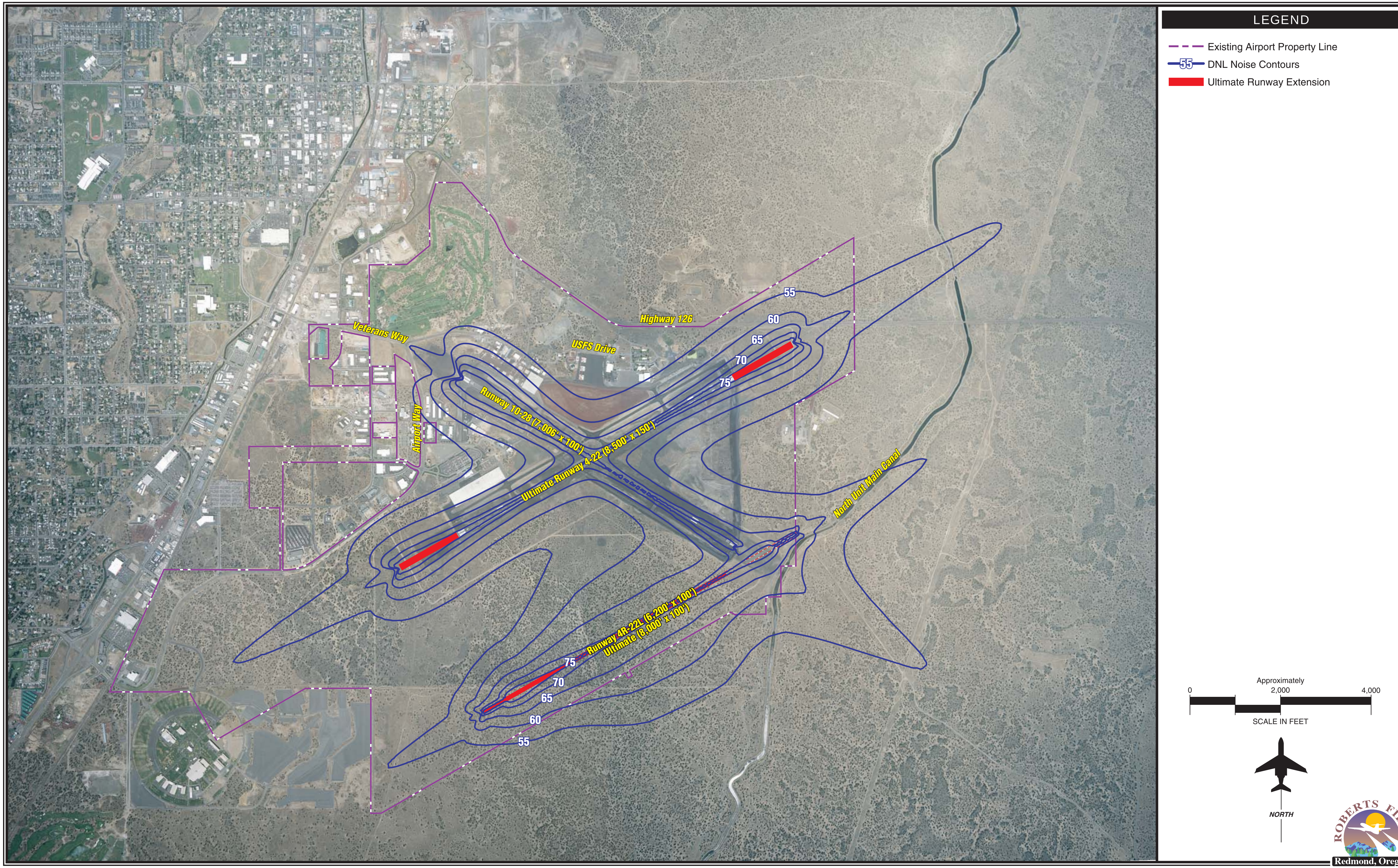


Exhibit 5D
ULTIMATE NOISE CONTOURS

- Inner Portion of the Approach Surface (multiple sheets)
- Terminal Area Plan (multiple sheets)
- Land Use Drawing
- Exhibit A (Property Map) Drawing

The layout drawings are prepared on a computer-aided drafting system (AutoCAD) to allow easier updating and revision. The set provides detailed information on existing and future facilities. The drawings will be submitted to the FAA for approval and must reflect any future development under consideration for potential funding with the Airport Improvement Program (AIP).

TABLE 5A
Federal Part 150 – Land Use Compatibility* Guidelines

	Yearly Day-Night Average Sound Level (DNL) in Decibels					
Land Use	**Below 65**	**65-70**	**70-75**	**75-80**	**80-85**	**Over 85**
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, businesses and Professional	Y	Y	25	30	N	N
Wholesale and retail building materials, hardware and farm Equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N

TABLE 5A (Continued)
Federal Part 150 – Land Use Compatibility* Guidelines

	Yearly Day-Night Average Sound Level (DNL) in Decibels					
Land Use	**Below 65**	**65-70**	**70-75**	**75-80**	**80-85**	**Over 85**
Manufacturing and Production (Continued)						
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arena and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shell, Amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

* The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with local authorities. FAA determinations under Part 150 are not intended to substitute federally-determined land uses for those determined to be appropriate by local authorities in response to locally-determined needs and values in achieving noise compatible land uses.

NOTES

Y (YES) Land Use and related structures compatible without restrictions

N (NO) Land use and related structures are not compatible and should be prohibited

NLR Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure

25, 30, 35 Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure

TABLE 5A (Continued)
Federal Part 150 – Land Use Compatibility* Guidelines

NOTES - (Continued)

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal level is low.
(5) Land use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

Source: Federal Aviation Regulations Part 150, Appendix A, Table 1.

AIRPORT LAYOUT PLAN

The Airport Layout Plan (ALP) graphically presents the existing and ultimate airport layout. Data tables for runway and building information have been included on a separate drawing sheet. The ALP also depicts runway protection zones, property boundaries, building restriction lines, elevation information, wind information, runway and taxiway details, location of navaid equipment, and several tables to identify object penetrations or modifications to FAA standards. This drawing must be approved by the FAA before individual projects shown on the drawing are approved for construction.

AIRPORT AIRSPACE DRAWINGS

To protect the airspace around the airport and approaches to each runway end from hazards that could affect the safe and efficient operation of aircraft arriving and departing the airport, standards contained in 14 CFR, Part 77, *Objects Affecting Navigable Airspace*, have been established for use by local jurisdictions to control the height of objects near the airport. The Airport Airspace Drawings included in the drawing set are a graphical depiction of these regulatory criterions.

The Airspace Drawings assign three-dimensional imaginary surfaces to each runway, each approach, and the area immediately around and above the airport. These imaginary surfaces emanate from the runway centerline and are dimensioned according to visibility minimums associated with each runway approach. These surfaces include the primary surfaces, approach surfaces, transitional surfaces, horizontal surface, and conical surface.

The **primary surface** is an imaginary surface centered on the runway and extending 200 feet beyond the end of each runway. It has the same elevation as the runway at any point along the runway. Each of the runways has primary surfaces 1,000 feet wide.

An **approach surface** is established for each runway. The approach surface begins at the same width as the primary surface, and extends upward and outward for a distance which is based upon the category of the runway approach. For Runways 4L, 22R, 4R, and 22L (each with ILS approaches) the approach surfaces extend 50,000 feet from the edge of the primary surfaces. The approach slope is 50:1 for the first 10,000 feet and 40:1 for the remaining 40,000 feet. Runways 10 and 28 have approach surfaces which extend 10,000 feet from the primary surface at an upward slope of 34:1.

Each runway has a **transitional surface** that begins at the outside edge of the primary surface and approach surfaces. This surface rises at a slope of 7:1 until it intersects with the **horizontal surface** which is established at an elevation 150 feet above the highest runway surface elevation. The outer edges of the horizontal surface connect with the transitional and **conical surfaces** at a distance of 10,000 from the primary surfaces at each runway end. The conical surface begins at the outer edge of the horizontal surface, continuing outward and upward for 4,000 feet at a slope of 20:1.

INNER APPROACH SURFACE AND RUNWAY PROFILE DRAWINGS

The Inner Approach Surface and Runway Profile Drawings are prepared for each runway approach surface and runway end, with details provided on runway protection zones, runway safety areas, object free areas, and obstacle free zones. It is intended to provide enlarged views and detail of the approaches for evaluation of obstructions or potential obstructions.

TERMINAL AREA DRAWINGS

The Terminal Area Drawings provide greater detail of the facilities located between Airport Way and the runway. Details on existing terminal building expansion have not been included; however, drawings have been included in the appendix depicting a two-phase expansion of the existing terminal. It has also been assumed in this plan that additional terminal area will need to be reserved east of Runway 4-

22, for eventual construction of a midfield terminal.

LAND USE DRAWING

The Land Use Drawing is provided in the drawings set to depict future uses of airport property and the current zoning (or land use) of properties outside of existing airport property. Much of this information was included on **Exhibit 5A**, which depicts the master plan concept. The land use categories include: passenger terminal complex, general aviation, air cargo/airline maintenance, industrial/commercial, national guard, U.S. Forest Service, Deschutes County fairgrounds, airfield, open space/park reserve (OS/PR), tourist control (C5), general residential (R4), medium industrial (M2), and light industrial (M1). The plan depicts the ultimate use of the airport property, taking into consideration potential runway-taxiway development, building restriction lines, and potential redevelopment areas. As facilities are proposed on airport property, they will need to be coordinated with the local FAA office.

EXHIBIT A (PROPERTY MAP) DRAWING

The Exhibit A (Property Map) Drawing provides information on land tracts owned (or released) by the City of Redmond. Tract numbers, property interest, acreage, and project number (as applicable) are provided on the drawing. Metes and bounds information is also provided for the airport perimeter, and survey monuments and section corners are noted. This drawing identifies 1,980 acres as currently within the City of Redmond's (airport property) ownership.

SUMMARY

The airport layout drawings and noise contours are designed to assist the City of Redmond and the FAA in decision-making relative to future development. The plan considers anticipated development needs based upon forecasts developed for a 20-year planning period, yet provides flexibility should activity not occur exactly as forecast. Areas have been reserved for terminal, general aviation, and air cargo facilities which exceed the expectations of this 20-year plan. The airspace drawings will need to be accepted by the City of Redmond as part of the master plan, and may be used by Deschutes County for updates to the Airport Safety (AS) Combining Zone Ordinance (Title 18-County Zoning). This will help to ensure land use compatibility and restrict the heights of future structures which could pose a hazard to air navigation.

In the following chapter, airport development schedules will be established based upon the operational requirements of the recommended airport concept. Potential funding sources will be identified to provide for an analysis of airport funding requirements.

AIRPORT LAYOUT PLAN

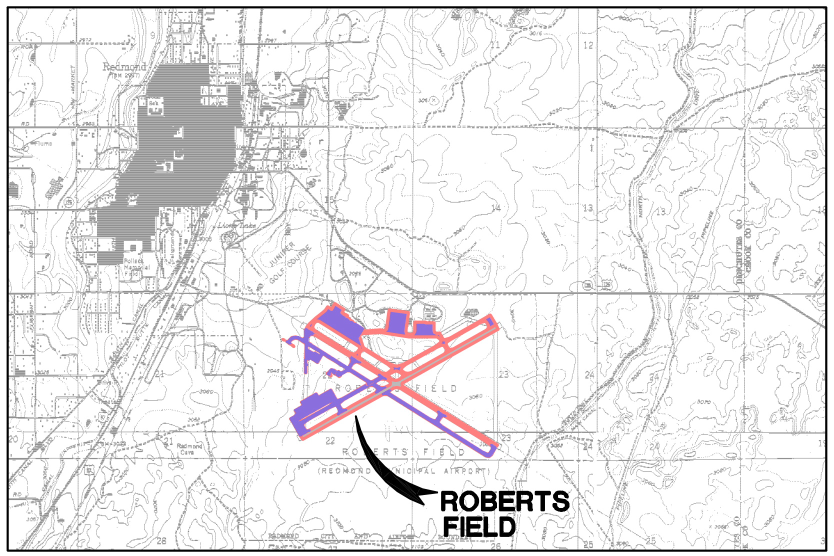
AT

ROBERTS FIELD

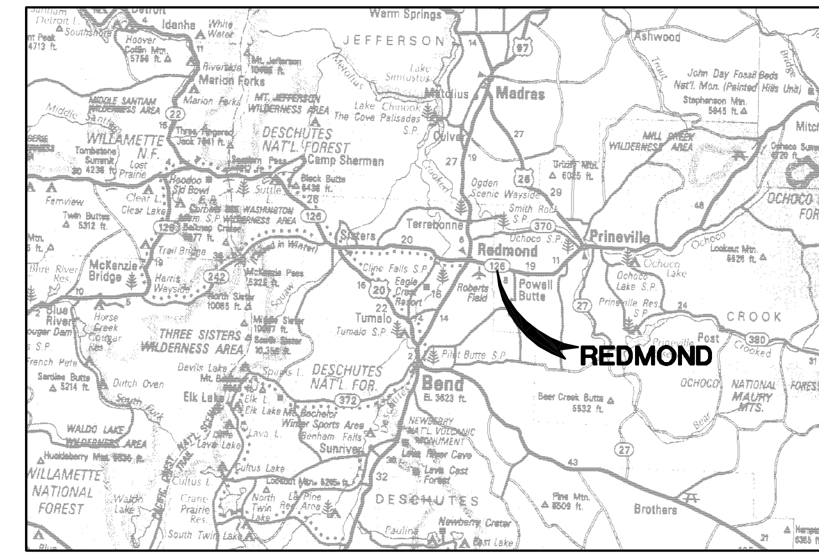
CITY OF REDMOND

DESCHUTES COUNTY , OREGON

REDMOND, OREGON



VICINITY MAP



LOCATION MAP

The preparation of this document may have been supported, in part, through the Airport Improvement Program financial assistance from the Federal Aviation Administration (Project Number 3-41-0052-23) as provided under Title 49, United States Code, section 47104. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.

SUBMITTED FOR FINAL APPROVAL MAY 2005.

REVISIONS

BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT

REDMOND, OREGON

TITLE SHEET

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS
SCIENTISTS
SURVEYORS
PLANNERS
SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

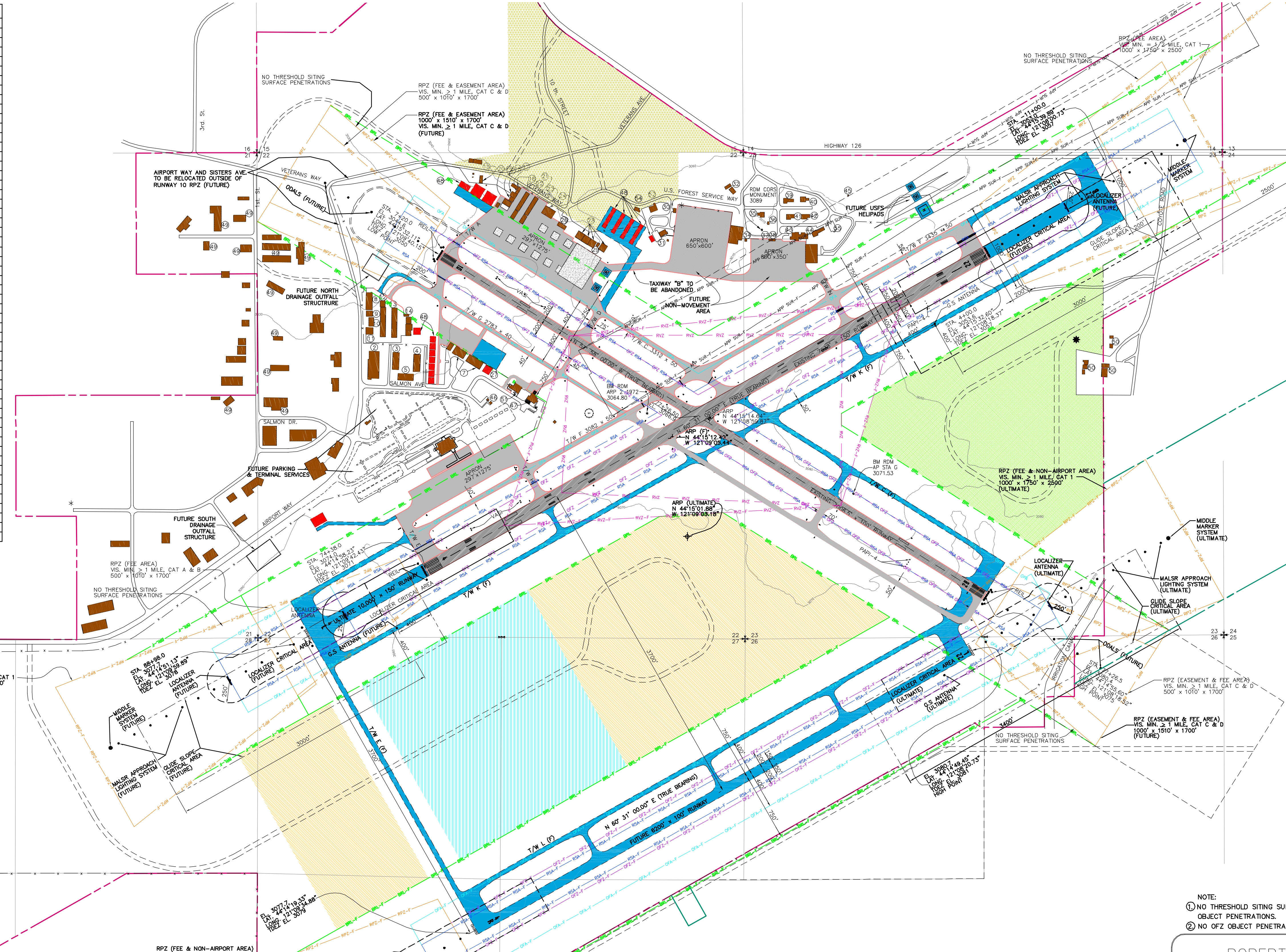
DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: MARCH 1998
Q. A.
PEER REVIEW______

PROJECT NUMBER
2953.001-010-0113

SHEET NUMBER
1

D:\CAD\project\redmond alp\alp-april-05\1-cover.dwg May/11/2005

BUILDINGS		[TOP ELEVATION]
1	TERMINAL BUILDING	[3103]
2	LANCAIR	[3064]
3	INDUSTRIAL BUILDING	[3049]
4	INDUSTRIAL BUILDING	[3052]
5	INDUSTRIAL BUILDING	[3052]
6	REDMOND AIR	[3067]
7	REDMOND AIR	[3074]
8	REDMOND AIR	[3051]
9	HANGAR	[3050]
10	HANGAR	[3049]
11	HANGAR	[3048]
12	T-HANGARS	[3045]
13	T-HANGARS	[3044]
14	HANGAR	[3052]
15	PUBLIC WORKS DEPARTMENT	[3061]
16	HANGAR	[3061]
17	HANGAR	[3067]
18	HANGAR	[3072]
19	HANGAR	[3068]
20	BUTLER AIRCRAFT	[3070]
21	T-HANGARS	[3063]
22	HANGAR	[3069]
23	T-HANGARS	[3063]
24	HANGAR	[3070]
25	BUTLER AIRCRAFT	[3088]
26	BUTLER AIRCRAFT	[3075]
27	FUTURE HANGAR	(FUTURE)
28	HANGARS	[3072]
29	AIRFIELD LIGHTING BUILDING	[3064]
30	FOREST SERVICE	[3092]
31	AIR TANKER BASE	[3078]
32	FOREST SERVICE	[3084]
33	FOREST SERVICE CASHE BLDG.	[3088]
34	STORAGE SHED	[3080]
35	U.S. FOREST SERVICE AIR CENTER	[3086]
36	BUILDING	[3083]
37	WELL PUMP HOUSE	[3083]
38	STORAGE BUILDING	[3083]
39	U.S. FOREST SERVICE AIR CENTER	[3090]
40	U.S. FOREST SERVICE AIR CENTER	[3091]
41	U.S. FOREST SERVICE AIR CENTER	[3092]
42	U.S. FOREST SERVICE AIR CENTER	[3092]
43	FOREST SERVICE	[3097]
44	FOREST SERVICE	[3117]
45	BUILDING	[3100]
46	AIR TRAFFIC CONTROL TOWER	[3100]
47	AIRPORT RESCUE & FIRE FIGHTING	[3083]
48	FUTURE HANGARS	(FUTURE)
49	AIRPORT INDUSTRIAL PARK BUILDINGS	
50	NATIONAL GUARD BUILDINGS	
51	SNOW EQUIP. & MAINT. STORAGE	[3082]
52	WAREHOUSE	
53	USFS HANGAR	[3095]
54	SMOKEY HALL	
55	FOREST SERVICE OFFICE BUILDING	[3095]



LEGEND		
EXISTING	FUTURE	
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT PROPERTY LINE
		AIRPORT PROPERTY EASEMENT
		SECURITY FENCE — BARBED WIRE (BW)
		RUNWAY THRESHOLD LIGHTS
VASI	PAPI	NAVIGATIONAL AID INSTALLATION
		REIL
		SURVEY MONUMENTS
		AIRPORT ROTATING BEACON
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		BUILDINGS
		ROAD
		GROUND CONTOURS
		AIRCRAFT PAVEMENT
		RUNWAY PROTECTION ZONE (RPZ)
		BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		RUNWAY VISIBILITY ZONE (RVS)

HATCH PATTERN LEGEND
PASSENGER TERMINAL COMPLEX
GENERAL AVIATION
AIR CARGO/AIRLINE MAINTENANCE
RUNWAYS
TAXIWAYS AND APRONS
FUTURE DEVELOPMENT
BUSINESS CENTER

MAG. DEC. 15°35' E MAY 2004

(182.88) 600 — 0 — (182.88) 600 — (365.76) 1200

SCALE IN FEET (METERS)

NO.	DESCRIPTION	DATE	BY:
1	CONSTRUCTION OF ARFF FACILITY	1/14/99	BJD
2	CONSTRUCTION OF USFS HANGAR	11/22/02	CRK
3	CONSTRUCTION OF SRE FACILITY	11/22/02	CRK
4	CONSTRUCTION OF AIR CARRIER RAMP	11/22/02	CRK
5	CONSTRUCTION OF TAXIWAY E, F, H, K, & N	11/22/02	CRK
6	CONSTRUCTION OF FOREST SERVICE OFFICE BLDG	10/20/03	BJD
7	ALP UPDATE	2/05	BJD

REVISIONS

NOTE:
1. NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS.
2. NO OFZ OBJECT PENETRATIONS.

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FAA APPROVAL

The contents of this plan do not necessarily reflect the official views or policy of the FAA. Acceptance of this document by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted herein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.

MODIFICATIONS TO STANDARD (APPROVAL DATE)
NONE

APPROVAL — DATE

SPONSOR

ROBERTS FIELD AIRPORT

REDMOND, OREGON

AIRPORT LAYOUT PLAN

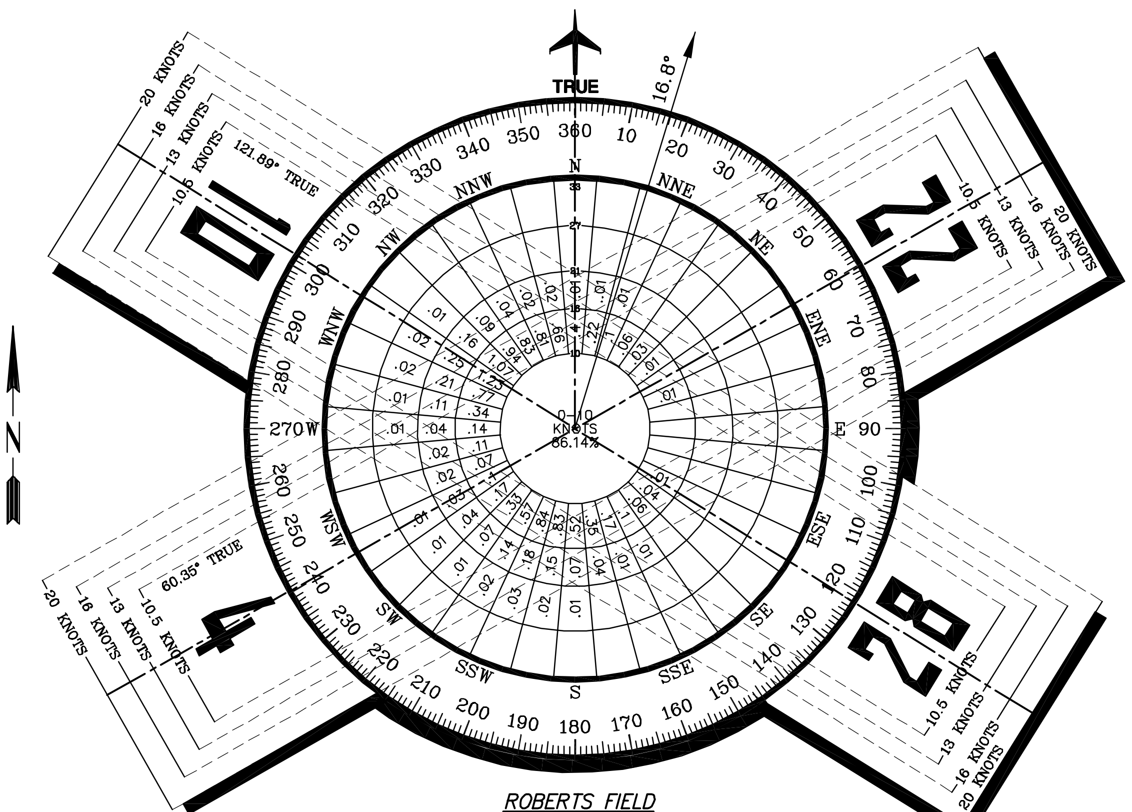
DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: MARCH 1998
Q. A.
PEER REVIEW

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS
SCIENTISTS
SURVEYORS
PLANNERS
SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

PROJECT NUMBER
2143.029-050-0113

SHEET NUMBER
2

ALL WEATHER WIND ROSE



ROBERTS FIELD

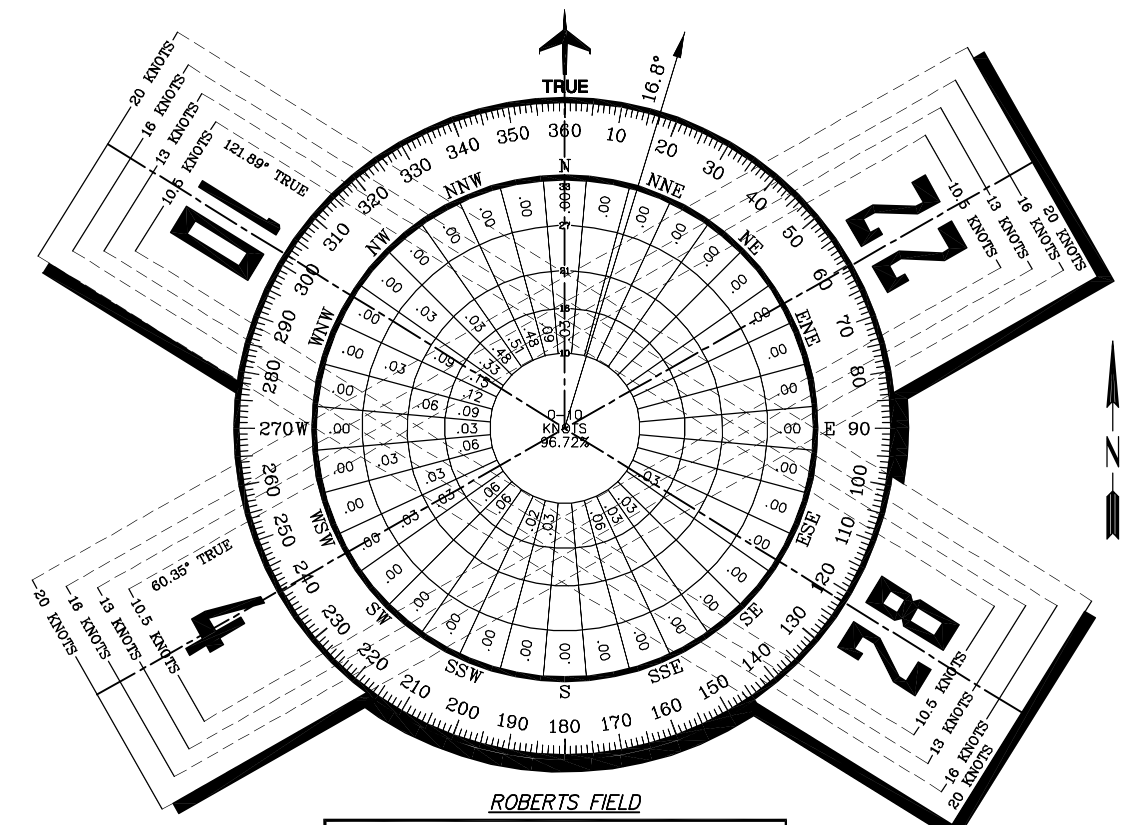
ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots Crosswind	13 Knots Crosswind	16 Knots Crosswind	20 Knots Crosswind
4–22	90.90%	96.24%	99.07%	99.88%
10–28	94.73%	97.09%	99.13%	99.78%
4–22 & 10–28	97.58%	99.40%	99.88%	99.98%

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Roberts Field
Redmond, Oregon

OBSERVATIONS:
82,232 All Weather Observations
1993–2002

IFR WIND ROSE

(Ceiling–200 ft.plus, 1000 ft.minus,visibility–1/2 mi.plus, 3 mi.minus)



ROBERTS FIELD

IFR WIND COVERAGE				
Runways	10.5 Knots Crosswind	13 Knots Crosswind	16 Knots Crosswind	20 Knots Crosswind
4–22	97.54%	98.54%	99.73%	99.93%
10–28	99.53%	99.72%	99.92%	99.98%
4–22 & 10–28	99.89%	99.99%	100.0%	100.0%

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Roberts Field
Redmond, Oregon

OBSERVATIONS:
3,346 IFR Observations
1993–2002

RUNWAY DATA

RUNWAY DATA	RUNWAY 4–22		RWY 4R–22L	RUNWAY 10–28	
	EXISTING	FUTURE	ULTIMATE	EXISTING	FUTURE
APPROACH VISIBILITY MINIMUMS	RW4: ≥ 1 MI. RW22: = 1/2 MI.	RW4L: SAME RW22R: SAME	RW4R: ≥ 1 MI. RW22L: ≥ 1 MI.	RW10: ≥ 1 MI. RW28: ≥ 1 MI.	RW10: SAME RW28: SAME
FAR PART 77 APPROACH SLOPE	RW4: 20:1 RW22: 50:1	RW4L: 50:1 RW22R: SAME	RW4R: 50:1 RW22L: 50:1	RW10: 34:1 RW28: 34:1	RW10: SAME RW28: SAME
RUNWAY DIMENSIONS	150' X 7038'	150' X 10,000'	100' X 6200'	100' X 7006.5'	SAME
PAVEMENT MATERIAL	ASPHALT	SAME		ASPHALT	SAME
PAVEMENT STRENGTH (1000 LBS) SINGLE (S) DUAL(D) DUAL TANDUM(DT)	S 68 D 110 DT 200	SAME SAME SAME	S 68 D 110 DT 200	S 28 D 40	SAME SAME
RUNWAY LIGHTING	HIRL	SAME	HIRL	MIRL	SAME
RUNWAY MARKING	PREC. INSTR.	SAME	PREC. INSTR.	NON–PRECISION	SAME
EFFECTIVE RUNWAY GRADIENT/MAX (in %)	0.29 %	0.28 %	0.30 %	0.51 %	SAME
MEETS LINE OF SITE REQUIREMENTS	YES	SAME	YES	YES	SAME
PERCENT WIND COVERAGE	95.2% (13 knots)	SAME	95.2% (13 knots)	97.2% (13 knots)	SAME
VISUAL APPROACH AIDS	RW4: REIL, VASI–4 RW22: MALSR, PAPI–4	RW4L: MALSR RW22R: SAME	RW4R: PAPI–4 RW22L: PAPI	RW10: REIL, VASI–4 RW28: REIL, PAPI–4	RW10: OLALS RW28: ODALS
INSTRUMENT APPROACH AIDS	VOR/DME, NDB RW22: ILS	RW4L: ILS RW22R: SAME	RW4R: ILS RW22L: ILS	RW10: GPS RW28: GPS	SAME SAME
AIRPORT REFERENCE CODE	C–III	C–IV	C–IV	B–III	SAME
RUNWAY SAFETY AREA (RSA)	500' x 9038'	500' x 10,700'	500' x 8900'	400' x 8206.5'	SAME
OBJECT FREE AREA (OFA)	800' x 9038'	800' x 10,700'	800' x 8100'	800' x 8206.5'	SAME
OBSTACLE FREE ZONE * (OFZ)	400' x 7439'	400' X 9100'	400' X 7300'	400' x 7406.5'	SAME
RUNWAY END COORDINATES (NAD 83)	RW4 44°14'58.23" 121°09'42.43" RW22 44°15'32.60" 121°08'18.37"	RW4L 44°14'51.13" 121°09'59.89" RW22R 44°15'39.89" 121°08'00.43"	RW4R 44°14'19.33" 121°09'34.88" RW22L 44°14'49.45" 121°08'20.73"	RW10 44°15'32.11" 121°09'40.15" RW28 44°14'55.60" 121°08'18.52"	SAME SAME
RUNWAY ELEVATIONS (FEET) (NAVD 88) * NO OFZ OBJECT PENETRATIONS.	RW4 3073.95 RW22 3053.55 RW4 TDZE 3071 RW22 TDZE 3057	RW4L 3077.65 RW 22R 3053.0 RW4L TDZE 3078 SAME	RW4R 3077.66 RW22L 3080.66 RW4R TDZE 3080 RW22L TDZE 3079	RW10 3044.35 RW28 3080.36 RW10 TDZE 3050 RW28 TDZE 3075	SAME SAME SAME SAME
	RW HIGH 3066.90	SAME	RW HIGH 3080.66	RW HIGH 3080.36	SAME
	RW LOW 3053.55	SAME	RW LOW 3077.66	RW LOW 3044.35	SAME
	RUNWAY INTERSECTIONS RW 4–22 AND RW 10–28 EL. 3066.90				

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CRITICAL AIRCRAFT

	RUNWAY 4–22(L & R)		RUNWAY 10–28	
	EXISTING	FUTURE	EXISTING	FUTURE
WING SPAN	DASH 8	C–130	DASH 8	DASH 8
APPROACH SPEED	BUSINESS JETS	C–130	BUSINESS JETS	BUSINESS JETS
WEIGHT	DC–7	C–130	DASH 8	G–IV

TAXIWAY DATA

	WIDTH (DESIGN GRP.)		PAVEMENT STRENGTH	
	EXISTING	FUTURE	EXISTING	FUTURE
T/W "B"	75'(II)	75'(II)	75S; 95D; 145DT	SAME
T/W "C"	50'(II)	50'(II)	30S; 45D; 65DT	SAME
T/W "D"(T/W "C" TO R/W 10–28)	75'(II)	75'(II)	30S; 45D; 65DT	SAME
T/W "D"(T/W "G" TO R/W 10–28)	40'(II)	40'(II)	30S; 45D; 65DT	SAME
T/W "E"	75'(II)	75'(II)	30S; 45D; 65DT	SAME
T/W "F"	50'(II)	50'(II)	30S; 45D; 65DT	SAME
T/W "G"	50'(II)	75'(II)	30S; 45D; 65DT	SAME
T/W "G"(T/W "E" TO R/W 4–22)	40'(II)	40'(II)	30S; 45D; 65DT	SAME
T/W "H"	50'(II)	50'(II)	30S; 45D; 65DT	SAME
T/W "J"(T/W "G" TO R/W 10–28)	70'(II)	70'(II)	30S; 45D; 65DT	SAME

NOTE: ALL TAXIWAY SAFETY AREAS ARE 200' WIDE.
ALL TAXIWAYS ARE LIGHTED AND MARKED

FAR PART 77 RUNWAY CATEGORIES

RUNWAY NO.	DESCRIPTION
RUNWAY 4	VISUAL(AIR CARRIER)
RUNWAY 22	PRECISION INSTRUMENT APPROACH
RUNWAY 10	VISUAL
RUNWAY 28	VISUAL

NOTE: BUILDING RESTRICTION LINE (BRL) BASED ON 35 FT. ELEVATION GAIN ABOVE THE PRIMARY SURFACE. A 500' WIDE PRIMARY SURFACE IS REQUIRED FOR RUNWAY 10–28 AND A FUTURE 1000' WIDE PRIMARY SURFACE IS REQUIRED FOR RUNWAY 4L–22R AND 4R–22L.

DECLARED DISTANCES

	RUNWAY 4–22	RUNWAY 4L–22R	RUNWAY 10–28	RUNWAY 4R–22L
	EXISTING	FUTURE	EXISTING	FUTURE
TAKEOFF RUN AVAILABLE (TORA)	7038	8700	7006.5	6900
TAKEOFF DISTANCE AVAILABLE (TODA)	7038	8700	7006.5	6900
ACCELERATE–STOP DISTANCE AVAILABLE (ASDA)	7038	8700	7006.5	6900
LANDING DISTANCE AVAILABLE (LDA)	7038	8700	7006.5	6900

AIRPORT DATA

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (NAVD 88)	3080.65	SAME	SAME
AIRPORT REF. POINT (ARP) COORDINATES (NAD 83)	44°15'14.64" 121°08'59.87"	44°15'14.83" 121°08'59.82"	44°15'04.02" 121°08'59.28"
MEAN MAX.TEMP.OF HOTTEST MONTH	85°	SAME	SAME
COMBINED WIND COVERAGE	100%	SAME	SAME
MAGNETIC VARIATION (2004)	16° 54' E	SAME	SAME
AIRPORT REFERENCE CODE (ARC)	R/W 4–22 C III R/W 10–28 B III	R/W 4–22 C IV SAME	R/W 4–22 C IV SAME
NPIAS SERVICE LEVEL	COMMERCIAL	SAME	SAME
TAXIWAY LIGHTING (B,C,D,E,F, & G)	MITL	SAME	SAME
TAXIWAY MARKING	CENTER LINE HOLD	SAME	SAME
AIRPORT AND TERMINAL NAVIGATIONAL AIDS	BEACON WIND CONE SEGMENTED CIRCLE VOR/DME NDB ILS (RW22) GPS–10 GPS–28	ILS (RW 4L)	ILS (RW 4R) ILS (RW 22L)

REVISIONS			
BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

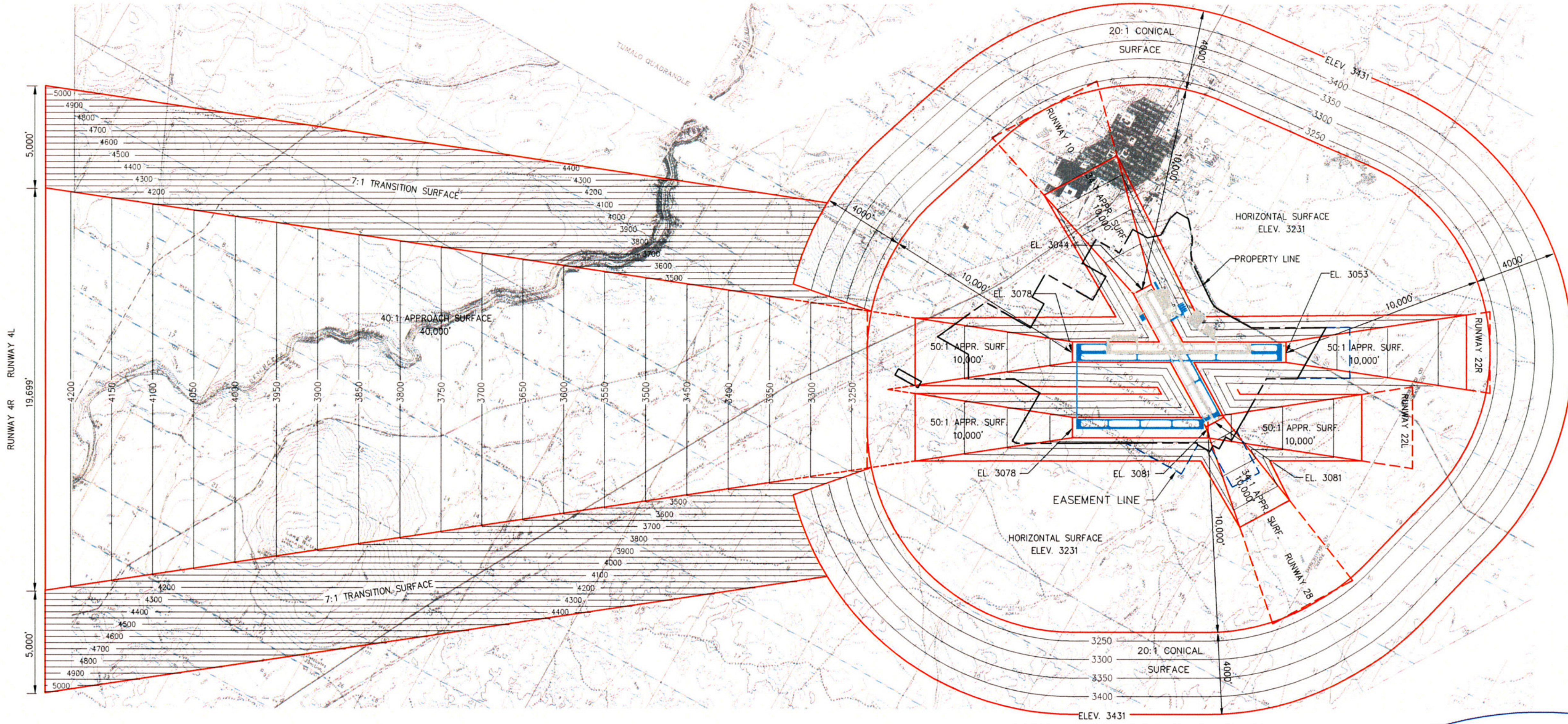
DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

ROBERTS FIELD AIRPORT
REDMOND, OREGON

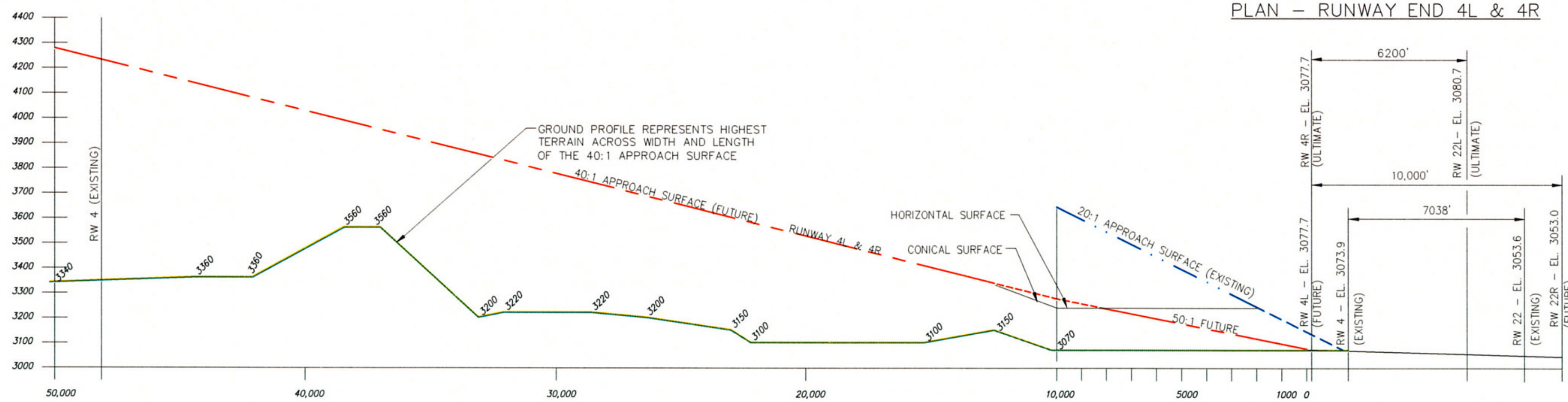
AIRPORT LAYOUT DATA SUMMARIES

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS
SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

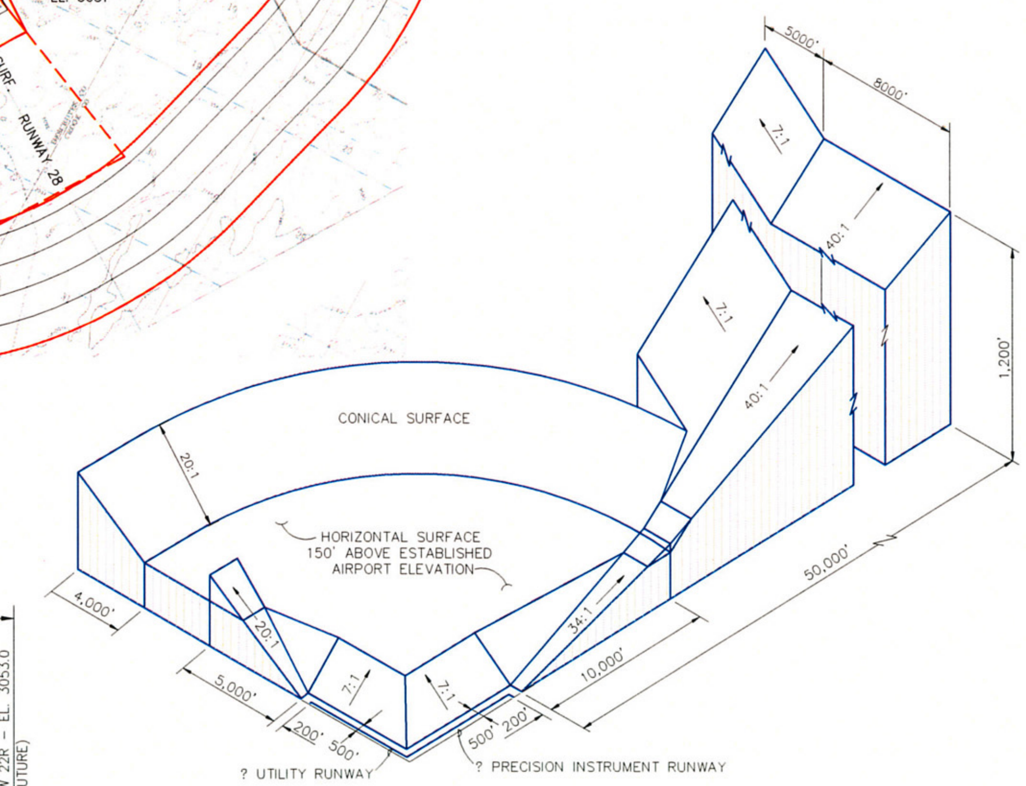
PROJECT NUMBER
2953.001–010–0113
SHEET NUMBER
3



PLAN – RUNWAY END 4L & 4R



PROFILE – RUNWAY END 4L & 4R



TYPICAL CIVIL AIRPORT IMAGINARY SURFACES

NOT TO SCALE

NOTES:

THE OBSTRUCTION INFORMATION, SHOWN IN THE TABLES ABOVE, WAS TAKEN FROM THE OBSTRUCTION DATA SHEET 345, ROBERTS FIELD, REDMOND, OREGON, DIGITIZED FROM OC 345, SURVEYED MARCH 1993, 9th EDITION.

FIFTEEN FEET ADDED TO NONINTERSTATE ROAD ELEVATIONS.
SEVENTEEN FEET ADDED TO INTERSTATE ROAD ELEVATIONS.
TWENTY-THREE FEET ADDED TO RAILROAD TRACK ELEVATIONS.
TRANSITIONAL SURFACE SLOPES ARE 7:1 UNLESS OTHERWISE INDICATED
OBSTRUCTING AREA LIMITS ARE APPROXIMATE.

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MAG. DEC. 16°54' E.

3000 (914.4) 0 3000(914.4) 6000 (1828.8)
SCALE IN FEET (METERS)

GENERAL NOTES
1. SEE SHEET NO. 6 FOR PLAN AND PROFILES.
2. SEE SHEET NO. 6 FOR OBSTRUCTION TABLES.

REVISIONS

BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT

REDMOND, OREGON

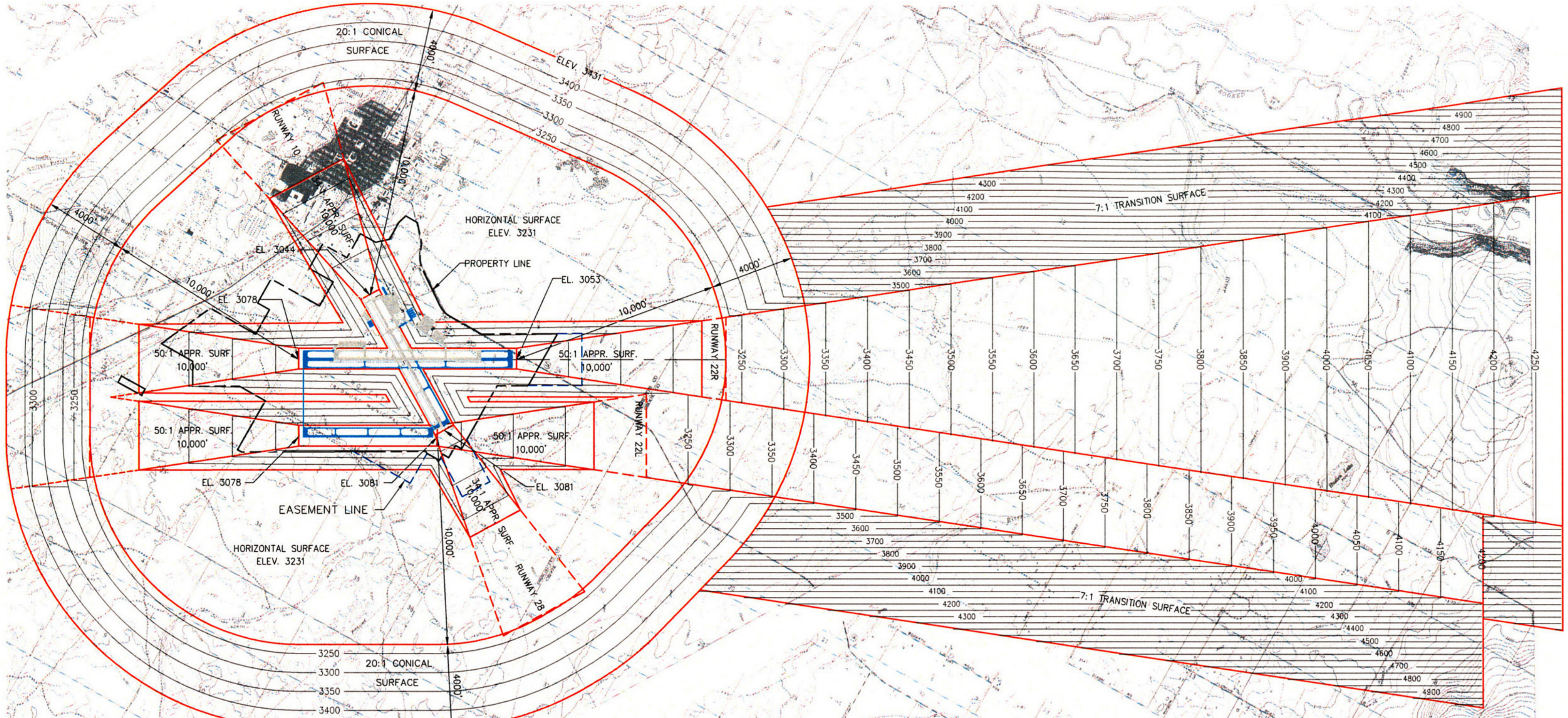
AIRPORT AIRSPACE DRAWING
RUNWAY END 4L & 4R

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

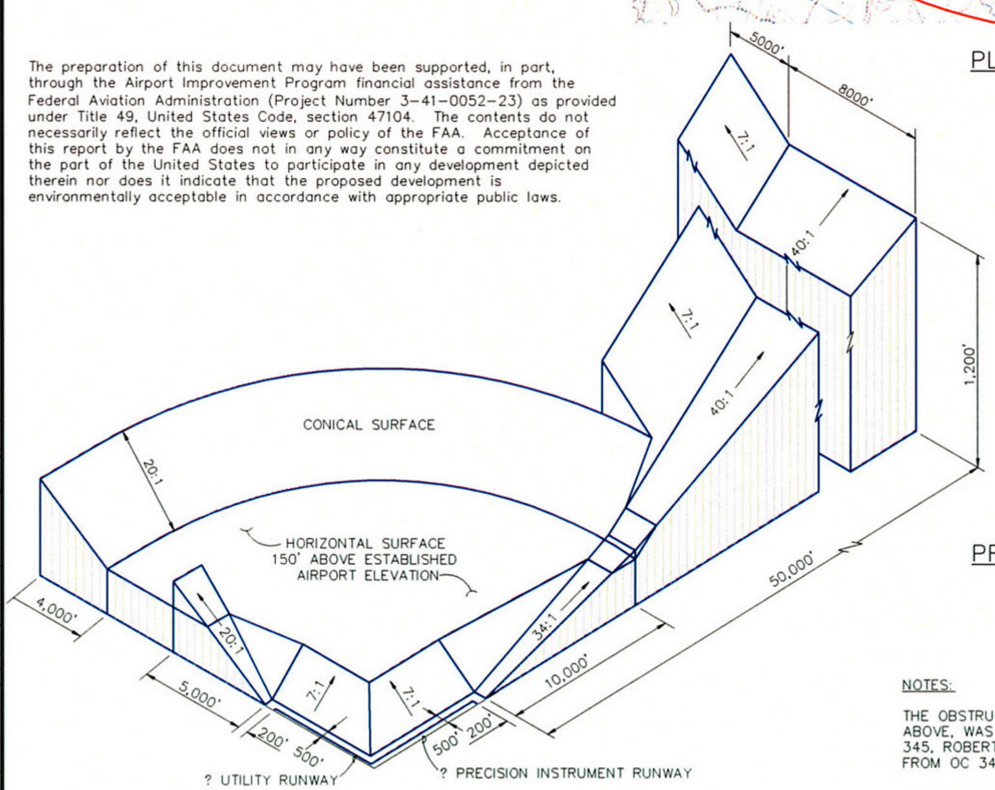
DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

PROJECT NUMBER 2953.001-010-0113

SHEET NUMBER 4



PLAN – RUNWAY END 22R & 22L



TYPICAL CIVIL AIRPORT IMAGINARY SURFACES
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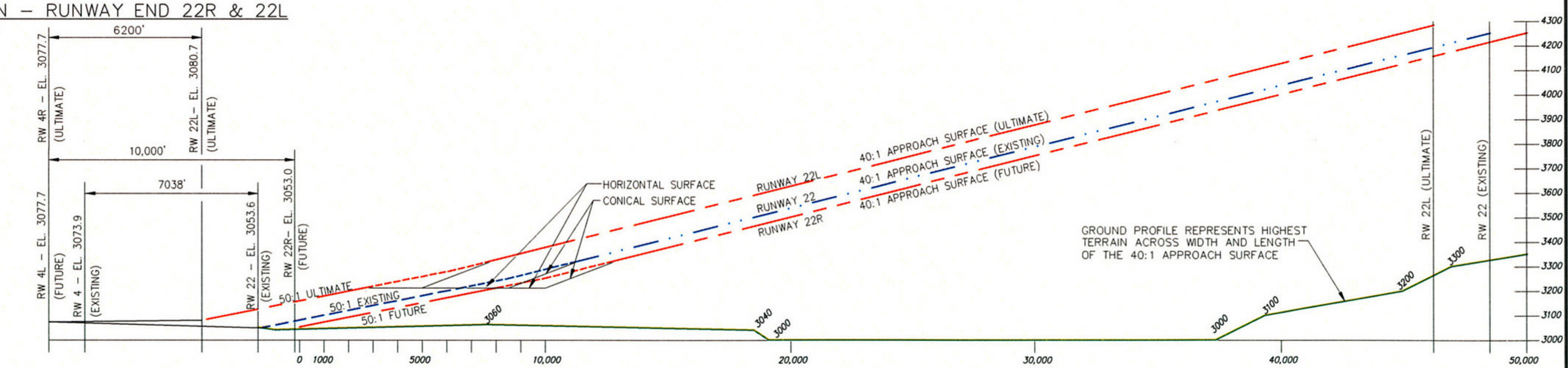
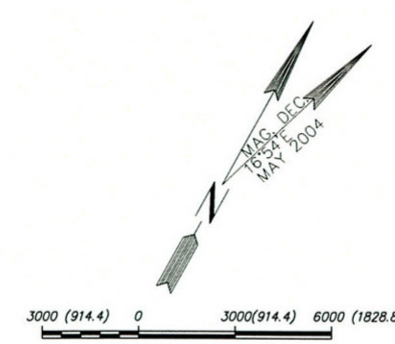


PROFILE – RUNWAY END 22R & 22L



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GENERAL NOTES

1. SEE SHEET NO. 6 FOR PLAN AND PROFILES.
2. SEE SHEET NO. 6 FOR OBSTRUCTION TABLES.

REVISIONS

BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT
REDMOND, OREGON

AIRPORT AIRSPACE DRAWING
RUNWAY END 22R & 22L

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS
SCIENTISTS
SURVEYORS
PLANNERS
SINCE 1945
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PROJECT NUMBER
2953.001-010-0113

SHEET NUMBER
5

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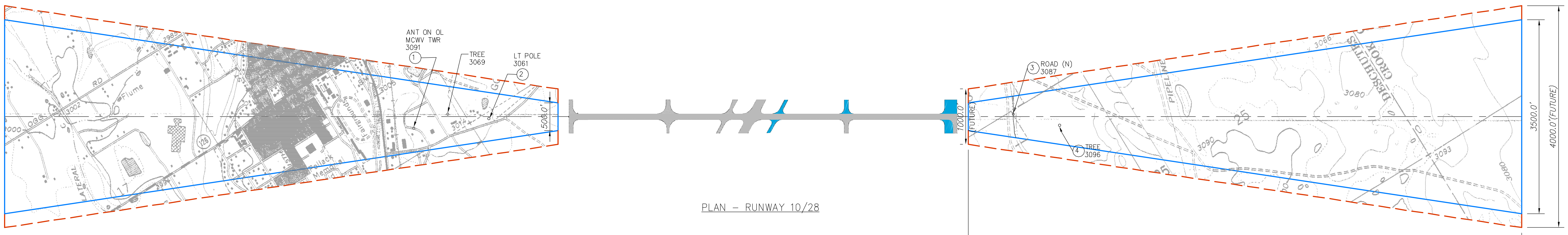
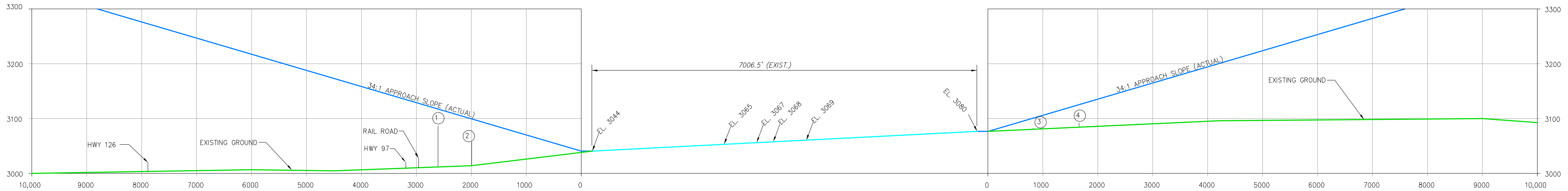
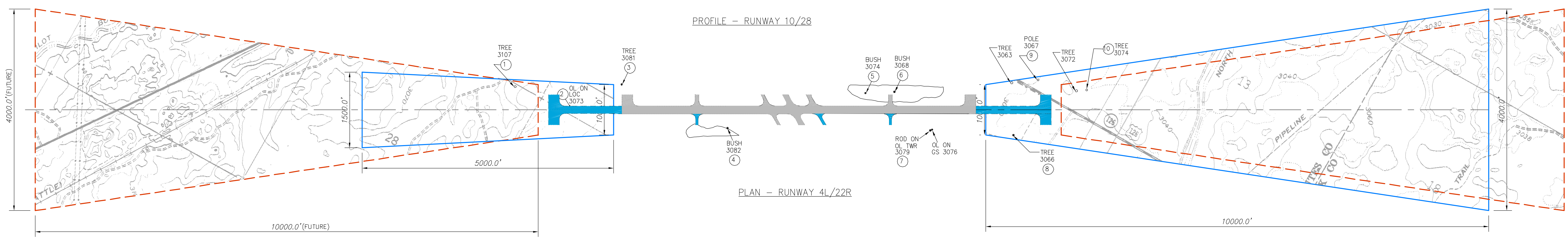


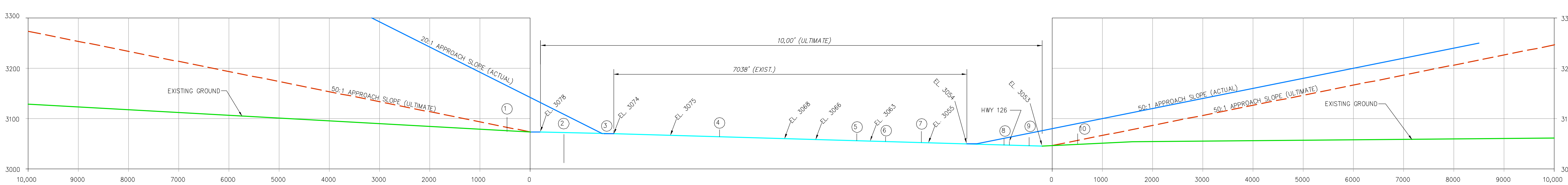
PLAN – RUNWAY 10/28



PROFILE – RUNWAY 10/28



PLAN – RUNWAY 4L/22R



PROFILE – RUNWAY 4L/22R

OBSTRUCTIONS – RUNWAY 4/22				
NO.	DESCRIPTION	SURFACE	PENETRATION	DISPOSITION
1	TREE	APPROACH	−3 FEET	NONE
2	OL ON LOC	APPROACH	−5 FEET	NONE
3	TREE	PRIMARY	7 FEET	NONE
4	BUSH	TRANSITION	14 FEET	NONE
5	BUSH	TRANSITION	14 FEET	NONE
6	BUSH	TRANSITION	9 FEET	NONE
7	ROD ON OL TWR	PRIMARY	22 FEET	NONE
8	TREE	APPROACH	0 FEET	NONE
9	POLE	APPROACH	−7 FEET	NONE
10	TREE	APPROACH	−20 FEET	NONE

OBSTRUCTIONS – RUNWAY 10/28				
NO.	DESCRIPTION	SURFACE	PENETRATION	DISPOSITION
1	ANT ON OL MCWV TWR	APPROACH	−30 FEET	NONE
2	LT POLE	APPROACH	−42 FEET	NONE
3	ROAD (N)	APPROACH	−18 FEET	NONE
4	TREE	APPROACH	−33 FEET	NONE

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MAG. DEC. 15°54'E MAY 2004

1000 0 1000 2000
SCALE IN FEET

• OBSTRUCTION
∘ NOT OBSTRUCTION

REVISIONS			
BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT
REDMOND, OREGON

AIRPORT AIRSPACE PROFILES
RUNWAY 10/28 & 4L/22R

MORRISON MAIERLE, INC.
An Employee–Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442–3050

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

PROJECT NUMBER 2953.001–010–0113
SHEET NUMBER 6

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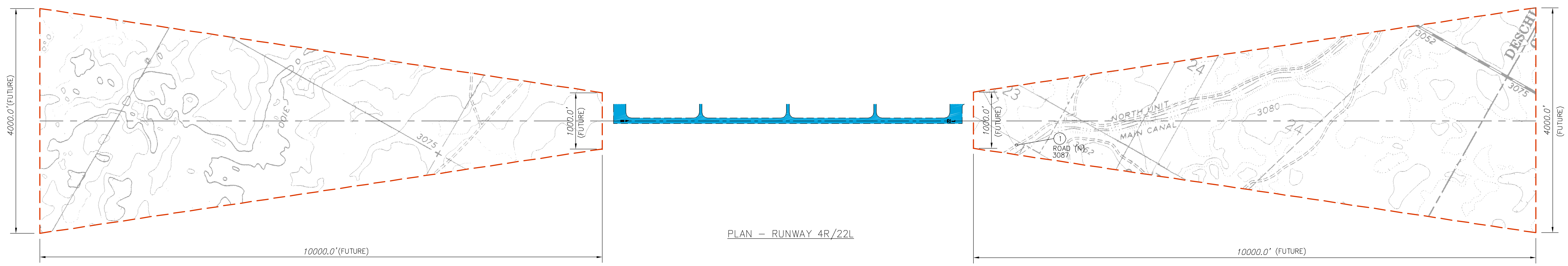
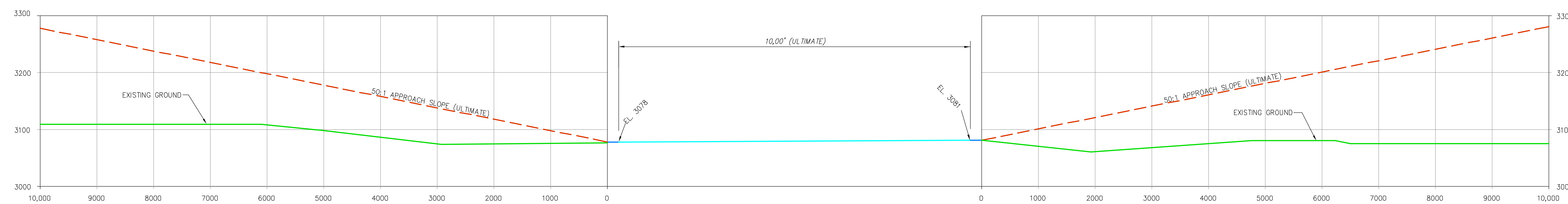


PLAN – RUNWAY 4R/22L



PROFILE – RUNWAY 4R/22L

OBSTRUCTIONS – RUNWAY 4R/22L				
NO.	DESCRIPTION	SURFACE	PENETRATION	DISPOSITION
1	ROAD (N)	APPROACH	−18 FEET	NONE

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MAG. DEC. 15°54'E MAY 2004

1000 0 1000 2000
SCALE IN FEET

• OBSTRUCTION
○ NOT OBSTRUCTION

REVISIONS			
BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT

REDMOND, OREGON

AIRPORT AIRSPACE PROFILES
RUNWAY 4R/22L

MORRISON MAIERLE, INC.
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P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

DRAWN BY: BJD
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APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW______

PROJECT NUMBER
2953.001-010-0113

SHEET NUMBER
7

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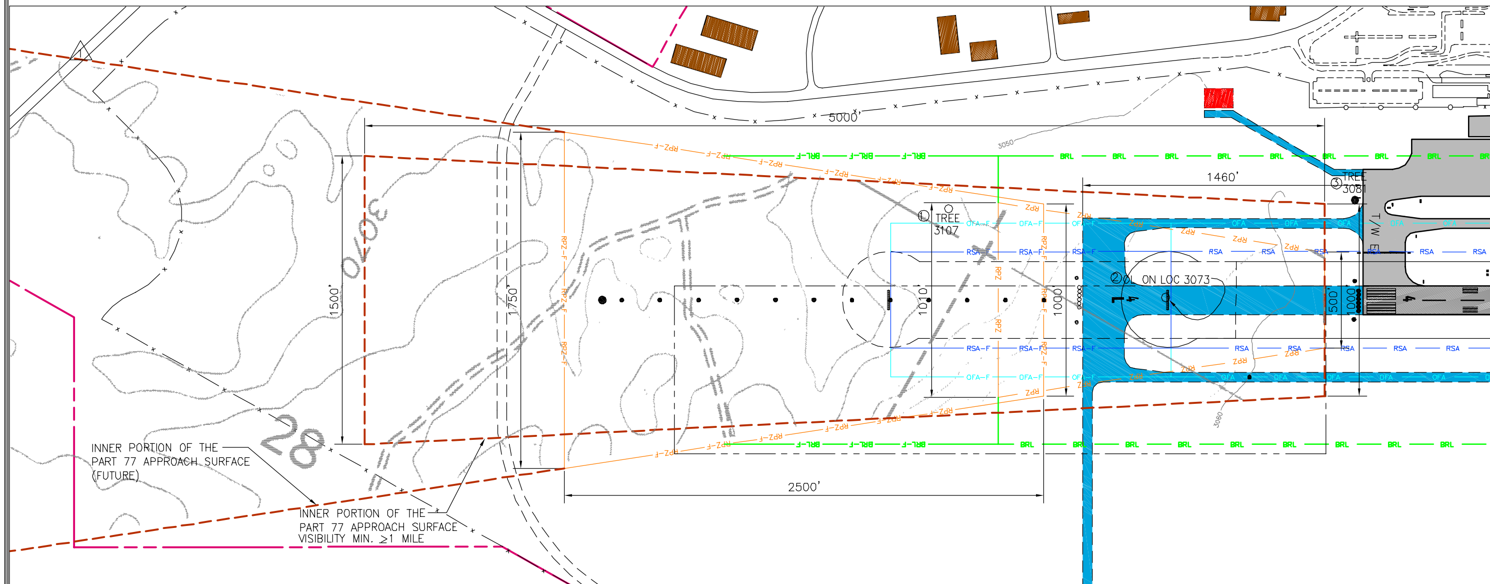
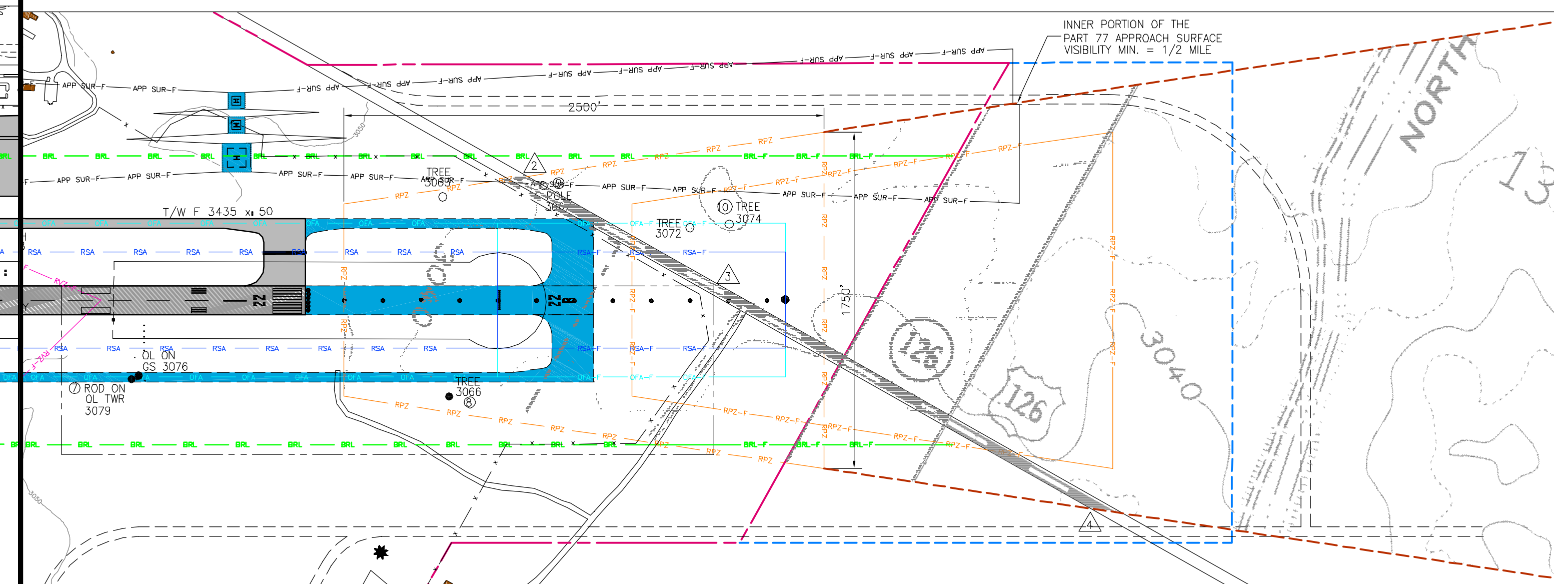
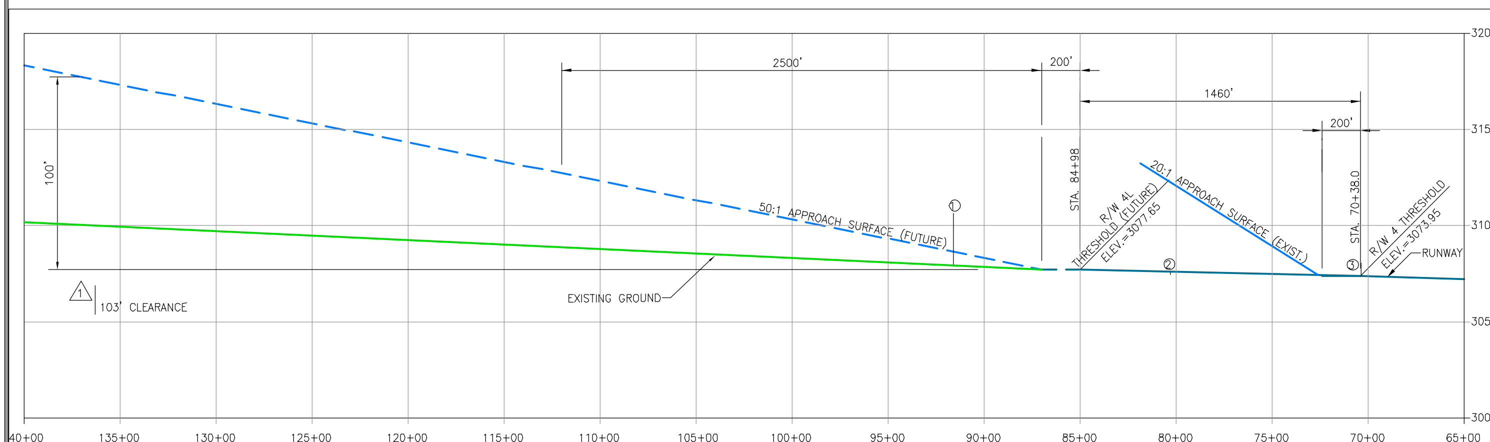


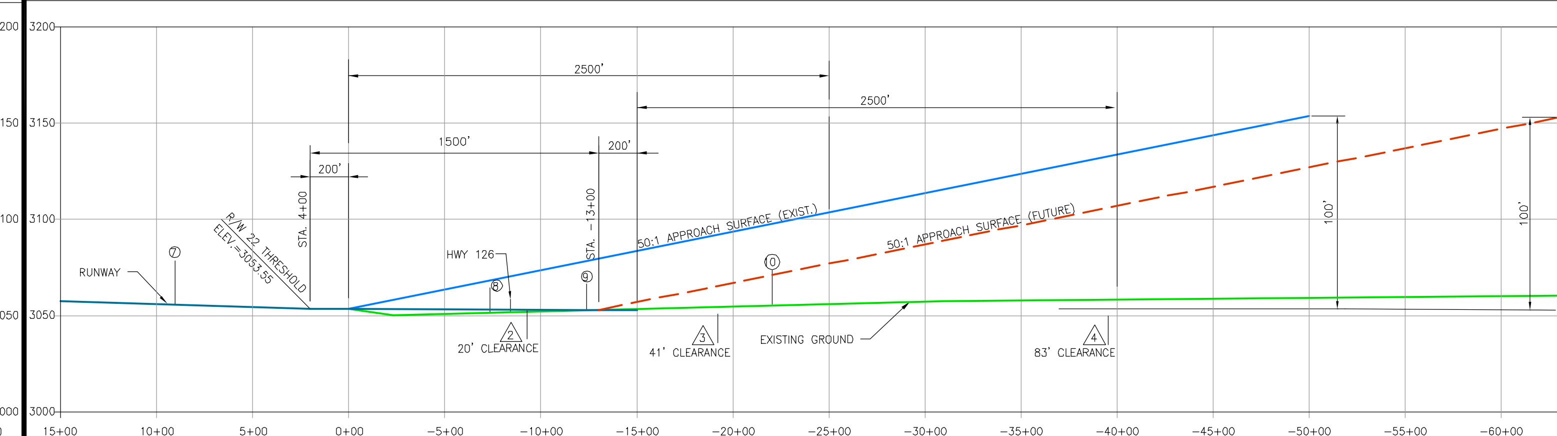
PLAN – RUNWAY 4L



PLAN – RUNWAY 22R



PROFILE – RUNWAY 4L



PROFILE – RUNWAY 22R

ROAD ELEVATIONS

1 3069±
2 3063±
3 3061±
4 3050±

LEGEND		
EXISTING	FUTURE	
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT PROPERTY LINE
		AIRPORT PROPERTY EASEMENT
		SECURITY FENCE —— BARBED WIRE (BW)
		RUNWAY THRESHOLD LIGHTS
VASI	PAPI	NAVIGATIONAL AID INSTALLATION
		REIL
		AIRPORT ROTATING BEACON
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		BUILDINGS
		ROAD
3860		GROUND CONTOURS
		AIRCRAFT PAVEMENT
RPZ	RPZ-F	RUNWAY PROTECTION ZONE (RPZ)
BRL	BRL-F	BUILDING RESTRICTION LINE (BRL)
OFA	OFA-F	OBJECT FREE AREA (OFA)
RSA	RSA-F	RUNWAY SAFETY AREA (RSA)

OBSTRUCTIONS – RUNWAY 4/22

NO.	DESCRIPTION	SURFACE	PENETRATION	DISPOSITION
1	TREE	APPROACH	−3 FEET	NONE
2	OL ON LOC	APPROACH	−5 FEET	NONE
3	TREE	PRIMARY	7 FEET	NONE
7	ROD ON OL TWR	PRIMARY	22 FEET	NONE
8	TREE	APPROACH	0 FEET	NONE
9	POLE	APPROACH	−7 FEET	NONE
10	TREE	APPROACH	−20 FEET	NONE

• OBSTRUCTION
○ NOT OBSTRUCTION

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HATCH PATTERN LEGEND	
	RUNWAYS
	TAXIWAYS AND APRONS
	FUTURE DEVELOPMENT

NOTES:

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FIFTEEN FEET ADDED TO NONINTERSTATE ROAD ELEVATIONS.
SEVENTEEN FEET ADDED TO INTERSTATE ROAD ELEVATIONS.
TWENTY–THREE FEET ADDED TO RAILROAD TRACK ELEVATIONS.
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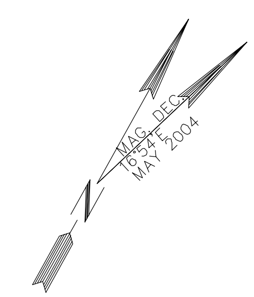
OBSTRUCTING AREA LIMITS ARE APPROXIMATE.



500 (152.4) 0 500 (152.4) 1000 (304.8)
SCALE IN FEET (METERS)

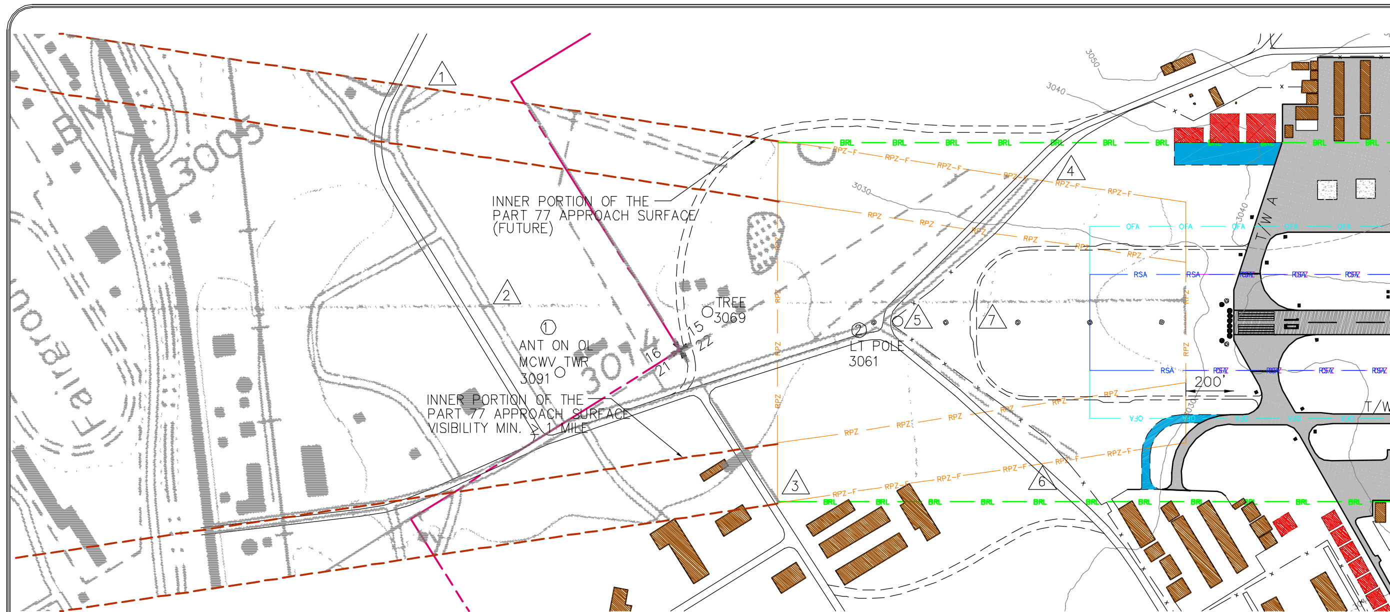
REVISIONS			
BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT
REDMOND, RUNWAY 4L/22R OREGON
INNER PORTION OF THE APPROACH SURFACE

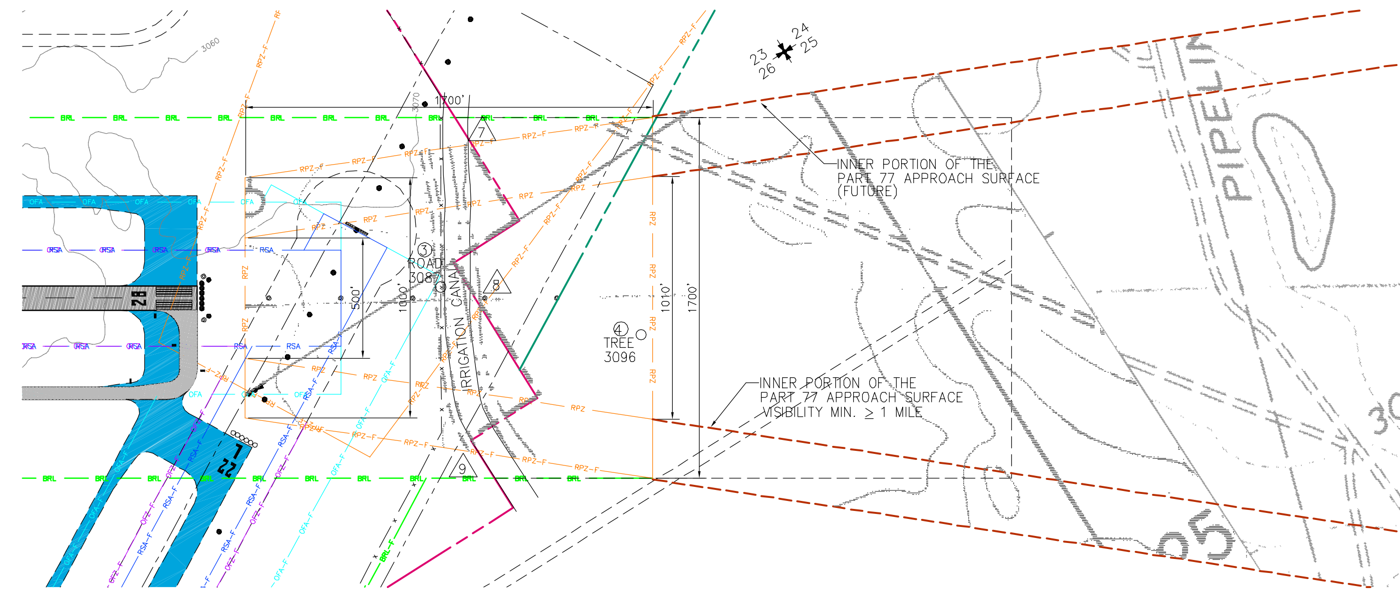
DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

MORRISON MAIERLE, INC.
An Employee–Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442–3050

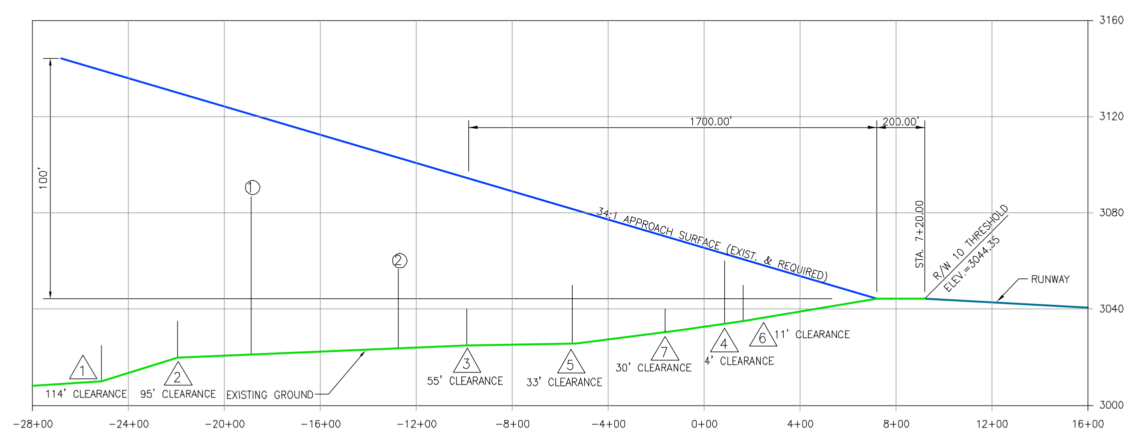
PROJECT NUMBER 2953.001–010–0113
SHEET NUMBER 8



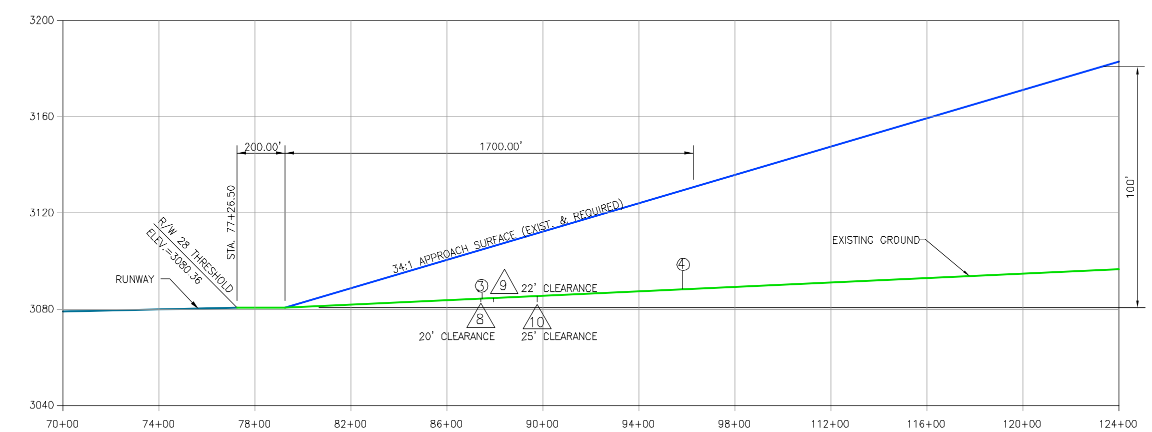
PLAN – RUNWAY 10



PLAN – RUNWAY 28



PROFILE – RUNWAY 10



PROFILE – RUNWAY 28

MAG. DEC. 16°54' E MAY 2004

LEGEND		
EXISTING	FUTURE	
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT PROPERTY LINE
		AIRPORT PROPERTY EASEMENT
		SECURITY FENCE —— BARBED WIRE (BW)
		RUNWAY THRESHOLD LIGHTS
VASI	PAPI	NAVIGATIONAL AID INSTALLATION
		REIL
		AIRPORT ROTATING BEACON
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		BUILDINGS
		ROAD
		GROUND CONTOURS
		AIRCRAFT PAVEMENT
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
OFA	OFA	OBJECT FREE AREA (OFA)
RSA	RSA	RUNWAY SAFETY AREA (RSA)

HATCH PATTERN LEGEND	
	RUNWAYS
	TAXIWAYS AND APRONS
	FUTURE DEVELOPMENT

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OBSTRUCTIONS – RUNWAY 10/28

NO.	DESCRIPTION	SURFACE	PENETRATION	DISPOSITION
1	ANT ON OL MCWV TWR	APPROACH	–30 FEET	NONE
2	LT POLE	APPROACH	–42 FEET	NONE
3	ROAD (N)	APPROACH	–18 FEET	NONE
4	TREE	APPROACH	–33 FEET	NONE

• OBSTRUCTION
○ NOT OBSTRUCTION

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ROAD ELEVATIONS

1 3025±	4 3060±
2 3035±	5 3050±
3 3040±	6 3050±
	7 3040±

IRRIGATION CANAL ELEVATIONS

8 3083±	10 3083±
9 3083±	

400 (121.9) 0 400 (121.9) 800 (243.8)
SCALE IN FEET (METERS)

REVISIONS

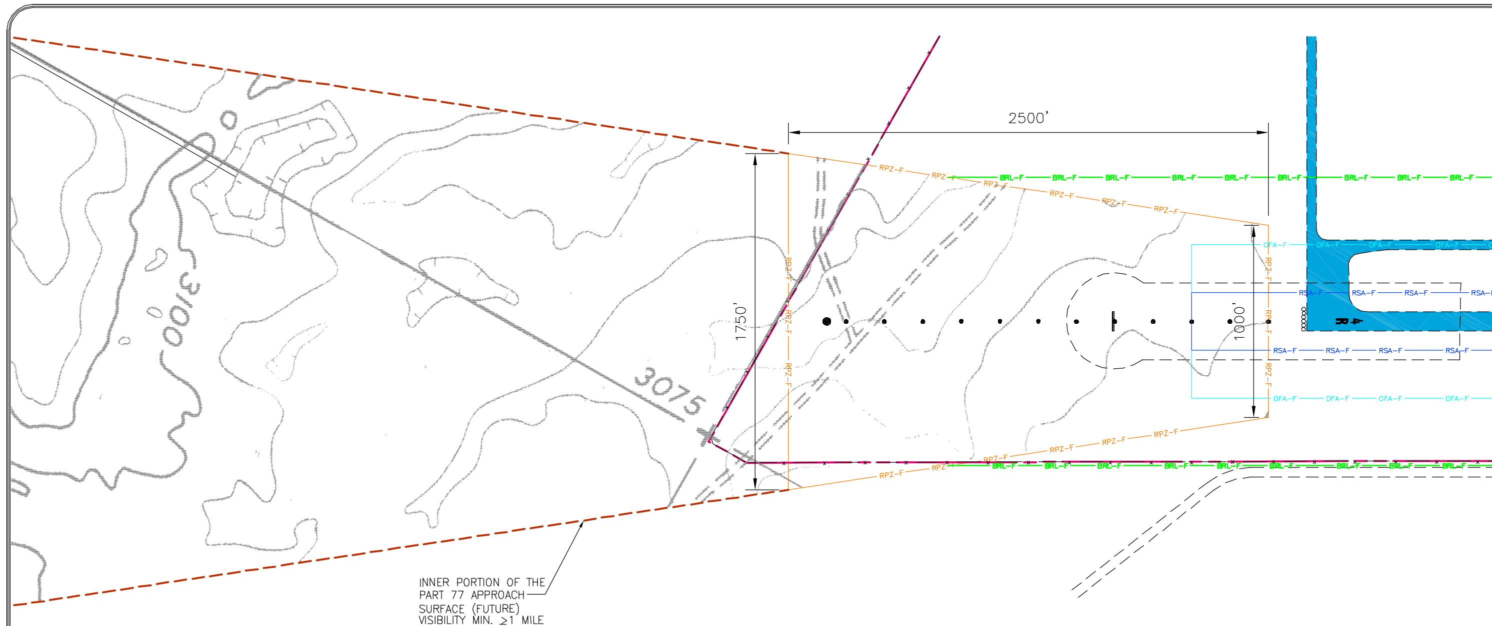
BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT
REDMOND, RUNWAY 10/28 OREGON
INNER PORTION OF THE APPROACH SURFACE

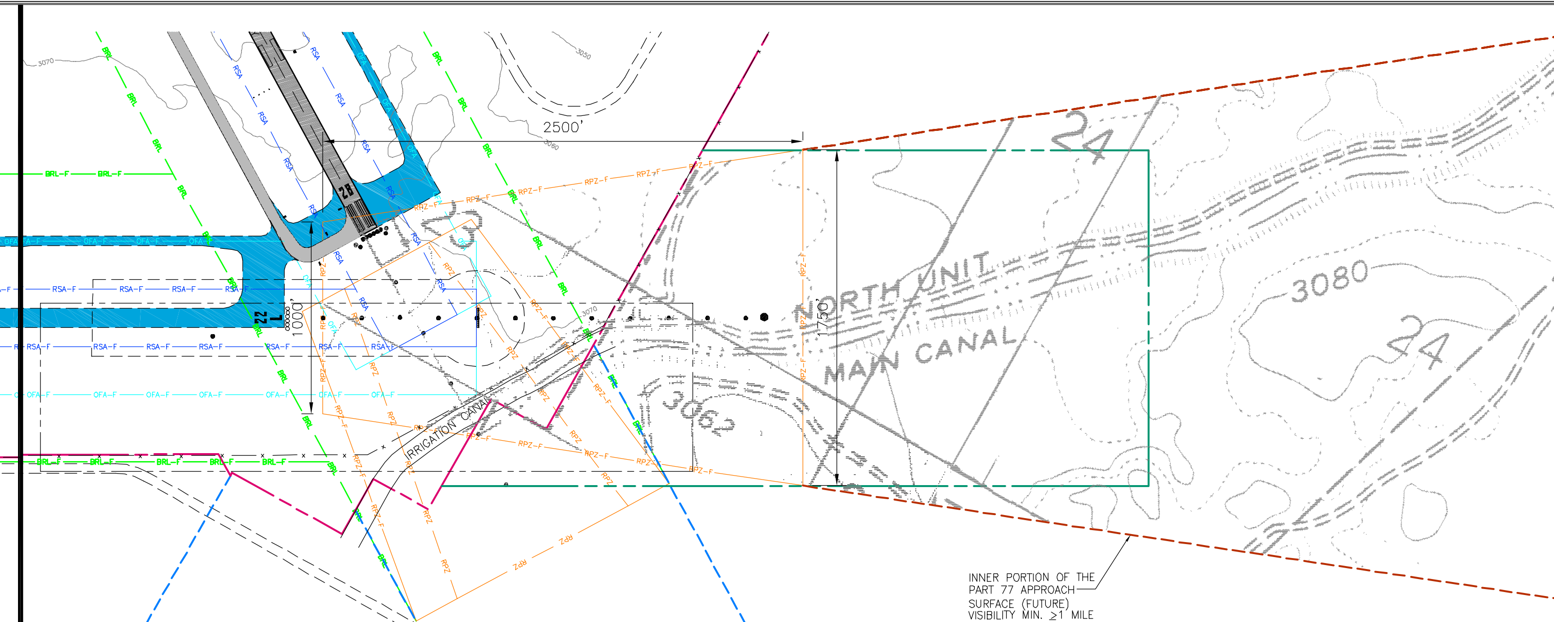
MORRISON MAIERLE, INC.
An Employee–Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442–3050

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW____

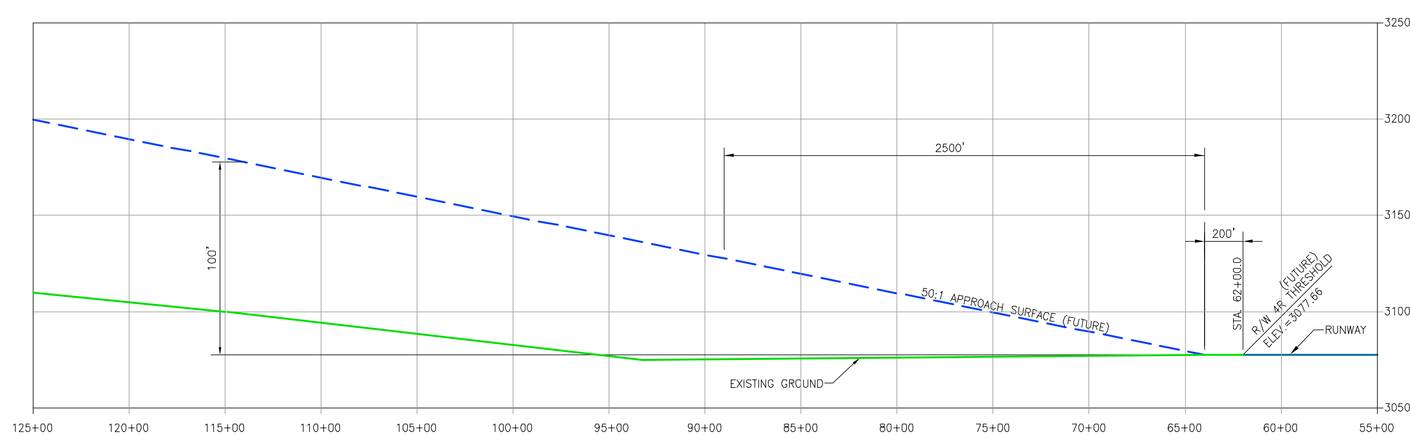
PROJECT NUMBER
2953.001–010–0113
SHEET NUMBER
9



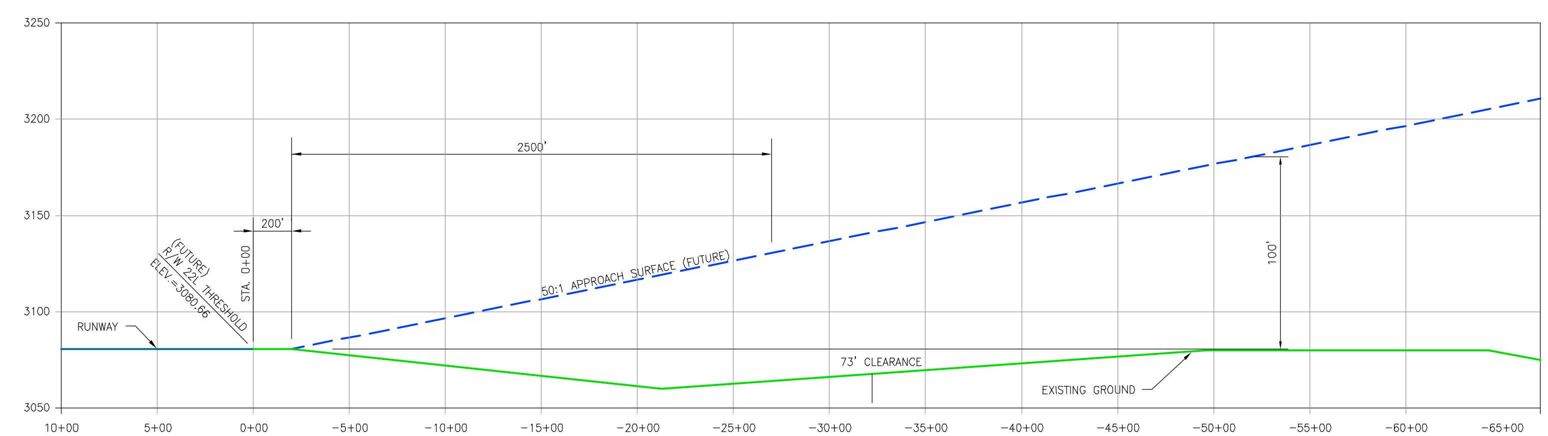
PLAN – RUNWAY 4R



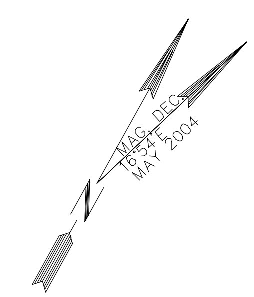
PLAN – RUNWAY 22L



PROFILE – RUNWAY 4R



PROFILE – RUNWAY 22L



LEGEND

EXISTING	FUTURE	
		AIRPORT REFERENCE POINT (ARP)
	F	AIRPORT PROPERTY LINE
	F	AIRPORT PROPERTY EASEMENT
X X	X	SECURITY FENCE —— BARBED WIRE (BW)
		RUNWAY THRESHOLD LIGHTS
VASI	PAPI	NAVIGATIONAL AID INSTALLATION
		REIL
		AIRPORT ROTATING BEACON
34 35 / 3 2		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		BUILDINGS
		ROAD
3860		GROUND CONTOURS
		AIRCRAFT PAVEMENT
RPZ RPZ	RPZ-F RPZ-F RPZ-F	RUNWAY PROTECTION ZONE (RPZ)
BRL BRL	BRL-F BRL-F BRL-F	BUILDING RESTRICTION LINE (BRL)
OFA OFA	OFA-F OFA-F OFA-F	OBJECT FREE AREA (OFA)
RSA RSA	RSA-F RSA-F RSA-F	RUNWAY SAFETY AREA (RSA)

OBSTRUCTIONS – RUNWAY 4/22

NO.	DESCRIPTION	SURFACE	PENETRATION	DISPOSITION
1	MAIN CANAL	APPROACH	−3 FEET	NONE

- • OBSTRUCTION
- ○ NOT OBSTRUCTION

HATCH PATTERN LEGEND

	RUNWAYS
	TAXIWAYS AND APRONS
	FUTURE DEVELOPMENT

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500 (152.4) 0 500 (152.4) 1000 (304.8)
SCALE IN FEET (METERS)

REVISIONS

BY:	DATE	DESCRIPTION	NO.
BJD	2/05	ALP UPDATE	1.

ROBERTS FIELD AIRPORT

REDMOND, RUNWAY 4R/22L OREGON

INNER PORTION OF THE APPROACH SURFACE

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442–3050

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW______

PROJECT NUMBER
2953.001–010–0113

SHEET NUMBER
10

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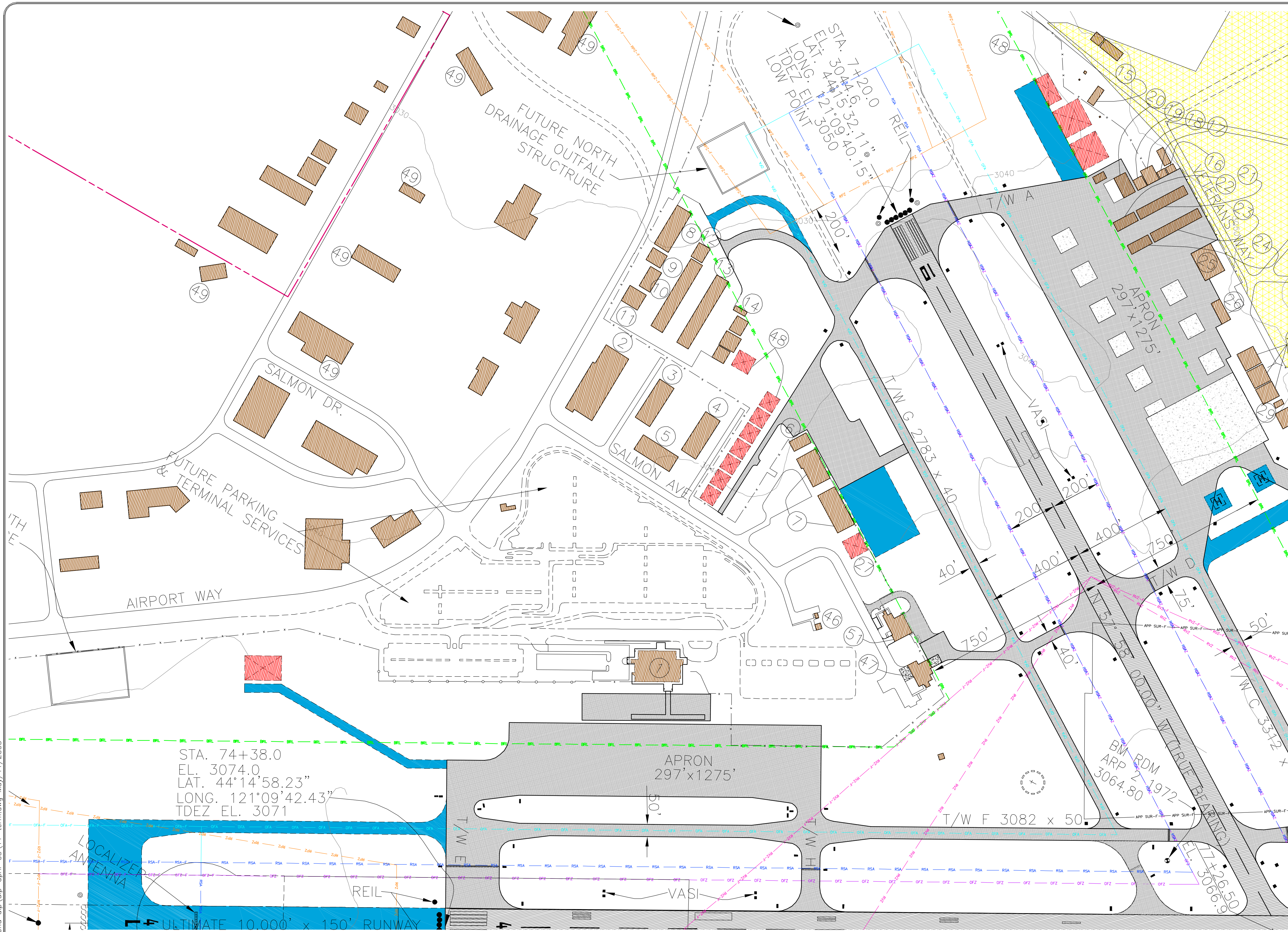

	BUILDINGS	[TOP ELEVATION]
1	TERMINAL BUILDING	[3103]
2	LANCAIR	[3064]
3	INDUSTRIAL BUILDING	[3049]
4	INDUSTRIAL BUILDING	[3052]
5	INDUSTRIAL BUILDING	[3052]
6	REDMOND AIR	[3067]
7	REDMOND AIR	[3074]
8	REDMOND AIR	[3051]
9	HANGAR	[3050]
10	HANGAR	[3049]
11	HANGAR	[3048]
12	T-HANGARS	[3045]
13	T-HANGARS	[3044]
14	HANGAR	[3052]
15	PUBLIC WORKS DEPARTMENT	[3061]
16	HANGAR	[3061]
17	HANGAR	[3067]
18	HANGAR	[3072]
19	HANGAR	[3068]
20	BUTLER AIRCRAFT	[3070]
21	T-HANGARS	[3063]
22	HANGAR	[3069]
23	T-HANGARS	[3063]
24	HANGAR	[3070]
25	BUTLER AIRCRAFT	[3088]
26	BUTLER AIRCRAFT	[3075]
27	FUTURE HANGAR	(FUTURE)
28	HANGARS	[3072]
29	AIRFIELD LIGHTING BUILDING	[3064]
30	FOREST SERVICE	[3092]
31	AIR TANKER BASE	[3078]
32	FOREST SERVICE	[3084]
33	FOREST SERVICE CASHE BLDG.	[3088]
34	STORAGE SHED	[3080]
35	U.S. FOREST SERVICE AIR CENTER	[3086]
36	BUILDING	[3083]
37	WELL PUMP HOUSE	[3083]
38	STORAGE BUILDING	[3083]
39	U.S. FOREST SERVICE AIR CENTER	[3090]
40	U.S. FOREST SERVICE AIR CENTER	[3091]
41	U.S. FOREST SERVICE AIR CENTER	[3092]
42	U.S. FOREST SERVICE AIR CENTER	[3092]
43	FOREST SERVICE	[3097]
44	FOREST SERVICE	[3117]
45	BUILDING	[3100]
46	AIR TRAFFIC CONTROL TOWER	[3100]
47	AIRPORT RESCUE & FIRE FIGHTING	[3083]
48	FUTURE HANGARS	(FUTURE)
49	AIRPORT INDUSTRIAL PARK BUILDINGS	
50	NATIONAL GUARD BUILDINGS	
51	SNOW EQUIP. & MAINT. STORAGE	[3082]
52	WAREHOUSE	
53	USFS HANGAR	[3095]
54	SMOKEY HALL	
55	FOREST SERVICE OFFICE BUILDING	[3095]

LEGEND

EXISTING	FUTURE	
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT PROPERTY LINE
		AIRPORT PROPERTY EASEMENT
		SECURITY FENCE — BARBED WIRE (BW)
		RUNWAY THRESHOLD LIGHTS
VASI	PAPI	NAVIGATIONAL AID INSTALLATION
		REIL
		AIRPORT ROTATING BEACON
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		BUILDINGS
		ROAD
		GROUND CONTOURS
		AIRCRAFT PAVEMENT
		RUNWAY PROTECTION ZONE (RPZ)
		BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		RUNWAY VISIBILITY ZONE (RVZ)
		OBSTACLE FREE ZONE (OFZ)

HATCH PATTERN LEGEND

- PASSENGER TERMINAL COMPLEX
- GENERAL AVIATION
- AIR CARGO/AIRLINE MAINTENANCE
- RUNWAYS
- TAXIWAYS AND APRONS
- FUTURE DEVELOPMENT
- BUISENESS CENTER

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NO.	DESCRIPTION	DATE	BY:
2	ALP UPDATE	2/05	BJD
1	CONSTRUCTION OF ARFF FACILITY	?/14/99	BJD

REVISIONS

ROBERTS FIELD AIRPORT

REDMOND, OREGON

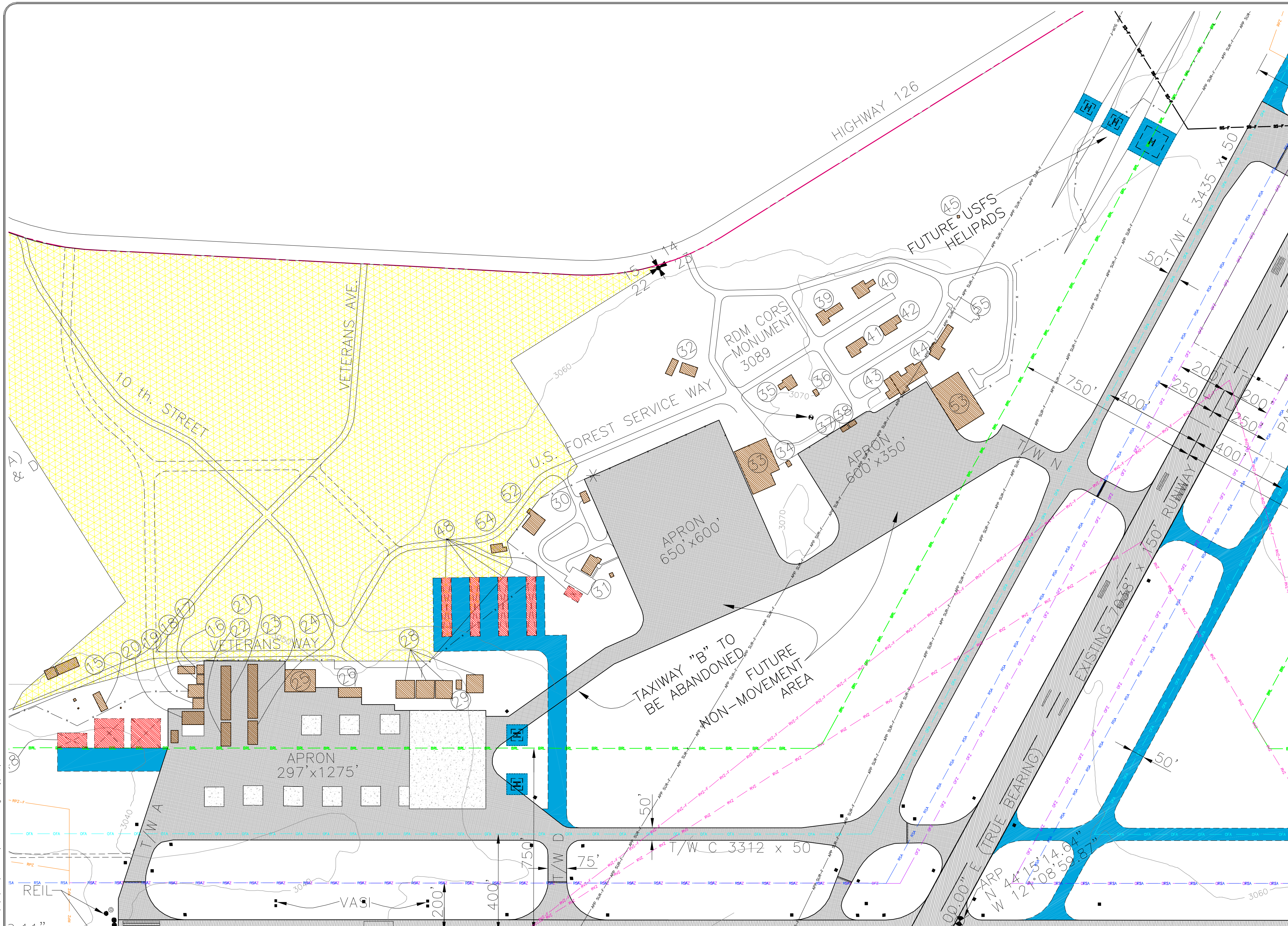
TERMINAL AREA PLAN

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS
SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

PROJECT NUMBER 2953.001-010-0113

SHEET NUMBER 11



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LEGEND

EXISTING	FUTURE	
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT PROPERTY LINE
		AIRPORT PROPERTY EASEMENT
		SECURITY FENCE —— BARBED WIRE (BW)
		RUNWAY THRESHOLD LIGHTS
VASI	PAPI	NAVIGATIONAL AID INSTALLATION
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OFA	OFA	OBJECT FREE AREA (OFA)
RSA	RSA	RUNWAY SAFETY AREA (RSA)
RVZ	RVZ	RUNWAY VISIBILITY ZONE (RVZ)
OFZ	OFZ	OBSTACLE FREE ZONE (OFZ)

HATCH PATTERN LEGEND

- PASSENGER TERMINAL COMPLEX
- GENERAL AVIATION
- AIR CARGO/AIRLINE MAINTENANCE
- RUNWAYS
- TAXIWAYS AND APRONS
- FUTURE DEVELOPMENT
- BUISENESS CENTER

MAG. DEC. MAY 2004

(60.96) 200 — 0 0 — (60.96) 200 — (121.92) 400

SCALE IN FEET (METERS)

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

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NO.	DESCRIPTION	DATE	BY:
1.	ALP UPDATE	2/05	BJD

REVISIONS

ROBERTS FIELD AIRPORT

REDMOND, OREGON

TERMINAL AREA PLAN

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

PROJECT NUMBER 2953.001-010-0113

SHEET NUMBER

12

LEGEND		
EXISTING	FUTURE	
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT PROPERTY LINE
		AIRPORT PROPERTY EASEMENT
		AIRPORT ROTATING BEACON
		BUILDINGS
		ROAD
		AIRCRAFT PAVEMENT
RPZ		RUNWAY PROTECTION ZONE (RPZ)
BRL		BUILDING RESTRICTION LINE (BRL)
RSA		RUNWAY SAFETY AREA (RSA)

HATCH PATTERN LEGEND	
	RUNWAYS
	TAXIWAYS AND APRONS
	FUTURE DEVELOPMENT

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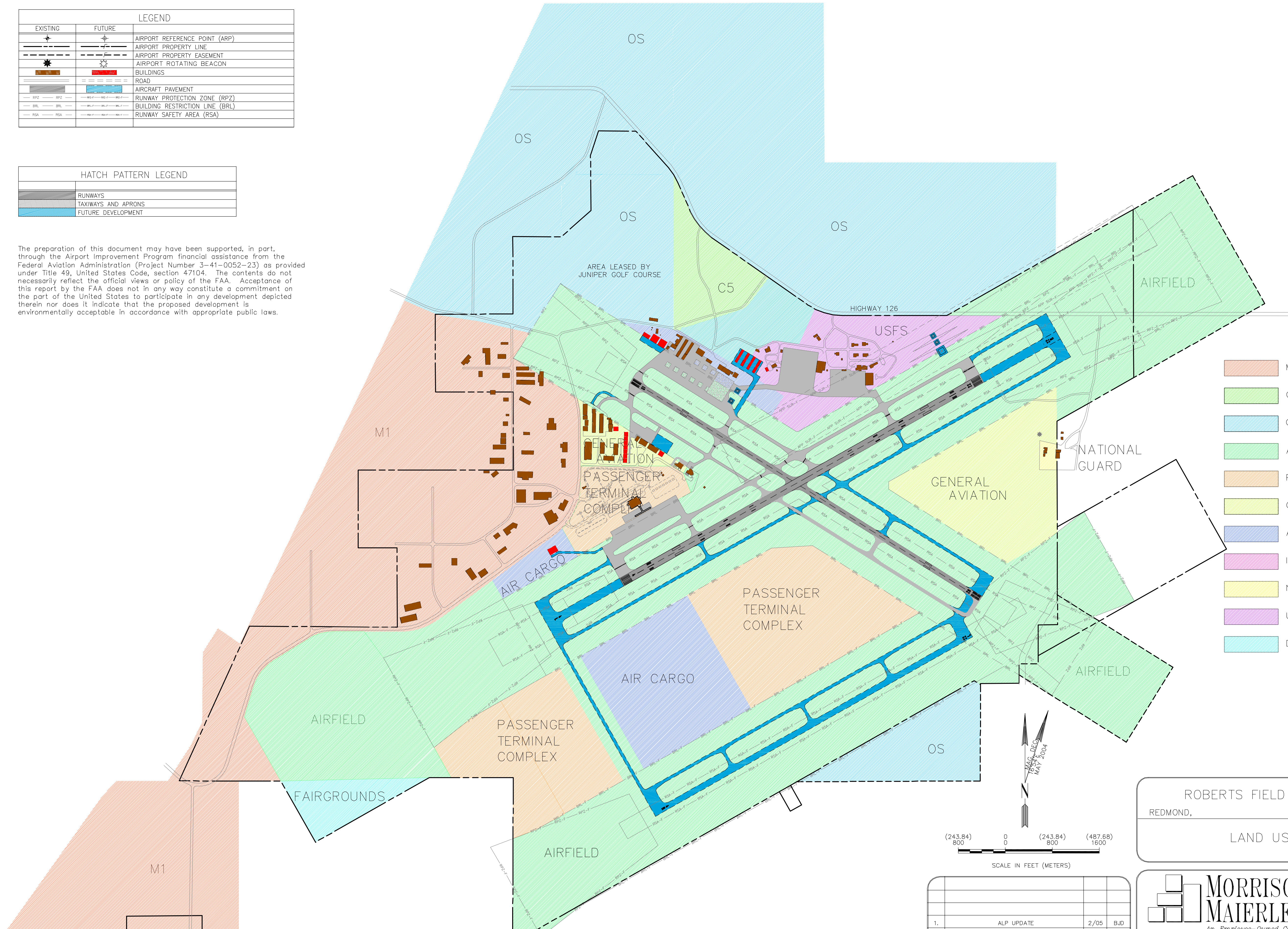

LEGEND

- M1 LIGHT INDUSTRIAL
- C5 BUSINESS CENTER
- OS OPEN SPACE
- AIRFIELD
- PASSENGER TERMINAL COMPLEX
- GENERAL AVIATION
- AIR CARGO/AIRLINE MAINTENANCE
- INDUSTRIAL/COMMERCIAL DEVELOPMENT
- NATIONAL GUARD
- U.S. FOREST SERVICE
- DESCHUTES COUNTY FAIRGROUNDS

NO.	DESCRIPTION	DATE	BY:
1.	ALP UPDATE	2/05	BJD

REVISIONS

ROBERTS FIELD AIRPORT

REDMOND, OREGON

LAND USE

MORRISON MAIERLE, INC.
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ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

PROJECT NUMBER 2953.001-010-0113

SHEET NUMBER 13

TANGENT TABLE

TANGENT	DIRECTION	DISTANCE
T1	N00°07'10"E	16.63'
T2	N89°32'01"E	655.82'
T3	N00°04'03"E	169.41'
T4	N00°04'03"E	160.81'
T5	N89°31'27"E	327.62'
T6	N00°02'25"E	660.56'
T7	N89°30'16"E	327.31'
T8	N00°11'39"W	532.37'
T9	N23°21'05"W	540.00'
T10	N41°57'05"W	631.08'
T11	N89°54'32"W	344.03'
T11	N89°39'32"W	636.64'
T12	N89°11'00"W	700.18'
T12	S19°15'15"W	82.68'
T13	S15°54'22"W	144.50'

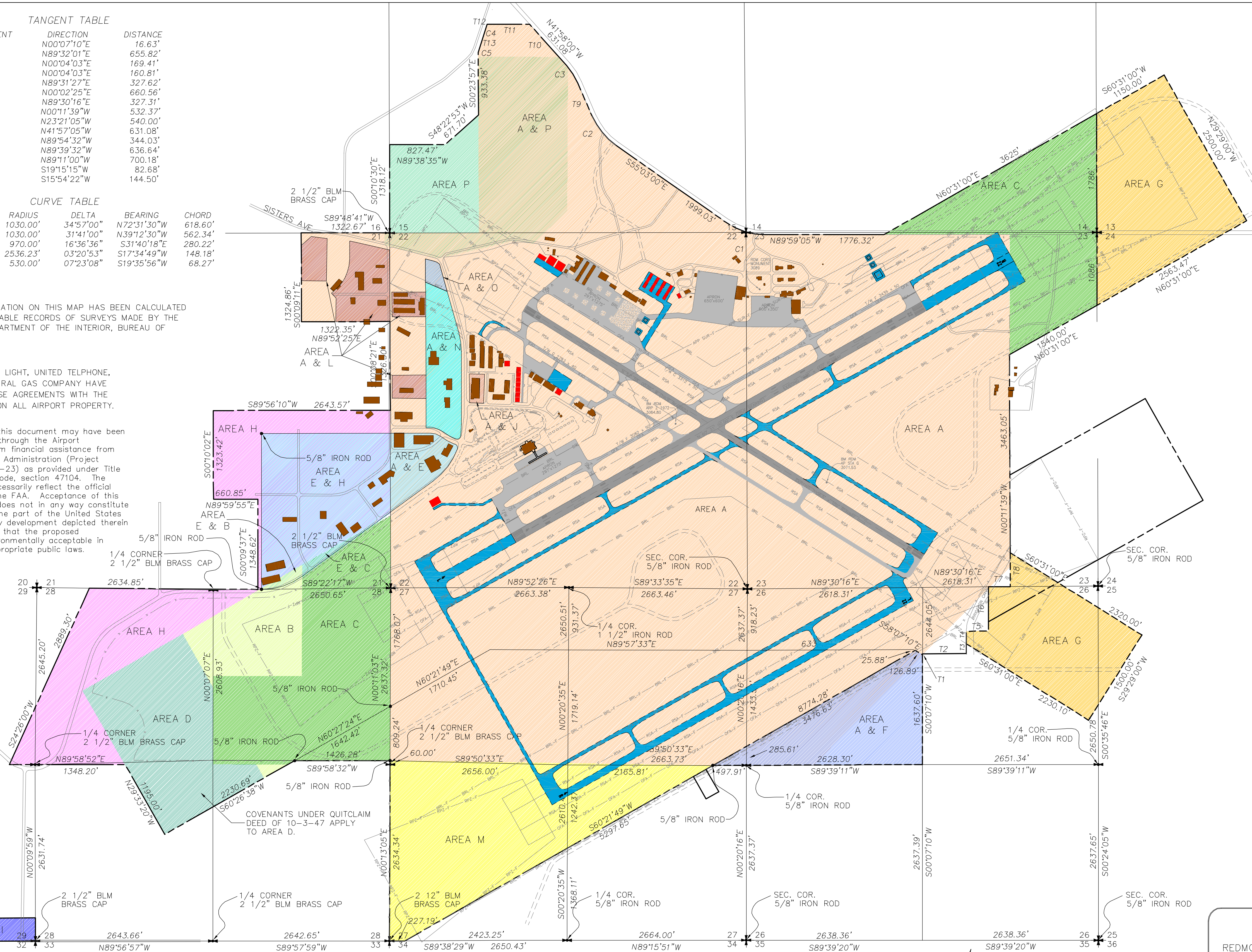
CURVE TABLE

CURVE	LENGTH	RADIUS	DELTA	BEARING	CHORD
C1	628.29'	1030.00'	34°57'00"	N72°31'30"W	618.60'
C2	569.57'	1030.00'	31°41'00"	N39°12'30"W	562.34'
C3	281.20'	970.00'	16°36'36"	S31°40'18"E	280.22'
C4	148.20'	2536.23'	03°20'53"	S17°34'49"W	148.18'
C5	68.32'	530.00'	07°23'08"	S19°35'56"W	68.27'

NOTES
ALL SURVEY INFORMATION ON THIS MAP HAS BEEN CALCULATED FROM LATEST AVAILABLE RECORDS OF SURVEYS MADE BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT.

EASEMENT
PACIFIC POWER AND LIGHT, UNITED TELPHONE, AND CASCADE NATURAL GAS COMPANY HAVE STANDARD FRANCHISE AGREEMENTS WITH THE CITY OF REDMOND ON ALL AIRPORT PROPERTY.

The preparation of this document may have been supported, in part, through the Airport Improvement Program financial assistance from the Federal Aviation Administration (Project Number 3-41-0052-23) as provided under Title 49, United States Code, section 47104. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.



LEGEND

PROPERTY BOUNDARY
AIRPORT PROPERTY CONTAINS 1980.27 ACRES.

AREA A
ACQUIRED UNDER PATENT DEED FROM U.S. GOVERNMENT 4-10-50.

AREA B
ACQUIRED UNDER ADAP 05 21.16 ACRES
ACQUIRED UNDER ADAP 04 24.89 ACRES

AREA C
ACQUIRED UNDER ADAP 03 252 ACRES

AREA D
ACQUIRED UNDER ADAP 06 90.2 ACRES

AREA E
AVIGATION EASEMENT FEE TITLE -TEKTRONIX INC. RELEASED BY FAA APRIL 24, 1980 100 ACRES

AREA F
CITY OF REDMOND PROPERTY TRADED TO DES CHUTES CO. RELEASED BY FAA JUNE 12, 1979

AREA G
AVIGATION EASEMENT AREA ACQUIRED FROM U.S. GOVERNMENT 9-8-80

AREA H
ACQUIRED IN FEE FROM DESCHUTES CO. INC. PROPERTY TRADE. APPROVED BY F.A.A. JUNE 12, 1979. 108.8 ACRES

AREA I
ADDED TO AIRPORT PROPERTY BY CITY OF REDMOND FEBRUARY 13, 1992 9.77± ACRES

AREA J
AVIGATION EASEMENT FEE TITLE-LANCLAIR INC. RELEASED BY FAA 1992 2.18 ACRES

AREA L
AVIGATION EASEMENT FEE TITLE RELEASED BY F.A.A. JUNE, 1992.

AREA M
ACQUIRED IN FEE FROM DESCHUTES COUNTY JUNE, 1992. PATENT TRANSFERRED FROM AREA "L" JUNE, 1992.

AREA N
C.O.C.C. DEEDED PROPERTY 24.38 ACRES JUNE 1996

AREA O
C.O.C.C. DEEDED PARKING EASEMENT 1990

AREA P
QUIT CLAIM DEED VOL. 105 PG. 164 SEPT. 16, 1985

OVERLAPING AREAS

- AREA A / AREA E
- AREA A / AREA F
- AREA A / AREA J
- AREA A / AREA N
- AREA A / AREA O
- AREA A / AREA P
- AREA E / AREA B
- AREA E / AREA C
- AREA E / AREA H

LEGEND

EXISTING	ULTIMATE	
		AIRPORT REFERENCE POINT (ARP)
	F	AIRPORT PROPERTY LINE
	F	AIRPORT PROPERTY EASEMENT
X X	X	SECURITY FENCE —— BARBED WIRE (BW)
34 35 / 3 2		SECTION CORNER

LEGEND

EXISTING	ULTIMATE	
		AIRPORT ROTATING BEACON
		BUILDINGS
		ROAD
		AIRCRAFT PAVEMENT
RPZ RPZ	RPZ-F RPZ-F RPZ-F	RUNWAY PROTECTION ZONE (RPZ)
BRL BRL	BRL-F BRL-F BRL-F	BUILDING RESTRICTION LINE (BRL)
RSA RSA	RSA-F RSA-F RSA-F	RUNWAY SAFETY AREA (RSA)

HATCH PATTERN LEGEND

	RUNWAYS
	TAXIWAYS AND APRONS
	FUTURE DEVELOPMENT

MAG. DEC. 16°54'E MAY 2004

(243.84) 800 — 0 0 — (243.84) 800 — (487.68) 1600
SCALE IN FEET (METERS)

NO.	DESCRIPTION	DATE	BY:
1	ALP UPDATE	2/05	BJD

REVISIONS

ROBERTS FIELD AIRPORT
REDMOND, OREGON

AIRPORT PROPERTY MAP
EXHIBIT "A"

MORRISON MAIERLE, INC.
An Employee-Owned Company
ENGINEERS SCIENTISTS SURVEYORS PLANNERS SINCE 1945
P.O. Box 6147 910 Helena Ave. Helena, MT 59604 • Phone: (406) 442-3050

DRAWN BY: BJD
CHK'D. BY: TFO
APPR. BY: TFO
DATE: JULY 1998
Q. A.
PEER REVIEW

PROJECT NUMBER 2953.001-010-0113
SHEET NUMBER 14

ROBERTS FIELD
Redmond, Oregon

Chapter Six
CAPITAL IMPROVEMENT PROGRAM

CAPITAL IMPROVEMENT PROGRAM

The successful implementation of the Roberts Field/Redmond Municipal Airport master plan will require the sound judgment on the part of the City of Redmond to meet changing needs. Among the more important factors influencing decisions to carry out a given recommendation are timing and airport activity. Both of these factors should be used as references in plan implementation.

Experience has indicated that problems have materialized from the standard time-based format of traditional planning documents. The problems center around their inflexibility and inherent inability to deal with unforeseen changes that may occur on the airport.

While it is necessary for scheduling and budgeting purposes to consider the timing of airport development, the actual

need for facilities is established by airport activity. Proper master planning implementation suggests the use of airport activity levels, rather than time as guidance for development.

This chapter of the master plan is intended to become one of the primary references used by the City of Redmond for implementing the plan recommendations. Consequently, the following narrative and graphic presentations must provide understanding of each recommended development item. This understanding of the overall program will be critical in main-

taining a realistic and cost-effective program that provides maximum benefit to the City of Redmond and the Federal Aviation Administration.

AIRPORT DEVELOPMENT SCHEDULE AND COST SUMMARIES

Once the specific needs and improvements for the airport have been established, the next step is to determine a realistic schedule and cost for implementing the plan. This section examines the overall cost of development and a demand-based schedule.

The development schedule can be initially established, dividing the improvement needs into the three planning horizons: short, intermediate, and long term. **Table 6A** summarizes the key activity milestones for each planning horizon.

TABLE 6A
Aviation Activity Planning Horizons
Redmond Municipal Airport

	Base Year	Short Term	Intermediate Term	Long Term
Annual Operations (Total)	54,378	63,170	71,570	91,370
Commercial Air Carrier	12,800	13,300	13,800	15,000
General Aviation	36,128	43,700	50,700	67,400
Military/USFS	1,250	1,250	1,250	1,250
Passenger Enplanements	147,106	186,000	220,000	300,000
Total Based Aircraft	110	130	150	190

The short term horizon covers items of highest priority, as well as items that should be developed as the airport approaches the short term activity milestones. A terminal planning effort has recommended the expansion of the existing terminal in the area adjacent to the existing ramp. The Phase I terminal program is reflected in a multi-year project through the short-term period. Other items in the short-term period include pavement rehabilitation, taxiway extensions, and extension of utilities to the east side of the airfield.

Because of their priority over the next five years, these items will need to be incorporated in the City of Redmond and FAA programming for the FY 2005-2009 programming period. However, since the priorities will need to be reestablished each year for programming the projects which are intended to receive federal aid, the City and FAA will need to revisit the program each year.

As the City reestablishes their projects and develops an updated five-year program, they will need to add projects included in the intermediate planning period. While demand levels will change over time, projects may need to be accelerated or delayed. However, the master plan program should remain viable over a multi-year period, before it becomes necessary to update the overall plan.

Due to the conceptual nature of a master plan, implementation of capital projects should occur only after further refinement of their design and costs through architectural and engineering analyses. Under normal conditions, the cost estimates reflect an allowance for engineering and contingences that may be anticipated on the project. Capital costs presented in this chapter should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered sufficiently accurate for performing the feasibility analyses in this chapter. Cost estimates for each development project have been presented in **Table 6B** and are given in current (2004) dollars, without future inflationary adjustment.

CAPITAL IMPROVEMENTS FUNDING

Financing for capital improvements at Redmond Municipal Airport does not utilize any general tax monies. Rather, the contributors to the airport's development are its users, through a system of leases and fees. These sources include not only the rates and charges for airport use imposed by the Redmond Municipal Airport, but also federal airport improvement programs (AIP) and passenger facility charge (PFC) revenues. Projects funded under these programs since 1993 have been itemized in **Table 6C**. The following paragraphs outline the key sources for funding.

TABLE 6B
Roberts Field – Redmond Municipal Airport
20-Year Capital Improvement Program
Airport Master Plan 2004

Year(s)	Project Description	Total Cost	Federal/ AIP Share	Local/ PFC Share
2005	Perimeter Road Construction – Runway 10	$250,000	$237,500	$12,500
	Terminal Building Expansion – Phase 1 (Design)	450,000	427,500	22,500
	Taxiway D Reconstruction and Extension	500,000	475,000	25,000
	General Aviation Apron Reconstruction	850,000	807,500	42,500
	Subtotal	**$2,050,000**	**$1,947,500**	**$102,500**
2006	Taxiway G (North) Reconstruction	$2,340,000	$2,223,000	$117,000
	Taxiway C (North & South) Reconstruction	2,350,000	2,232,500	117,500
	Taxiway C Extension – South	4,800,000	4,560,000	240,000
	Terminal Building – Phase 2 (Construction) Multi-Year	3,000,000	1,500,000	1,500,000
	Subtotal	**$12,490,000**	**$10,515,500**	**$1,974,500**
2007	Apron Expansion/Helipads	$555,000	$527,250	$27,750
	Taxilane Development (Hangars)	480,000	456,000	24,000
	Terminal Building – Phase 2 (Construction) Multi-Year	3,000,000	1,500,000	1,500,000
	Subtotal	**$4,035,000**	**$2,483,250**	**$1,551,750**
2008	Terminal Building – Phase 2 (Construction) Multi-Year	$3,000,000	$1,500,000	$1,500,000
	Veterans Way/Airport Way Relocation	900,000	810,000	90,000
	Utility Extension to East Side – Phase 1	2,200,000	0	2,200,000
	Subtotal	**$6,100,000**	**$2,310,000**	**$3,790,000**
2009	Utility Extension to East Side – Phase 2	$2,200,000	$0	$2,200,000
	Master Plan Update	250,000	225,000	25,000
	Subtotal	**$2,450,000**	**$225,000**	**$2,225,000**
	Subtotal Short Term (2005-2009)	**$27,125,000**	**$17,481,250**	**$9,643,750**
2010-2014	Runway 4-22 Extension – West	$5,640,000	$5,076,000	$564,000
	Install CAT I Approach (Runway 4L)	1,500,000	1,350,000	150,000
	Expand Maintenance Building	350,000	315,000	35,000
	Water and Sewer Connection – West Side	4,700,000	2,350,000	2,350,000
	Re-route Highway 126	1,500,000	1,350,000	150,000
	Master Plan Update	250,000	225,000	25,000
	Subtotal Intermediate Term (2010-2014)	**$13,940,000**	**$10,666,000**	**$3,274,000**
2015-2024	Runway 4-22 Extension – East	$5,700,000	$5,130,000	$570,000
	Relocate CAT I Equipment (Runway 22)	750,000	675,000	75,000
	Parallel Runway (4R-22L)	16,200,000	14,580,000	1,620,000
	Install CAT I Approaches (Runway 4R-22L0	3,000,000	2,700,000	300,000
	Parallel Taxiway K	10,000,000	9,000,000	1,000,000
	Parallel Taxiway L	7,200,000	6,480,000	720,000
	Taxiway E Connector	2,460,000	2,214,000	246,000
	Master Plan Update	250,000	225,000	25,000
	Subtotal Long Term (2015-2024)	**$45,560,000**	**$41,004,000**	**$4,556,000**
	Grand Totals	**$86,625,000**	**$69,151,250**	**$$17,473,750**

Sources: Cost estimates for pavement and utility extensions provided by Morrison Maierle, Inc.
Cost estimates for terminal expansion provided by HNTB Corp.

Notes: AIP – Airport Improvement Program, PFC – Passenger Facility Charge
CAT I Approach consists of a localizer, glide slope, and medium intensity approach light system.

TABLE 6C
Projects Receiving AIP or PFC Funding, 1993-2003
Redmond Municipal Airport

FAA Fiscal Year	Project Description	Total Project Amount
1993	Reconstruct Runway 4/22, Including HIRLS	$4,223,802
	Expand/Rehabilitate Aircraft Apron (PFC)	100,000
	Install Signs (PFC)	20,000
	Expand/Modify Terminal Building (PFC)	584,052
	Rehabilitate Runway 4/22, Lights, Electrical Vault, Windsock (PFC)	405,792
	Conduct Master Plan Update (Pavement Study) (PFC)	2,500
	Rehabilitate Runway 10/28, Markers, With Sock (PFC)	200,000
1994	Overlay Runway 10/28	$1,770,792
	Acquire Emergency Generator	55,556
	Rehabilitate Runway 10/28 (Design Only)	83,034
	Construct Electrical Vault	72,521
	Acquire Snow Removal Equipment	324,742
1995	Extend Taxiway C or G (Design)	$48,669
	Acquire ARFF Vehicle (PFC)	350,000
	Conduct Feasibility Study (Parallel Taxiway C)	6,100
1997	Construct ARFF Station	$792,000
	Install PAPI/Revise ALP	35,556
	Extend Taxiway G and Construct Taxiway J	1,370,521
	Master Plan Update	197,792
1998	Reconstruct Taxiway F (North) (Design Only)	$145,000
	Acquire Handicap Lift	25,000
1999	Acquire Sweeper (PFC)	$122,222
	Acquire Snow Removal Equipment (PFC)	222,222
2000	Construct Snow Removal Equipment Building (PFC)	$600,000
	Rehabilitate Apron, Including Taxiway F South Terminal Bldg. (Design)	509,300
	Install Perimeter (Wildlife) Fencing	650,108
2001	Remove Obstructions (Line-of-sight)	$1,500,000
	Rehabilitate Terminal Apron (Phase 2)	3,507,919
	Install Runway 4 REIL	30,000
	Install Runway 10 Distance-To-Go Signs	40,000
	Rehabilitate Taxiway F (PFC)	4,909,736
2002	Rehabilitate Terminal Apron	$1,555,556
	Security Enhancements (100% Funding)	28,000
	Security Enhancements (90% Funding)	879,097
	Rehabilitate Taxiway F South (Phase 3)	555,556
	Revise ALP	5,556
	Install PAPI (Amendment to Project #1702)	58,858
2003	Rehabilitate Runway (Electrical Building)	$388,889
	Rehabilitate and Relocate Airport Beacons (Required by Part 139)	76,111
	Update Runway, Taxiway, and Apron (PCI)	35,000

Source: FAA NPIAS Database, 2004.
(PFC-funded projects noted in parentheses.)

FEDERAL GRANTS

The United States Congress has long recognized the need to develop and maintain a system of aviation facilities across the nation for the purpose of national defense and promotion of interstate commerce. Various grants-in-aid programs to public airports have been established over the years for this purpose. The most recent legislation was the Airport Improvement Program (AIP) of 1982. AIP has been reauthorized several times. The **Wendell H. Ford Aviation Investment and Reform Act for the 21st Century** covered four years (through federal fiscal year 2003), while **Vision 100 – Century of Aviation Reauthorization Act** covers FY 2004-2007.

The source for AIP funds is the Aviation Trust Fund. The Trust Fund is the depository for all federal aviation taxes such as those on airline tickets, aviation fuel, lubricants, tires and tubes, aircraft registrations, and other aviation-related fees. The funds are distributed under appropriations set by Congress to airports in the United States which have certified eligibility. The distribution of grants is administered by the Federal Aviation Administration.

Under the AIP program, examples of eligible development projects include the airfield, aprons, and access roads. Passenger terminal building improvements (such as bag claim and public waiting lobbies) may also be eligible for FAA funding (in addition, TSA provides funding for terminal security). However, improvements such as automobile parking, fueling facilities, utilities, hangar buildings, airline ticketing and airline operations areas are not generally eligible for AIP funds. The airport is eligible for 95 percent funding under **Vision 100**, although the FAA has recommended that airports only assume 90 percent participation after 2007 (when the current bill expires).

The program provides funding for eligible projects at airports. Through an entitlement program, primary commercial service airports receive a guaranteed minimum of federal assistance each year, based on their enplaned passenger levels and Congressional appropriation levels. A primary airport is defined as any commercial service airport enplaning at least 10,000 passengers annually. Redmond was the 193rd busiest primary airport in the U.S. in CY 2002.

Under the current formula, airports enplaning at least 10,000 passengers annually are entitled to a minimum of $1,000,000. For the first 50,000 enplanements, the airport receives $15.60 per enplanement. For the next 50,000 enplanements, the airport receives $10.40 per enplanement. The next 400,000 boardings provide $5.20 per enplanement. For the next 500,000, the airport receives $1.30 per enplanement. For all enplanements over one million, the airport receives $1.00 per enplaned passenger.

In addition, airports that have over 100 million pounds of landed weight by all-cargo carriers receive a cargo entitlement (Redmond does not qualify). This entitlement is based upon the airport's percentage of the total landed weight at all eligible airports.

The **Wendell H. Ford Aviation Investment and Reform Act for the 21st Century** (AIR 21) adjusted allocation formulas to increase entitlements over previous levels and to establish special set-asides for noise programs, general aviation and non-primary airports, and other special programs.

Table 6D outlines estimates of annual entitlement funds for Redmond Municipal Airport for each of the planning horizon milestones assuming the current entitlement formula remains in place over the planning period.

In a number of cases, airports face major projects that will require funds in excess of the airport's annual entitlements. Thus, additional funds from discretionary apportionments under AIP become desirable. The primary feature about discretionary funds is that they are distributed on a priority basis. These priorities are established by the FAA, utilizing a priority code system. Under this system, projects are ranked by their purpose. Projects ensuring airport safety and security are ranked as the most important priorities, followed by maintaining current infrastructure development, mitigating noise and other environmental impacts, meeting standards, and increasing system capacity. Capacity projects requiring greater than $5 million in discretionary funding require a benefit-cost analysis to prove that the benefit-cost (B/C) ratio is greater than 1.0.

Other funds can come through the Facilities and Equipment (F&E) section of the FAA. As activity conditions warrant, the airport will be considered by F&E for various navigational aids to be installed, owned, and maintained by the FAA.

TABLE 6D
Potential FAA Entitlement Funds
Redmond Municipal Airport

Period	Annual Enplanements	Annual Entitlement Funding Level
Current	147,106	$1,544,950
Short Term	186,000	$1,747,200
Intermediate Term	220,000	$1,924,000
Long Term	300,000	$2,340,000

Whereas entitlement monies are guaranteed on an annual basis, discretionary funds are not assured. **Table 6B** has outlined the amount of funding for the development program that Redmond will desire from the FAA. If the combination of entitlement and discretionary funding does not provide enough capital for planned development, projects would either be delayed or require funding from the airport's revenues or other authorized sources such as those described in the following subsections.

PASSENGER FACILITY CHARGES

The **Aviation Safety and Capacity Expansion Act of 1990** contained a provision for airports to levy passenger facility charges (PFCs) for the purposes of enhancing airport safety, capacity, or security, or to reduce noise or enhance competition.

14 CFR Part 158 of May 29, 1991, establishes the regulations that must be followed by airports choosing to levy PFCs. Passenger facility charges may be imposed by public agencies controlling a commercial service airport with at least 2,500 annual passengers with scheduled service. Authorized agencies were allowed to impose a charge of $1.00, $2.00, or $3.00 per enplaned passenger. Recent legislation (AIR 21) passed in early 2000, has allowed the cap to increase to $4.50. Redmond has been collecting at this level since November 1, 2001.

Prior approval is required from the Department of Transportation (DOT) before an airport is allowed to levy a PFC. DOT must find that the projected revenues are needed for specific, approved projects. Any AIP-eligible project, whether development or planning related, is eligible for PFC funding. Gates and related areas for the movement of passengers and baggage are eligible, as are on-airport ground access projects. Any project approved must preserve or enhance safety, security, or capacity; reduce/mitigate noise impacts; or enhance competition among carriers.

PFCs may be used only on approved projects. However, PFCs can be utilized to fund 100 percent of a project. They may be used as matching funds for AIP grants or to augment AIP-funded projects. PFCs can be used for debt service and financing costs of bonds for eligible airport development. These funds may also be commingled with general revenue for bond debt service. Before submitting a PFC application, the airport must give notice and an opportunity for consultation to airlines operating at the airport.

PFCs are to be treated similar to other airport improvement grants, rather than as airport revenues, and will be administered by the FAA. Participating airlines are able to retain up to eight cents per passenger for administrative handling purposes.

Redmond Municipal Airport has imposed a PFC and is dedicating revenues from this source to several projects. **Table 6E** outlines the estimated annual PFC revenue at $4.50 per enplaned passenger at each of the planning horizon thresholds.

TABLE 6E Potential PFC Revenues Redmond Municipal Airport	
	Annual PFCs (at $4.50)
Current	$584,000
Short Term	$738,000
Intermediate Term	$873,000
Long Term	$1,191,000

Note: Based upon 90 percent revenue passengers and $0.08 per passenger to airlines for administration costs.

LOCAL SHARE FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. Assuming federal funding, this essentially equates from 5 to 10 percent of the project costs if all eligible FAA funds are available.

A year-by-year cash flow has been included as **Table 6F**. The cash flow projects operating revenues and expenses, capital development items, anticipated federal funding, PFC revenues, and local match or bonding needs.

There are several alternatives for local finance options for future development at the airport, including airport revenues, direct funding from the City, issuing bonds, and leasehold financing. These strategies could be used to fund the local matching share, or complete the project if grant funding cannot be arranged.

The capital improvement program has assumed that some landside facility development (e.g., private hangars) would be completed privately. Under this type of development, the City would complete the necessary infrastructure (e.g., ramp and taxiway) improvements, as this development is grant-eligible.

There are several municipal bonding options available through the City of Redmond including: general obligation bonds, limited obligation bonds, and revenue bonds. General obligation bonds are a common form of municipal bonds which are issued by voter approval and secured by the full faith and credit of the City of Redmond. City of Redmond tax revenues are pledged to retire the debt. As instruments of credit, and because the community secures the bonds, general obligation bonds reduce the available debt level of the community. Due to the community pledge to secure and pay general obligation bonds, they are the most secure type of municipal bond and are generally issued at lower interest rates and carry lower costs of issuance. The primary disadvantage of general obligation bonds is that they require voter approval and are subject to statutory debt limits. This requires that they be used for projects that have broad support among the voters, and that they are reserved for projects that have highest public priorities.

In contrast to general obligation bonds, limited obligation bonds (sometimes referred to as Self-Liquidating Bonds) are secured by revenues from a local source. While neither general fund revenues nor the taxing power of the local community is pledged to pay the debt service, these sources may be required to retire the debt if pledged revenues are insufficient to make interest and principal payments on the bonds. These bonds still carry the full faith and credit pledge of the local community and, therefore, are considered, for the purpose of financial analysis, as part of the debt burden of the local community. The overall debt burden of the local community is a factor in determining interest rates on municipal bonds.

There are several types of revenue bonds, but in general they are a form of a municipal bond which is payable solely from the revenue derived from the operation of a facility that was constructed or acquired with the proceeds of the bonds. For example, a Lease Revenue Bond is secured with the income from a lease assigned to the repayment of the bonds. Revenue bonds have become a common form of financing airport improvements. Revenue bonds present the opportunity to provide those improvements without direct burden to the taxpayer. Revenue bonds normally carry a higher interest rate because they lack the guarantees of general and limited obligation bonds.

Leasehold financing refers to a developer or tenant financing improvements under a long term ground lease. The obvious advantage of such an arrangement is that it relieves the community of all responsibility for raising the capital funds for improvements. However, the private development of facilities on a ground lease, particularly on property owned by a municipal agency, produces a unique set of problems. Companies that want to own their property as a matter of financial policy may not locate where land is only available for lease.

The existing leases for the airport have been summarized in tables which are attached as an appendix to this master plan. These leases have also been graphically depicted on an aerial base (and AutoCAD drawing) to depict the boundaries of existing leases on airport property. This has been undertaken to provide the sponsor with clear direction on the availability of leasable airport property (in addition to existing lease terms). By taking advantage of areas which are not needed for aviation-related development (identified on Sheet 11 of the airport layout drawings), the sponsor will optimize local share financing of future capital projects.

IMPLEMENTATION

Experience has indicated that problems have materialized from the standard format of time-based planning documents. These problems center around the plan's inflexibility and inherent inability to deal with new issues that develop from unforeseen changes that may occur after it is completed. The format used in the development of this Master Plan has attempted to deal with this issue by providing more flexibility in the program. The primary issues upon which this Master Plan is based will remain valid for many years. The primary goal is for the airport to maintain a self-supporting position without sacrificing service to the public.

TABLE 6F
Cash Flow Analysis
Redmond Municipal Airport
Airport Master Plan

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operating Revenues - See Note 1 (3% annual incr.)	$3,371,100	$3,472,233	$3,576,400	$3,683,692	$3,794,203	$3,908,029	$4,025,270	$4,146,028	$4,270,409	$4,398,521
Operating Expenses - See Note 2 (1.5% annual incr.)	$2,901,700	$2,945,225	$2,989,404	$3,034,245	$3,079,759	$3,125,955	$3,172,844	$3,220,437	$3,268,744	$3,317,775
Existing Debt Service	$577,900	$576,220	$570,257	$578,434	$520,728	$520,007	$518,585	$375,429	$372,344	$275,256
Net Income	-$108,500	-$49,212	$16,739	$71,013	$193,716	$262,067	$333,840	$550,162	$629,321	$805,490
Capital Improvement Projects (Refer to Table 6B)	$5,000,000	$5,000,000	$7,840,000	$7,400,000	$4,055,000	$4,055,000	$4,055,000	$4,055,000	$4,055,000	$5,356,000
AIP Eligible Projects	$2,500,000	$2,500,000	$5,198,000	$7,017,500	$2,491,850	$2,491,850	$2,491,850	$2,491,850	$2,491,850	$4,500,400
Non-AIP Eligible Projects	$2,500,000	$2,500,000	$2,642,000	$382,500	$1,563,150	$1,563,150	$1,563,150	$1,563,150	$1,563,150	$855,600
Federal Grants - Entitlement Funds	$1,690,038	$1,718,184	$1,747,200	$1,780,085	$1,814,088	$1,849,247	$1,885,601	$1,924,000	$1,962,896	$2,003,114
Federal Grants - Discretionary Funds	$809,962	$781,816	$3,450,800	$5,237,415	$677,762	$642,603	$606,249	$567,850	$528,954	$2,497,286
State Grants	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
PFC Revenues (based upon future enplanements)	$696,179	$717,711	$739,908	$765,065	$791,077	$817,974	$845,785	$875,160	$904,915	$935,683
Bond Proceeds (future needs based upon CIP)	$1,900,000	$2,000,000	$2,100,000	$0	$1,100,000	$1,000,000	$1,100,000	$900,000	$800,000	$0
Debt Service (based upon future bond proceeds)	$0	$165,642	$340,002	$523,080	$523,080	$618,978	$706,158	$802,056	$880,518	$950,262
Cumulative Cash Flow	$37,679	$90,536	$15,181	-$4,321	$44,242	-$7,846	$52,472	$62,587	$3,156	-$11,533
Annual Enplaned Passengers (AMP)	175,007	180,420	186,000	192,324	198,863	205,624	212,616	220,000	227,480	235,214

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operating Revenues - See Note 1 (3% annual incr.)	$4,530,477	$4,666,391	$4,806,383	$4,950,574	$5,099,091	$5,252,064	$5,409,626	$5,571,915	$5,739,072	$5,911,244
Operating Expenses - See Note 2 (1.5% annual incr.)	$3,367,541	$3,418,054	$3,469,325	$3,521,365	$3,574,186	$3,627,798	$3,682,215	$3,737,449	$3,793,510	$3,850,413
Existing Debt Service	$274,888	$273,863	$272,175	$274,938	$226,875	$226,410	$103,970	$104,600	$0	$0
Net Income	$888,047	$974,473	$1,064,882	$1,154,271	$1,298,031	$1,397,856	$1,623,441	$1,729,866	$1,945,562	$2,060,831
Capital Improvement Projects (Refer to Table 6B)	$5,356,000	$5,356,000	$5,356,000	$5,356,000	$5,356,000	$5,356,000	$5,356,000	$5,356,000	$5,356,000	$5,356,000
AIP Eligible Projects	$4,500,400	$4,500,400	$4,500,400	$4,500,400	$4,500,400	$4,500,400	$4,500,400	$4,500,400	$4,500,400	$4,500,400
Non-AIP Eligible Projects	$855,600	$855,600	$855,600	$855,600	$855,600	$855,600	$855,600	$855,600	$855,600	$855,600
Federal Grants - Entitlement Funds	$2,044,700	$2,087,700	$2,132,162	$2,178,135	$2,225,672	$2,274,825	$2,325,649	$2,340,000	$2,393,040	$2,447,883
Federal Grants - Discretionary Funds	$2,455,700	$2,412,700	$2,368,238	$2,322,265	$2,274,728	$2,225,575	$2,174,751	$2,160,400	$2,107,360	$2,052,517
State Grants	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
PFC Revenues (based upon future enplanements)	$967,496	$1,000,391	$1,034,404	$1,069,574	$1,105,939	$1,143,541	$1,182,421	$1,193,400	$1,233,976	$1,275,931
Bond Proceeds (future needs based upon CIP)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Debt Service (based upon future bond proceeds)	$950,262	$950,262	$950,262	$950,262	$950,262	$950,262	$950,262	$950,262	$950,262	$950,262
Cumulative Cash Flow	$88,148	$307,150	$650,574	$1,118,556	$1,766,664	$2,552,199	$3,602,199	$4,769,603	$6,193,278	$7,774,178
Annual Enplaned Passengers (AMP)	243,212	251,481	260,031	268,872	278,014	287,466	297,240	300,000	310,200	320,747

These projections were prepared using current budget and debt service information provided by airport management and extrapolated by the consultant.
Inevitably, some of these assumptions will not be realized and unanticipated events and circumstances may occur.
Therefore, material differences may be expected between the projected and actual results.

Note 1: Operating revenues include the following: landing fees, airport parking, airport fuel revenue, tie-downs, air terminal revenue, landside leases, forest service buildings, rental car commissions, airside leases, and other miscellaneous income.

Note 2: Operating expenses include the following: personal services, materials, and services.

ROBERTS FIELD
Redmond, Oregon

Appendix A
GLOSSARY OF TERMS

Appendix A

GLOSSARY OF TERMS

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): see declared distances.

AIR CARRIER: an operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transport mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRPORT REFERENCE CODE (ARC): a coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT ELEVATION: The highest point on an airport's usable runway expressed in feet above mean sea level (MSL).

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRCRAFT APPROACH CATEGORY: a grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- *Category A:* Speed less than 91 knots.
- *Category B:* Speed 91 knots or more, but less than 121 knots.
- *Category C:* Speed 121 knots or more, but less than 141 knots.
- *Category D:* Speed 141 knots or more, but less than 166 knots.
- *Category E:* Speed greater than 166 knots.

AIRPLANE DESIGN GROUP (ADG): a grouping of aircraft based upon wingspan. The groups are as follows:

- *Group I:* Up to but not including 49 feet.
- *Group II:* 49 feet up to but not including 79 feet.
- *Group III:* 79 feet up to but not including 118 feet.
- *Group IV:* 118 feet up to but not including 171 feet.
- *Group V:* 171 feet up to but not including 214 feet.
- *Group VI:* 214 feet or greater.

AIR TAXI: An air carrier certificated in accordance with FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): a central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling, and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): a facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

ALERT AREA: see special-use airspace.

ANNUAL INSTRUMENT APPROACH (AIA): an approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): an airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: the altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

AUTOMATIC DIRECTION FINDER (ADF): an aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AUTOMATED WEATHER OBSERVATION STATION (AWOS): equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dewpoint, etc...)

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): the continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BEARING: the horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: a barrier used to divert or dissipate jet blast or propeller wash.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

CIRCLING APPROACH: a maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.

CLASS A AIRSPACE: see Controlled Airspace.

CLASS B AIRSPACE: see Controlled Airspace.

CLASS C AIRSPACE: see Controlled Airspace.

CLASS D AIRSPACE: see Controlled Airspace.

CLASS E AIRSPACE: see Controlled Airspace.

CLASS G AIRSPACE: see Controlled Airspace.

CLEAR ZONE: see Runway Protection Zone.

CROSSWIND: wind flow that is not parallel to the runway of the flight path of an aircraft.

COMPASS LOCATOR (LOM): a low power, low/medium frequency radiobeacon installed in conjunction with the instrument landing system at one or two of the marker sites.

CONTROLLED AIRSPACE: airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- *CLASS A:* generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- *CLASS B:* generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

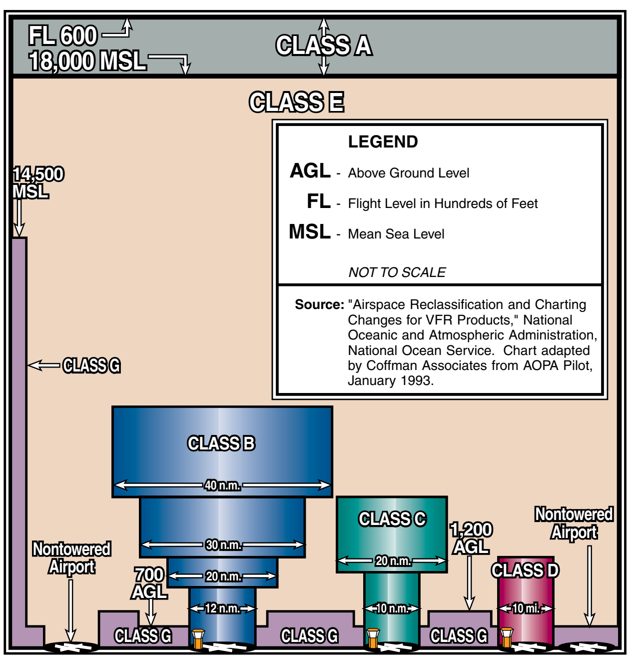
- *CLASS C:* generally, the airspace from the surface to 4,000 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- *CLASS D:* generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airport that have an operational control tower. Class D air space is individually tailored and configured to encompass published instrument approach procedures.
  Unless otherwise authorized, all

persons must establish two-way radio communication.

- *CLASS E:* generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- *CLASS G:* generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.



CONTROLLED FIRING AREA: see special-use airspace.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- *TAKEOFF RUNWAY AVAILABLE (TORA):* The runway length declared available and suitable for the ground run of an airplane taking off;

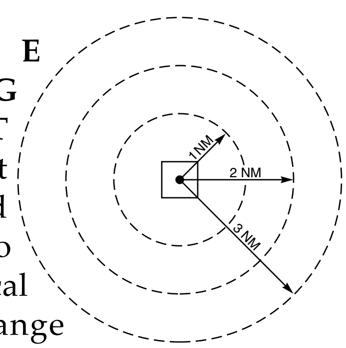
- *TAKEOFF DISTANCE AVAILABLE (TODA):* The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA;

- *ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):* The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff; and

- *LANDING DISTANCE AVAILABLE (LDA):* The runway length declared available and suitable for landing.

DISPLACED THRESHOLD: a threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range



distance of an aircraft from the DME navigational aid.

DNL: The 24-hour average sound level, in A-weighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ENPLANED PASSENGERS: the total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and non-scheduled services.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FRANGIBLE NAVAID: a navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

GENERAL AVIATION: that portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM: See "GPS."

GPS - GLOBAL POSITIONING SYSTEM: A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

HELIPAD: a designated area for the takeoff, landing, and parking of helicopters.

HIGH-SPEED EXIT TAXIWAY: a long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

INSTRUMENT APPROACH: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

LANDING DISTANCE AVAILABLE (LDA): see declared distances.

LOCAL TRAFFIC: aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch-and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): a facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LORAN: long range navigation, an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for enroute navigation.

MICROWAVE LANDING SYSTEM (MLS): an instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS AREA (MOA): see special-use airspace.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: the runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

NAVAID: a term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc..)

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NONDIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NONPRECISION APPROACH PROCEDURE: a standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

OBJECT FREE AREA (OFA): an area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

OPERATION: a take-off or a landing.

OUTER MARKER (OM): an ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline indicating to the pilot, that he/she is passing over the facility and can begin final approach.

PRECISION APPROACH: a standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- *CATEGORY I (CAT I):* a precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.

- *CATEGORY II (CAT II):* a precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- *CATEGORY III (CAT III):* a precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION OBJECT FREE AREA (POFA): an area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PROHIBITED AREA: see special-use airspace.

REMOTE COMMUNICATIONS OUTLET (RCO): an unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering enroute clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): see remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: an airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: see special-use airspace.

RNAV: area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used enroute and for approaches to an airport.

RUNWAY: a defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY BLAST PAD: a surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash.

RUNWAY END IDENTIFIER LIGHTS (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: the average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY SAFETY AREA (RSA): a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISUAL RANGE (RVR): an instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

RUNWAY VISIBILITY ZONE (RVZ): an area on the airport to be kept clear of permanent objects so that there is an unobstructed line-of-site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

SEGMENTED CIRCLE: a system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: an area adjacent to the edge of paved runways, taxiways or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SPECIAL-USE AIRSPACE: airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- *ALERT AREA:* airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- *CONTROLLED FIRING AREA:* airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- *MILITARY OPERATIONS AREA (MOA):* designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.

- *PROHIBITED AREA:* designated airspace within which the flight of aircraft is prohibited.

- *RESTRICTED AREA:* airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

- *WARNING AREA:* airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): a preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD TERMINAL ARRIVAL (STAR): a preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: a procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STRAIGHT-IN LANDING/APPROACH: a landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

TACTICAL AIR NAVIGATION (TACAN): An ultra-high frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): see declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): see declared distances.

TAXILANE: the portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: a defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY SAFETY AREA (TSA): a defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TETRAHEDRON: a device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: the beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

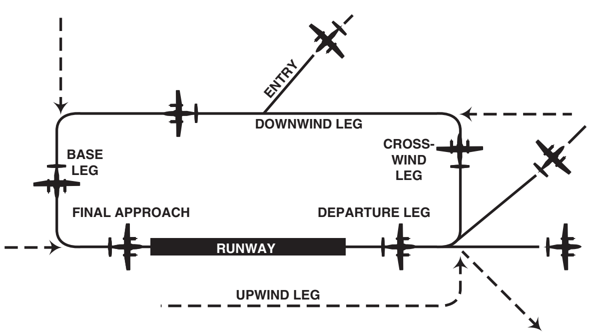
TOUCH-AND-GO: an operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.

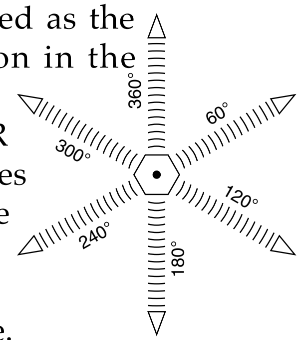


UNICOM: A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE STATION (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.



VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

WARNING AREA: see special-use airspace.

ABBREVIATIONS

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach light ing system with sequenced flashers (CAT II configuration)

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and firefighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulations

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

Coffman Associates
Airport Consultants
www.coffmanassociates.com

DWL: runway weight bearing capacity for aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity for aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LOC: ILS localizer

LOM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system

MALSR: medium intensity approach lighting system with runway alignment indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076 .1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule-making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW: public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

RCO: remote communications outlet

REIL: runway end identifier lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: Runway Safety Area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with sequenced flashers

SSALR: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel type landing gear

STWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TDZ: touchdown zone

TDZE: touchdown zone elevation

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omnidirectional range

VORTAC: VOR and TACAN collocated

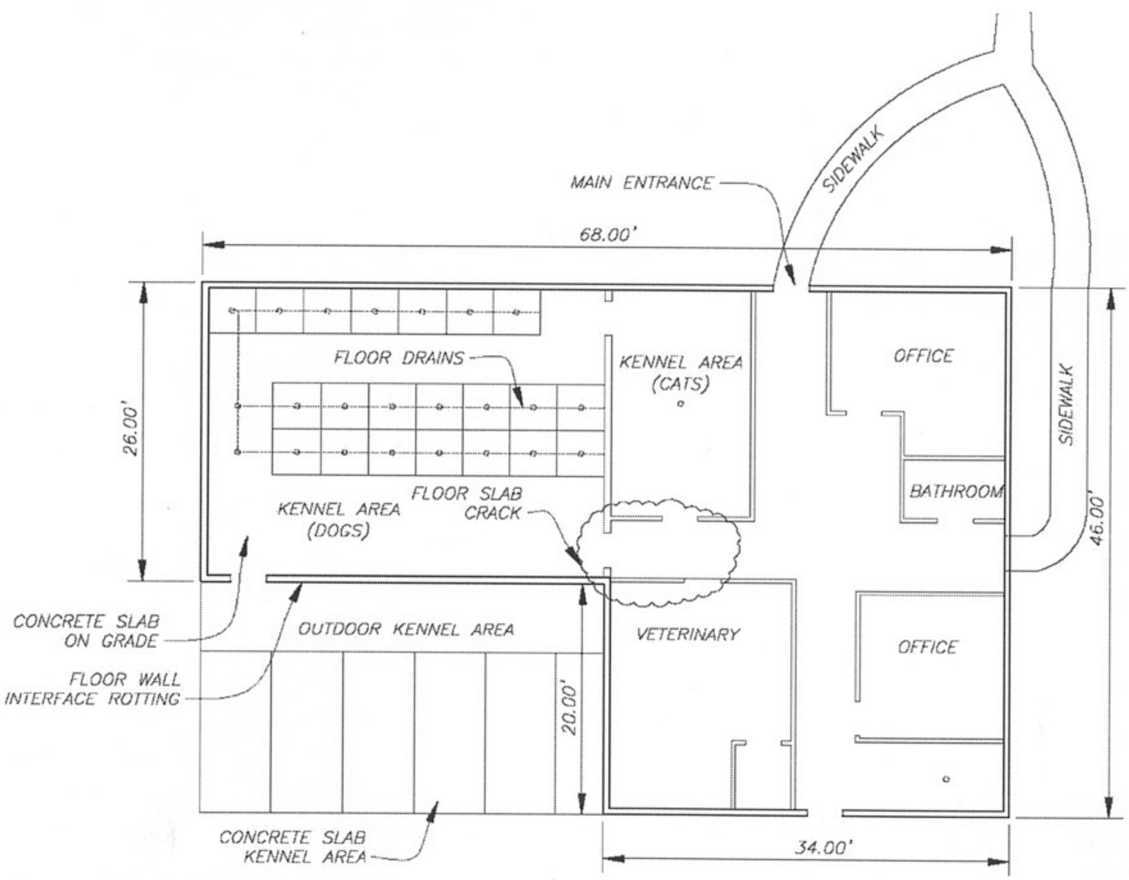
ROBERTS FIELD
Redmond, Oregon

Appendix B
BUILDING EVALUATION

HUMANE SOCIETY BUILDING

The Humane Society building is constructed of wood framed walls and roof supported on a 6" concrete foundation wall with a concrete floor slab. The building walls are 8' high typical with wood T-111 grooved siding. The roof is constructed with pre-engineered wood trusses that bear on the exterior walls and are sheathed with plywood. The roofing material is asphalt shingles. All interior partition walls and ceilings are sheathed in drywall and painted. The construction materials used for the interior walls were indeterminable due to wall coverings. The building is single level, L shaped structure with approximately 2450 square feet of occupied space. One side is 46' long by 34' wide (office, work area) and the other side is 34' long by 26' wide used as the kennel area.

Currently this building is being occupied by an animal shelter. A portion of the interior of the building is being used as a kennel area with concrete floors and floor drains for cleaning. Other uses in the building include animal holding areas with pens, office and reception area, and miscellaneous other areas where uses are conducive for this type of business.



FLOOR PLAN

CONDITION:

Roof: The roof of this building appears to be generally in good condition. An attic access allowed a visual observation of the trusses and underneath side of the roof sheathing. No detrimental structural anomalies were observed from this point. The trusses appear to be in good shape as well as the sheathing of the roof. Insulation filled the ceiling portion hindering full view of the truss bottom chords, but no problems were apparent in this area from observation of the ceiling sheathing. On the exterior, there are two areas of roofing where the shingles appear to have been blown off by wind. The more significant area of shingle loss is located on the south roof elevation. This has also occurred to a minor extent on the southwest side of the roof. Other than these areas, the roof shingles appear to be in satisfactory condition.

Exterior Walls: The exterior walls, as previously noted, are sheathed with plywood T-111 grooved siding. This siding is an exterior type and is typically used as such for buildings. Upon observation, the exterior wall siding is in satisfactory shape and appears to have been recently painted and well maintained. No discrepancies or poor conditions were noted for the siding.

Interior: All of the interior partitions and framing appears to be in satisfactory condition with the exception of the wall and doorway adjacent to the kennel area. In this area, rotting (rusting) of the bottom of the metal door jam to the kennel room as well as approximately 2' along the bottom portion of the hallway wall is visible. This appears to be caused by water infiltration from washing of the kennel floors.

Foundation: The concrete foundation was visible in the doorway openings and along the exterior of the building. Observing these areas, it appears to be in satisfactory condition with no major cracking or settlement visible. The depth of the foundation was not determinable nor was the footing. No determination was made on depth requirements or footing condition due to this.

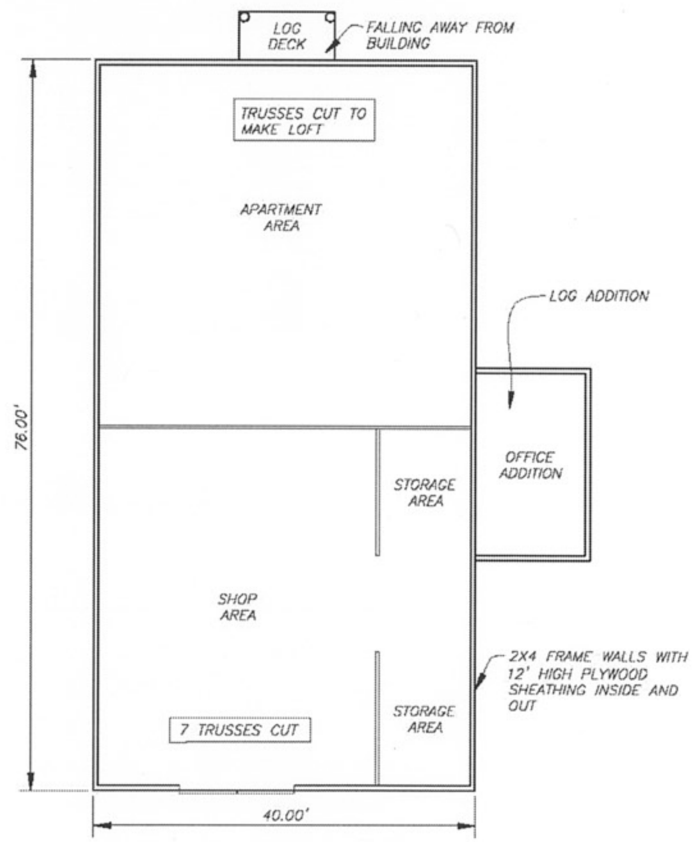
Interior Floor: The interior floor of this building is constructed of concrete slab on grade. Observation of the floor revealed no major problem areas. The floor is generally in good condition. There are some cracks visible in the floor, but there is no elevation difference across these cracks. They appear to be stress relief cracks typical of concrete floors.

RECOMMENDATION: Generally this building is in satisfactory condition. If the occupancy of the building was to change, however, it may be necessary to remodel the interior of the building to alleviate the odor of animals that is apparent at this time. It also may be necessary to remodel the interior to alleviate any rotting/rusting problems that are starting to occur in the walls as mentioned. On another note, parking on the exterior is limited, with only 4 parking stalls on the south side. It appears that more parking may be available on the north side. Limited parking may hinder the occupancy use of the building.

MAINTENANCE/EQUIPMENT SHOP

The maintenance/equipment building is a wood frame structure rectangular in shape, 40' wide by 76' long with 12' high side walls. It has an addition located on the north side that is 12' wide by 24 feet long Construction typically consists of 2x4 framed exterior walls supporting wood trusses located on 4' centers. Exterior siding varies from standard plywood on the eastern 2/3 of the building walls to a board and batten system on the remaining western portion of the walls. The addition on the north side also has a board and batten siding. None of the exterior shows signs of preservative wood treatment and is weathering accordingly. The roofing of the structure's exterior consists of metal ribbed sheathing panels.

Currently, forty four feet (44') of the east portion of the building, is being used as a truck maintenance shop. The remaining portion of the main structure is being used as a residence area, with partitions defining the different interior rooms. In addition, there is a lean-to type structure located on the north side of the building that is being used as an equipment rental/sales office. This addition is approximately 12' wide by 24' long located 24' from the east end.



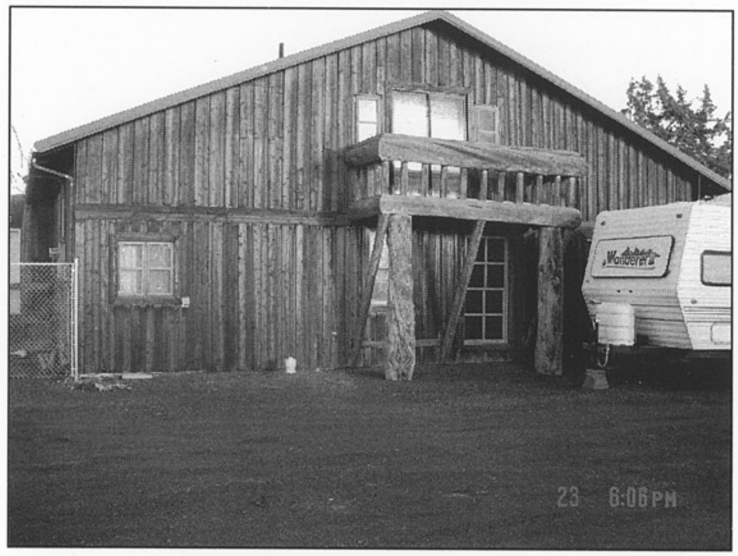
MAINTENANCE SHOP AND EQUIPMENT SALES

CONDITION:

Exterior Roof: Most of the exterior metal roofing appears to be in satisfactory condition. Talking with the current tenants, there seams to be some leaking problems at the connection of the addition to the main building. This area could not be observed due to finish coverings.

Roof Structure: In the truck shop maintenance area, the roof trusses are exposed to view. The first 7 trusses starting from the east wall have been modified at one time and have had their bottom chords cut out to facilitate more headroom in the shop area. This has rendered these trusses incapable of supporting the required dead loads and live loads for roof trusses. There was some additional framing added to these trusses, but they are currently structurally unsound. Over the apartment area it also appears that the trusses have been modified to accommodate an upper floor loft area, but this could not be confirmed. If they have been modified for this, these trusses would also be structurally unstable.

Exterior Walls: The exterior walls on the east two thirds of the building, as previously noted, are sheathed with standard plywood sheeting, both interior and exterior. The remaining portion of the building, including the addition has a 2x6 and 2x4 board and batten type siding. Generally, all of the siding is in poor shape and showing signs of deterioration due to weather. There has been a deck constructed on the west wall with access from the interior loft area. This deck is falling away from the building and appears to be structurally unsound at this time.



Interior Floors: In the maintenance shop area, the floor is concrete slab on grade. In this area the floor is in poor shape with major cracking and differential slab heights across the cracks. The floor in the apartment area could not be observed due to carpet coverings. The floor in the addition could not be determined due to floor coverings.

Foundation: The concrete foundation was only visible in the doorway openings and along portions of the exterior of the building. Observing these areas, it appears to be in satisfactory condition with no major cracking or settlement visible. The depth of the foundation was not determinable nor was the footing. No determination was made on depth requirements or footing condition due to this. The foundation under the addition on the north side was undeterminable. It appears that this foundation was constructed of log timbers but a determination could not be made as to depth in the ground or if a concrete footing or foundation wall existed. The exposed timbers that appear to be the foundation support for the building were in substandard condition, showing signs of weather deterioration. The timbers in contact with ground did not appear to be pressure treated, which does not meet building code requirements.

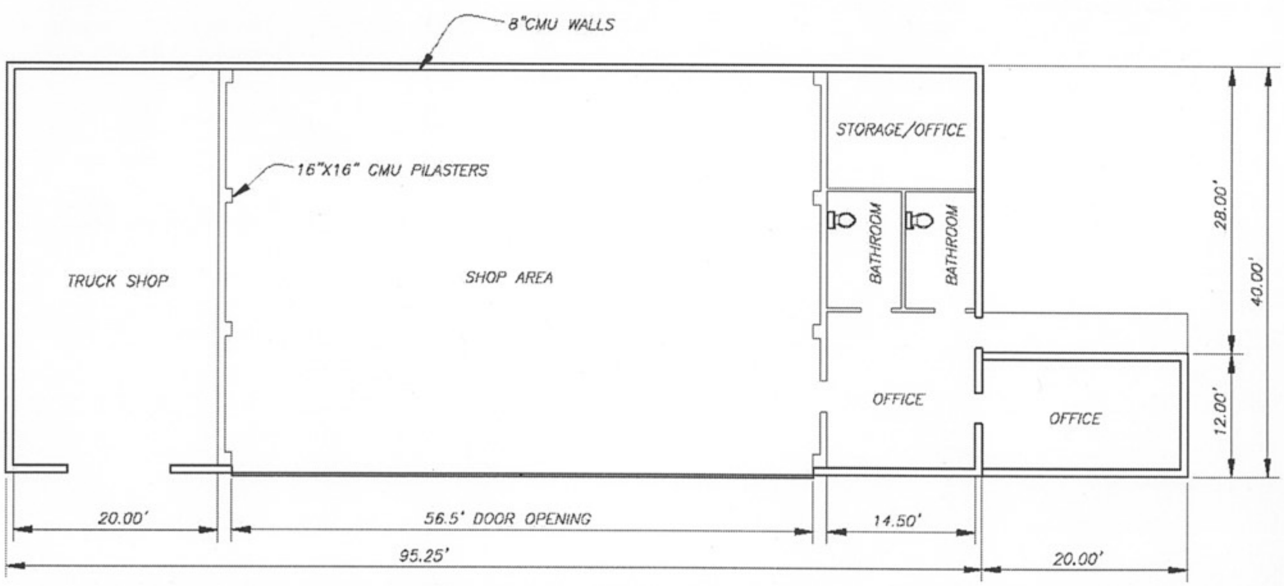
More Notes: Evidence of termite infestation was visible inside the apartment area and was confirmed with the local tenant.

RECOMMENDATION: Due to the modification of the trusses, this building would require remodeling and reconstruction of the trusses to make them structurally sound. Also, evidence of termite infestation indicates the structure may be in substandard condition. Extensive remodeling would be required to upgrade this structure to a safe condition, conforming to current building codes.

BUTLER AIRCRAFT MAINTENACE BUILDING

The Butler Aircraft building is constructed of concrete masonry unit (cmu) walls with a wood truss roof supported on concretes footings with a concrete floor slab. The building walls of the main hangar area are 12' high typical. In the truck shop area on the west side they are 10' high and the office area and office addition on the east side they very from 10' to 8' high. The roof over the hangar area is constructed with large pre-engineered wood trusses spaced at 13'-0" on center that bear on 16" square cmu pilasters built into the side walls. Wood 2x8 rafters span the distance between trusses and 2x6 flat nailers are installed on top of these rafters, creating the roof structure. Metal rib panels make up the roof covering over this framing. The roof construction over the additions on either side are constructed of 2x8 rafters on 24" centers with 2x6 flat nailers spanning perpendicular and metal rib panels for the roofing. There is also an office addition on the east side of the hangar that is constructed of 8" cmu walls and pre-engineered roof trusses with the same metal rib panel roofing. There is a hangar door opening facing south that is 56' wide by 12' high that opens up the entire front part of the hangar portion of this building. The doors that cover this opening are constructed with steel frames, ribbed metal exterior sheathing, flat steel interior sheet panels and insulation. There are a total of 4 bay doors. They are supported by steel wheels on steel tracks cast in concrete along the floor. The top of the doors are guided by barn door type tracking and roller guides.

Currently this building is being used and an aircraft maintenance shop with parts storage, office area and garage area. The building has concrete floors throughout.



BUTLER AIRCRAFT MAINTENANCE BUILDING

CONDITION:

Exterior Roof: Most of the exterior metal roofing appears to be in satisfactory condition. There are visible signs of leaking problems with the connection of the west side garage addition to the main building. This is apparent by water stains in the drywall on the ceiling. This could be observed from inside the garage area. No other water staining was noted in the rest of the structure.

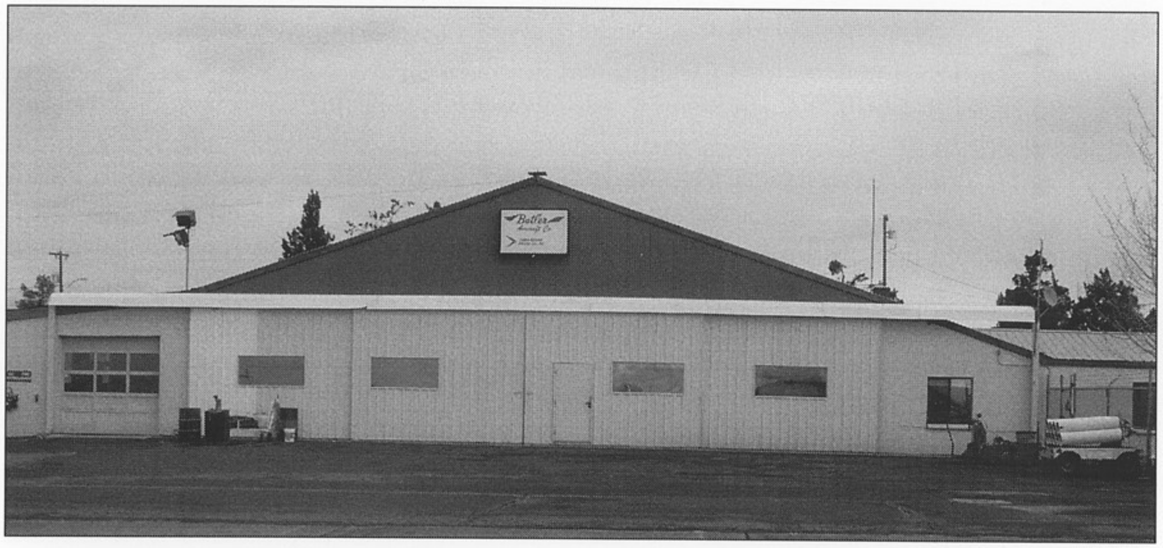
Roof Structure: In the aircraft maintenance area, the large roof trusses could be observed from an attic access. The trusses appear to be in satisfactory condition. The ceiling and roof rafter framing over the office/restroom area of the main structure could also be observed from this access point and this framing appeared satisfactory. Roof/ceiling framing over the garage area on the west side was not accessible, but as noted previously, the only discrepancy apparent was the water staining on the ceiling drywall. The office addition on the east side was not accessible, but visually observing the interior ceilings and exterior roof structure, this area appeared to be in satisfactory condition.

Exterior and Interior Walls: The exterior walls of the entire structure are constructed of 8" cmu. The walls appear to be in satisfactory condition. No major cracking was observed that would indicate settlement or structural problems. The walls are painted both inside and out white in color. In the office area, there are partition walls covered in drywall and painted. These walls also appear to be in satisfactory condition.

Foundation: The exterior foundation was visible in the doorway openings and along the south west exterior corner of the building. Observing these areas, it appears the foundation is constructed of cmu block on a concrete footing. Observation of the areas that were visible, it appears to be in satisfactory condition with no major cracking or settlement visible. The depth of the foundation was not determinable nor was the footing, although a portion of both were showing in the south west corner at grade level. No determination was made on depth requirements or footing condition due to this.

Interior Floor: The interior floor of this building is constructed of concrete slab on grade. Observation of the floor revealed no major problem areas. The floor is generally in good condition. There are some cracks visible in the floor, but there is none or only minor elevation difference across these cracks. They appear to be stress relief cracks typical of concrete floors. The floor is painted white in the maintenance area.

Hangar Doors and Opening: The front of the building has a hangar door opening area 56' wide by 12' high across the hangar maintenance area. This opening is covered by a large, 4 panel rolling door system. These doors are constructed of steel framework with insulation and metal sheathing interior and ribbed metal sheathing on their exterior. The doors are bottom rolling type, using a wheel and track system to support their weight on the ground and guidance track along the top. Their weight is supported by wheels on a steel track embedded in a concrete footing along the bottom. Upon observation, it appears that some of the weight of these door panels has shifted to the roof truss over the door opening. This is apparent by a slight deflection down in the truss over the door opening and also by the fact that 2 of the door panels were not resting on their bottom tracks.

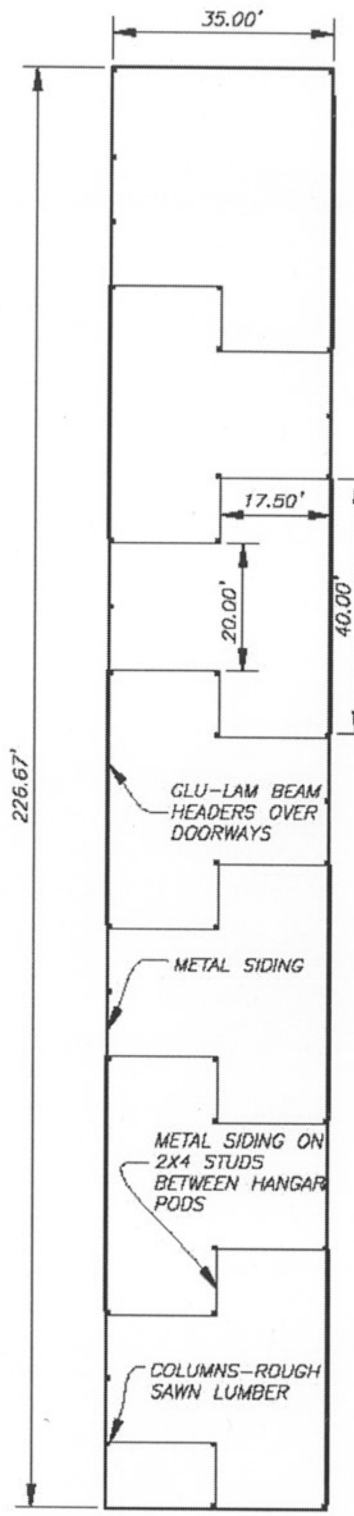


RECOMMENDATION: Generally this building is in satisfactory condition. The cmu walls are in good condition with no major cracking visible. The roof leak over the garage should be repaired so water rotting of the structure does not occur. The large hangar doors should be adjusted so that they only utilize the bottom roller track to support their weight. This may require that a new track be constructed along the ground to better support the doors. This would alleviate the door weight from the building truss. It doesn't appear that the truss over the door opening was designed to handle the weight of the doors, apparent by its current deflection and its construction is similar to the other trusses in the building which only support roof and ceiling load.

HANGAR COMPLEXES A AND B

Hangar complexes A and B are two similar aircraft hangar facilities. They are each 35' wide by 227' long. They are approximately 14' tall along their eaves with 12' high clear door openings and 15' tall along the ridge line. Each unit has the capacity to hangar 7 aircraft, 3 on one side and 4 on the other. The configuration of the unit is the nested T type. Each unit has a 40' clear door opening and is 35' deep. There is a storage area at the end of each hangar that is extra space along side the last aircraft. Each door opening has a glu-lam beam spanning the door opening and supporting the roof framing. Typical roof framing consists of 2x12 rafters on 24" centers. On top of these are 2x4 flat-wise nailers on 24" centers supporting a metal ribbed roof decking. The structure is composed of a post frame system with pressure treated posts supported by concrete piers cast into the ground. Each post is supported by a metal angle bracket with anchor bolts cast into the concrete. Wall framing and roof framing is supported by this post system throughout the structure. There is metal cross bracing at each hangar wall that provides lateral support to the structure. The buildings were built over the existing ground, so the floors vary from old asphalt paving to concrete slabs that were in existence before the hangars were constructed. The roof framing is support by 2x12 beams spanning between posts over non-door opening areas and by the glu-lam beams over the door openings. Typically the hangar doors are steel framed panels covered with metal rib siding on the exterior and are supported on metal tracks embedded in a concrete footing at ground level. These doors are guided along their tops by metal tracks with guidance rollers.

Currently the buildings are used to store general aviation aircraft, are unheated and un-insulated. The units have power to them and there are lighting abilities set up in some on the hangars.



TYPICAL T-HANGAR LAYOUT

CONDITION:

Exterior Roofing: The exterior metal roofing appears to be in satisfactory condition on both of these buildings. Metal flashing covers the top of the doors to prevent moisture infiltration at these locations. This flashing is in satisfactory condition except at Hangar 1, Complex A, where it shows signs of damage.

Roof Framing Structure: The roof structure appears to be in satisfactory condition in both buildings. Upon observance, the wood framing materials are in good condition with no broke pieces or rotting or overstressing visible. The glu-lam beams are in good condition over the door openings. These beams have been well protected from weather and moisture and are in satisfactory condition.

Wall Structure: The interior framing also appears to be in good shape. Most of the wood is in satisfactory condition and the posts are all in good shape with no rotting or problem areas apparent. In general, the wood wall framing in both buildings is in satisfactory condition.

Interior: floors. The interior floors of each of the hangars consist of what was previously covering the ground before the buildings were erected. It varies from concrete slab to asphalt paving materials. It is not really good material, but for a hangar storage floor it performs to a satisfactory level. Since the existing ground coverings do not add to the structural integrity of the hangars they are not a concern in their current condition.

Foundation: The foundation of these structures consists of concrete piers cast into the ground that support post framing above grade. The piers all appear to be in satisfactory condition as well as the post connections that are supported on the piers. The posts are also in good condition, all are pressure treated or cedar timbers and due not show signs of distress or rotting.

RECOMMENDATION: Both hangar complexes are in good shape, No modification would be required at this time for their structural integrity. Each hangar unit should be continually maintained over time to alleviate any moisture problems that could potentially infiltrate the framework and cause long term damage, such as repairing the door flashing over Hangar 1 in Complex A.

Appendix C
AIRFIELD DESIGN STANDARDS

AIRPORT AND RUNWAY DATA

Airport elevation	3081 feet
Mean daily maximum temperature of the hottest month	86.00 F.
Maximum difference in runway centerline elevation	36 feet
Length of haul for airplanes of more than 60,000 pounds	1000 miles
Wet and slippery runways	

RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN

Small airplanes with approach speeds of less than 30 knots . . .	390 feet
Small airplanes with approach speeds of less than 50 knots . . .	1050 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3570 feet
95 percent of these small airplanes	4430 feet
100 percent of these small airplanes	4890 feet
Small airplanes with 10 or more passenger seats	4900 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	5920 feet
75 percent of these large airplanes at 90 percent useful load	8260 feet
100 percent of these large airplanes at 60 percent useful load	7250 feet
100 percent of these large airplanes at 90 percent useful load	9450 feet
Airplanes of more than 60,000 pounds . . . . Approximately	7230 feet

REFERENCE: Chapter 2 of AC 150/5325-4A, Runway Length Requirements for Airport Design, no Changes included.

AIRPORT DESIGN AIRPLANE AND AIRPORT DATA

Q-200

Aircraft Approach Category B
Airplane Design Group III
Airplane wingspan . . . . 85.00 feet
Primary runway end approach visibility minimums are not lower than 1 mile
Other runway end approach visibility minimums are not lower than 1 mile
Airplane wheelbase is less than 60 feet
Airplane undercarriage width (1.15 x main gear track) . . . 30.00 feet
Airport elevation . . . . 3081 feet

RUNWAY AND TAXIWAY WIDTH AND CLEARANCE STANDARD DIMENSIONS

	Airplane	Group/ARC
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is not treated as a factor:		
VFR operations with no intervening taxiway		700 feet
VFR operations with one intervening taxiway		700 feet
VFR operations with two intervening taxiways		752 feet
IFR approach and departure with approach to near threshold 2500 feet less 100 ft for each 500 ft of threshold stagger to a minimum of 1000 feet.		
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is treated as a factor:		
VFR operations		2500 feet
IFR departures		2500 feet
IFR approach and departure with approach to near threshold . .		2500 feet
IFR approach and departure with approach to far threshold 2500 feet plus 100 feet for each 500 feet of threshold stagger.		
IFR approaches		3400 feet
Runway centerline to parallel taxiway/taxilane centerline .	242.5	300 feet
Runway centerline to edge of aircraft parking	400.0	400 feet
Runway width		100 feet
Runway shoulder width		20 feet
Runway blast pad width		140 feet
Runway blast pad length		200 feet
Runway safety area width		300 feet
Runway safety area length beyond each runway end or stopway end, whichever is greater		600 feet
Runway object free area width		800 feet
Runway object free area length beyond each runway end or stopway end, whichever is greater		600 feet
Clearway width		500 feet
Stopway width		100 feet
Obstacle free zone (OFZ):		
Runway OFZ width		400 feet
Runway OFZ length beyond each runway end		200 feet
Inner-approach OFZ width		400 feet
Inner-approach OFZ length beyond approach light system		200 feet
Inner-approach OFZ slope from 200 feet beyond threshold . . .		50:1
Inner-transitional OFZ slope		0:1
Runway protection zone at the primary runway end:		
Width 200 feet from runway end		500 feet

Width 1200 feet from runway end		700 feet
Length		1000 feet

Runway protection zone at other runway end:

Width 200 feet from runway end		500 feet
Width 1200 feet from runway end		700 feet
Length		1000 feet

Departure runway protection zone:

Width 200 feet from the far end of TORA		500 feet
Width 1200 feet from the far end of TORA		700 feet
Length		1000 feet

Threshold surface at primary runway end:

Distance out from threshold to start of surface		0 feet
Width of surface at start of trapezoidal section		400 feet
Width of surface at end of trapezoidal section		1000 feet
Length of trapezoidal section		1500 feet
Length of rectangular section		8500 feet
Slope of surface		20:1

Threshold surface at other runway end:

Distance out from threshold to start of surface		0 feet
Width of surface at start of trapezoidal section		400 feet
Width of surface at end of trapezoidal section		1000 feet
Length of trapezoidal section		1500 feet
Length of rectangular section		8500 feet
Slope of surface		20:1

Taxiway centerline to parallel taxiway/taxilane centerline	112.0	152 feet
Taxiway centerline to fixed or movable object	69.5	93 feet
Taxilane centerline to parallel taxilane centerline	103.5	140 feet
Taxilane centerline to fixed or movable object	61.0	81 feet
Taxiway width	50.0	50 feet
Taxiway shoulder width		20 feet
Taxiway safety area width	85.0	118 feet
Taxiway object free area width	139.0	186 feet
Taxilane object free area width	122.0	162 feet
Taxiway edge safety margin		10 feet
Taxiway wingtip clearance	27.0	34 feet
Taxilane wingtip clearance	18.5	22 feet

REFERENCE: AC 150/5300-13, Airport Design, including Changes 1 through 4.

AIRPORT DESIGN AIRPLANE AND AIRPORT DATA

Q-400

Aircraft Approach Category C
Airplane Design Group III
Airplane wingspan . . . . 93.30 feet
Primary runway end approach visibility minimums are not lower than CAT I
Other runway end approach visibility minimums are not lower than 1 mile
Airplane maximum certificated takeoff weight is 150,000 lbs or less
Airplane wheelbase is less than 60 feet
Airplane undercarriage width (1.15 x main gear track) . . . 33.00 feet
Airport elevation . . . . 3081 feet
Airplane tail height . . . . 27.30 feet

RUNWAY AND TAXIWAY WIDTH AND CLEARANCE STANDARD DIMENSIONS

		Airplane Group/ARC
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is not treated as a factor:		
VFR operations with no intervening taxiway		700 feet
VFR operations with one intervening taxiway		800 feet
VFR operations with two intervening taxiways		952 feet
IFR approach and departure with approach to near threshold 2500 feet less 100 ft for each 500 ft of threshold stagger to a minimum of 1000 feet.		
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is treated as a factor:		
VFR operations		2500 feet
IFR departures		2500 feet
IFR approach and departure with approach to near threshold		2500 feet
IFR approach and departure with approach to far threshold 2500 feet plus 100 feet for each 500 feet of threshold stagger.		
IFR approaches		3400 feet
Runway centerline to parallel taxiway/taxilane centerline	296.6	400 feet
Runway centerline to edge of aircraft parking	400.0	500 feet
Runway width		100 feet
Runway shoulder width		20 feet
Runway blast pad width		140 feet
Runway blast pad length		200 feet
Runway safety area width		500 feet
Runway safety area length beyond each runway end or stopway end, whichever is greater		1000 feet
Runway object free area width		800 feet
Runway object free area length beyond each runway end or stopway end, whichever is greater		1000 feet
Clearway width		500 feet
Stopway width		100 feet
Obstacle free zone (OFZ):		
Runway OFZ width		400 feet
Runway OFZ length beyond each runway end		200 feet
Inner-approach OFZ width		400 feet
Inner-approach OFZ length beyond approach light system		200 feet
Inner-approach OFZ slope from 200 feet beyond threshold		50:1
Inner-transitional OFZ height H	43.0	40.7 feet
Inner-transitional OFZ slope		6:1

Runway protection zone at the primary runway end:

Width 200 feet from runway end	1000 feet
Width 2700 feet from runway end	1750 feet
Length	2500 feet

Runway protection zone at other runway end:

Width 200 feet from runway end	500 feet
Width 1900 feet from runway end	1010 feet
Length	1700 feet

Departure runway protection zone:

Width 200 feet from the far end of TORA	500 feet
Width 1900 feet from the far end of TORA	1010 feet
Length	1700 feet

Threshold surface at primary runway end:

Distance out from threshold to start of surface	200 feet
Width of surface at start of trapezoidal section	1000 feet
Width of surface at end of trapezoidal section	4000 feet
Length of trapezoidal section	10000 feet
Length of rectangular section	0 feet
Slope of surface	34:1

Threshold surface at other runway end:

Distance out from threshold to start of surface	0 feet
Width of surface at start of trapezoidal section	400 feet
Width of surface at end of trapezoidal section	1000 feet
Length of trapezoidal section	1500 feet
Length of rectangular section	8500 feet
Slope of surface	20:1

Taxiway centerline to parallel taxiway/taxilane centerline	122.0	152 feet
Taxiway centerline to fixed or movable object	75.3	93 feet
Taxilane centerline to parallel taxilane centerline	112.6	140 feet
Taxilane centerline to fixed or movable object	66.0	81 feet
Taxiway width	53.0	53 feet
Taxiway shoulder width		20 feet
Taxiway safety area width	93.3	118 feet
Taxiway object free area width	150.7	186 feet
Taxilane object free area width	131.9	162 feet
Taxiway edge safety margin		10 feet
Taxiway wingtip clearance	28.7	34 feet
Taxilane wingtip clearance	19.3	22 feet

REFERENCE: AC 150/5300-13, Airport Design, including Changes 1 through 4.

AIRPORT DESIGN AIRPLANE AND AIRPORT DATA

C-130

Aircraft Approach Category C	
Airplane Design Group IV	
Airplane wingspan	132.60 feet
Primary runway end approach visibility minimums are not lower than CAT I	
Other runway end approach visibility minimums are not lower than CAT I	
Airplane undercarriage width (1.15 x main gear track)	30.00 feet
Airport elevation	3081 feet
Airplane tail height	39.30 feet

RUNWAY AND TAXIWAY WIDTH AND CLEARANCE STANDARD DIMENSIONS

	Airplane	Group/ARC
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is not treated as a factor:		
VFR operations with no intervening taxiway		700 feet
VFR operations with one intervening taxiway		800 feet
VFR operations with two intervening taxiways		1015 feet
IFR approach and departure with approach to near threshold 2500 feet less 100 ft for each 500 ft of threshold stagger to a minimum of 1000 feet.		
Runway centerline to parallel runway centerline simultaneous operations when wake turbulence is treated as a factor:		
VFR operations		2500 feet
IFR departures		2500 feet
IFR approach and departure with approach to near threshold		2500 feet
IFR approach and departure with approach to far threshold 2500 feet plus 100 feet for each 500 feet of threshold stagger.		
IFR approaches		3400 feet
Runway centerline to parallel taxiway/taxilane centerline	316.3	400 feet
Runway centerline to edge of aircraft parking	400.0	500 feet
Runway width		150 feet
Runway shoulder width		25 feet
Runway blast pad width		200 feet
Runway blast pad length		200 feet
Runway safety area width		500 feet
Runway safety area length beyond each runway end or stopway end, whichever is greater		1000 feet
Runway object free area width		800 feet
Runway object free area length beyond each runway end or stopway end, whichever is greater		1000 feet
Clearway width		500 feet
Stopway width		150 feet
Obstacle free zone (OFZ):		
Runway OFZ width		400 feet
Runway OFZ length beyond each runway end		200 feet
Inner-approach OFZ width		400 feet
Inner-approach OFZ length beyond approach light system		200 feet
Inner-approach OFZ slope from 200 feet beyond threshold		50:1
Inner-transitional OFZ height H	39.3	35.7 feet
Inner-transitional OFZ slope		6:1

Runway protection zone at the primary runway end:

Width 200 feet from runway end	1000 feet
Width 2700 feet from runway end	1750 feet
Length	2500 feet

Runway protection zone at other runway end:

Width 200 feet from runway end	1000 feet
Width 2700 feet from runway end	1750 feet
Length	2500 feet

Departure runway protection zone:

Width 200 feet from the far end of TORA	500 feet
Width 1900 feet from the far end of TORA	1010 feet
Length	1700 feet

Threshold surface at primary runway end:

Distance out from threshold to start of surface	200 feet
Width of surface at start of trapezoidal section	1000 feet
Width of surface at end of trapezoidal section	4000 feet
Length of trapezoidal section	10000 feet
Length of rectangular section	0 feet
Slope of surface	34:1

Threshold surface at other runway end:

Distance out from threshold to start of surface	200 feet
Width of surface at start of trapezoidal section	1000 feet
Width of surface at end of trapezoidal section	4000 feet
Length of trapezoidal section	10000 feet
Length of rectangular section	0 feet
Slope of surface	34:1

Taxiway centerline to parallel taxiway/taxilane centerline	169.1	215 feet
Taxiway centerline to fixed or movable object	102.8	129.5 feet
Taxilane centerline to parallel taxilane centerline	155.9	198 feet
Taxilane centerline to fixed or movable object	89.6	112.5 feet
Taxiway width	60.0	75 feet
Taxiway shoulder width		25 feet
Taxiway safety area width	132.6	171 feet
Taxiway object free area width	205.6	259 feet
Taxilane object free area width	179.2	225 feet
Taxiway edge safety margin		15 feet
Taxiway wingtip clearance	36.5	44 feet
Taxilane wingtip clearance	23.3	27 feet

REFERENCE: AC 150/5300-13, Airport Design, including Changes 1 through 4.

ROBERTS FIELD
Redmond, Oregon

Appendix D
AIRCRAFT NOISE ANALYSIS

Appendix D
AIRCRAFT NOISE ANALYSIS

This aircraft noise analysis was prepared to assess aircraft noise at Roberts Field/Redmond Municipal Airport based on current and future operations. In addition, a 1,460-foot extension to Runway 4 is included in the 2008 future aircraft noise assessment. In the long range 2023 noise assessment, a 1,500-foot extension to Runway 22 and an 8,000-foot parallel Runway 4R-22L are included in the analysis. The following discussion describes the methodology, input assumptions, and results of aircraft noise analysis.

AIRCRAFT NOISE ANALYSIS METHODOLOGY

The standard methodology for analyzing the prevailing noise conditions at airports involves the use ofa computer simulation model. The Federal Aviation Administration (FAA) has approved the Integrated Noise Model (INM) for developing noise exposure contours at civilian airports.

The INM is designed as a conservative planning tool, tending to slightly overstate noise. The model and its database are periodically updated based on the philosophy that each version should err on the side of over-prediction while each subsequent update moves closer to reality. Version 6.1 is the most current version of the INM at this time. It is the version used for the noise analysis described in this analysis.

INM describes aircraft noise in *Yearly Day-Night Average Sound Level* (DNL). DNL accounts for the increased sensitivity to noise at night (10:00 p.m. to 7:00 a.m.) and is the metric preferred by the FAA, Environmental Protection Agency (EPA), and Department of Housing and Urban Development (HUD), among others, as an appropriate measure of cumulative noise exposure.

DNL is defined as the average A-weighted sound level as measured in decibels during a 24-hour period. A 10-decibel weighting is applied to noise events occurring during the nighttime hours. DNL is a summation metric which allows for objective analysis and can describe noise exposure comprehensively over a large area. In addition to being widely accepted, the primary benefit ofusing the DNL metric is that it accounts for the average community response to noise as determined by the actual number and types of noise events and the time of day they occur.

The INM works by defining a network ofgrid points at ground level around the airport. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure for each aircraft operation, by aircraft type and engine thrust level, along each flight track. Corrections are applied for air-to-ground acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are then summed at each grid location. The cumulative noise exposure levels at all grid points are then used to develop noise exposure contours for selected values (we show 55, 60, 65, 70, and 75 DNL). Noise contours are then plotted on a base map of the airport environs using the DNL metrics.

Federal Aviation Regulation (FAR) Part 150 provides guidelines for compatible land uses around an airport based upon DNL. The Oregon Department of Environmental Quality (DEQ) defines noise sensitive uses as property normally used for sleeping or used as schools, churches, hospitals, or public libraries. Residential uses usually present the most noise sensitive uses. 65 DNL has been identified as the threshold of incompatibility.

In addition to the mathematical procedures defined in the model, the INM has another very important element. This is a database containing tables correlating noise, thrust settings, and flight profiles for most of the civilian aircraft, and many common military aircraft, operating in the United States. This database, often referred to as the noise curve data, has been developed under FAA guidance based on rigorous noise monitoring in controlled settings. In fact, the INM database was developed through more than a decade of research including extensive field measurements of more than 10,000 aircraft operations. The database also includes performance data for each aircraft to allow for the computation of airport-specific flight profiles (rates of climb and descent).

INM INPUT

A variety of user-supplied input data is required to use the INM. This includes the airport elevation, average annual temperature, a mathematical definition of the airport runways, the mathematical description of ground tracks above which aircraft fly, and the assignment of specific aircraft with specific engine types at specific takeoff weights to individual flight tracks. In addition, aircraft not included in the model's database may be defined for modeling, subject to FAA approval.

For the purposes of this analysis, computer input files were prepared for the existing (2003) noise condition without planned airfield changes at Roberts Field/Redmond Municipal Airport. The 2008 noise contours were developed with a 1,460-foot extension to Runway 4. The 2023 noise contours were developed with a 1,460-foot extension to

Runway 4, a 1,500-foot extension to Runway 22 and an 8,000-foot parallel Runway 4R-22L.

OPERATIONS AND FLEET MIX

The number of aircraft operating at the airport on an average day is the result of a compilation of all recorded operations during the base period divided by the number of days in the period. The distribution of these operations among various categories, users, and types of aircraft is part of the basic input data required for the model. Operational and fleet mix shown in **Table 1** is based on forecasting information in the Airport Master Plan.

DATABASE SELECTION

For the general aviation aircraft, the FAA has published a Pre-Approved List of Aircraft Substitutions. The list indicates that the general aviation single engine fixed pitch propeller and variable pitched models, the GASEPF and GASEPV, represent a broad range of single engine general aviation aircraft. The list recommends the use of BEC58P for the light twin-engine aircraft. The CNA441 was used to represent the small turboprop aircraft. The DHC6 was used to represent the larger turboprop aircraft. The CNA500, Lear25, Lear35 and GIV were used to model the range of the business jets at the airport. The CL601, DHC8, EMB120 and DHC830 were used to model the range of commercial aircraft at the airport. The B206L was used to represent the civilian helicopters and the S70 was used to represent the military helicopters operating at the airport. The DC6 and the P3A were used to represent the United States Forest Service aircraft. All substitutions are in accordance with the Pre-Approved Substitution List and are commensurate with published FAA guidelines.

TABLE 1
Existing and Forecast Annual Operations
Roberts Field/Redmond Municipal Airport

	INM Designator	2003	2008	2023
GENERAL AVIATION (Itinerant)				
Single Engine Piston Variable Pitch	GASEPV	5,665	6,475	11,278
Single Engine Piston Fixed Pitch	GASEPF	7,935	9,225	14,171
Twin-Engine Piston Fixed Pitch	BEC58P	1,290	1,635	1,998
Turboprop	CNA441	1,660	2,550	3,872
Helicopter	B206L	130	315	386
Business Jet	CNA500	800	1,000	1,224
Business Jet	GIV	600	1,370	1,676
Business Jet	Lear25	600	300	0
Business Jet	Lear35	1,030	850	2,115
COMMERCIAL *(Itinerant)*				
Regional Jet	CL601	0	9,300	10,500
Turboprop	DHC8	6,400	0	0
Turboprop	EMB120	6,400	0	0
Turboprop	DHC830	0	4,000	4,500
Military				
Helicopter	S70	400	400	400
United States Forestry Service				
Piston	DC6	375	375	375
Turboprop	P3A	375	375	375
Subtotal		33,660	38,170	52,870
GENERAL AVIATION (Local)				
Single Engine Piston Variable Pitch	GASEPV	9,165	10,940	16,875
Single Engine Piston Fixed Pitch	GASEPF	9,165	10,940	16,875
Twin-Engine Piston Fixed Pitch	BEC58P	2,288	3,020	4,650
Military				
Helicopter	S70	100	100	100
Subtotal		20,718	25,000	38,500
TOTAL ANNUAL OPERATIONS		54,378	63,170	91,370

Source: Airport Master Plan

TIME-OF-DAY

The time-of-day at which operations occur is important as input to the INM due to the penalty weighting of nighttime (10:00 p.m. to 7:00 a.m.) operations. In calculating airport noise exposure, one nighttime operation is equivalent to ten daytime operations. General aviation nighttime operations were assumed to occur approximately five percent of the time.

RUNWAY USE

The use of a specific runway is typically influenced by wind direction. The runway use percentages assumed for both the 2003 and 2008 analysis are summarized in **Table 2**. The runway use percentages assumed for 2023 are summarized in **Table 3**.

TABLE 2
Runway Use (2003 and 2008)
Roberts Field/Redmond Municipal Airport

Runway	Commercial	Business Jet & Turboprop	Single and Multi-Engine Piston Itinerant	Military Helicopter	Single and Multi-Engine Piston Local
ARRIVALS					
4	37.0%	10.0%	20.0%	40.0%	30.0%
22	60.0%	40.0%	20.0%	60.0%	20.0%
10	1.0%	10.0%	25.0%	0.0%	30.0%
28	2.0%	40.0%	35.0%	0.0%	20.0%
DEPARTURES					
4	60.0%	20.0%	20.0%	50.0%	30.0%
22	37.0%	20.0%	20.0%	50.0%	20.0%
10	2.0%	50.0%	50.0%	0.0%	30.0%
28	1.0%	10.0%	10.0%	0.0%	20.0%

TABLE 3
Runway Use (2023)
Roberts Field/Redmond Municipal Airport

Runway	Commercial	Business Jet & Turboprop	Single and Multi-Engine Piston Itinerant	Military Helicopter	Single and Multi-Engine Piston Local
ARRIVALS					
4L	18.5%	10.0%	20.0%	40.0%	0.0%
22R	30.0%	40.0%	20.0%	60.0%	0.0%
4R	18.5%	0.0%	0.0%	0.0%	0.0%
22L	30.0%	0.0%	0.0%	0.0%	0.0%
10	1.0%	10.0%	25.0%	0.0%	60.0%
28	2.0%	40.0%	35.0%	0.0%	40.0%
DEPARTURES					
4L	30.0%	20.0%	20.0%	50.0%	0.0%
22R	18.5%	20.0%	20.0%	50.0%	0.0%
4R	30.0%	0.0%	0.0%	0.0%	0.0%
22L	18.5%	0.0%	0.0%	0.0%	0.0%
10	2.0%	50.0%	50.0%	0.0%	60.0%
28	1.0%	10.0%	10.0%	0.0%	40.0%

FLIGHT TRACKS

Consolidated flight tracks which describe the average flight route corridors that lead to and from Roberts Field/Redmond Municipal Airport were developed. The consolidated flight tracks are based upon experience at general aviation airports similar to Roberts Field/Redmond Municipal Airport. Although the consolidated flight tracks appear as distinct paths, they actually represent average flight routes and illustrate the areas of the surrounding community where aircraft operations can be expected most often. Air traffic density generally increases nearer the airport as it is funneled to and dispersed from the runway system. The consolidated tracks were developed to reflect these common patterns and to account for the inevitable flight track dispersions around the airport.

FLIGHT PROFILES

INM Version 6.1 was used in this analysis to compute the takeoff profiles based on the user-supplied airport elevation and the average annual temperature entries in the input batch. At Roberts Field/Redmond Municipal Airport, the elevation is 3,077 feet and the average annual temperature is 44.2 degrees Fahrenheit (F). If other than standard conditions (temperature of 59 degrees F and elevations of zero feet mean sea levels [MSL]) are specified by the user, the profile generator automatically computes the takeoff profiles using the airplane performance coefficients and the equations in the Society of Automotive Engineers Aerospace Information Report 1845 (SAE/AIR 1845).

RESULTS OF NOISE ANALYSIS

Output data selected for calculation by the INM were annual average noise contours in DNL. This section presents the results of the contour analysis without the project and with the project noise exposure conditions, as developed from the Integrated Noise Model. **Table 4** summarizes the area within each set of contours. The Federal government, including the FAA, has identified the 65 DNL contour as the threshold of incompatibility.

TABLE 4 **Comparative Areas of Noise Exposure (Square Miles)** **Roberts Field/Redmond Municipal Airport**			
DNL Contour	**2003**	**2008**	**2023**
55	5.30	5.26	2.68
60	2.10	2.01	1.37
65	0.86	0.81	0.71
70	0.41	0.41	0.30
75	0.22	0.20	0.11

2003 Noise Exposure Contours

Exhibit 5B presents the plotted results of the INM contour analysis for 2003 using input data as previously described. The surface areas falling within the contours are shown in **Table 4**. The shape and extent of the contours reflect the underlying flight track assumptions. The 70 and 75 DNL contours remain on airport property. The 65 DNL contour extends beyond airport property to the southeast, off Runway 28 (921 feet)and to the northeast, off Runway 22 (80 feet). The 60 DNL contour extends beyond airport property to the southeast, off Runway 28 (3,736 feet); to the southwest, off Runway 4 (701 feet); to the northeast, off Runway 22 (4,425 feet). The 55 DNL contour extends beyond airport property to the southeast, off Runway 28 (7,304 feet); to the southwest, off Runway 4 (7,843 feet); to the northwest, off Runway 10 (12,082 feet), and to the northeast, off Runway 22 (1,665 feet).

2008 Noise Exposure Contours

Exhibit 5C presents the plotted results of the INM contour analysis for 2008 using input data as previously described. The surface areas falling within the 2008 contours are shown in **Table 4**.

The 2008 DNL noise exposure contours are similar in shape to the 2003 contours. However, due to the 1,460-foot extension of Runway 4 and the forecasted increase in operations the contours have increased in size along Runway 4-22. The contours have decreased slightly in size along Runway 10-28. This is due to the transition from older generation business jet aircraft to newer quieter generation aircraft that operate on this runway. The 70 and 75 DNL contours remain on airport property. The 65 DNL contour extends beyond airport property to the southeast, off Runway 28 (10 feet). The 60 DNL contour extends beyond airport property to the southeast, off Runway 28 (2,249 feet); to the southwest, off Runway 4 (1,254 feet); to the northeast, off Runway 22 (3,705 feet). The 55 DNL contour extends beyond airport property to the southeast, off Runway 28 (5,286 feet); to the southwest, off Runway 4 (9,629 feet); to the northeast, off Runway 22 (12,462 feet); and to the northwest, off Runway 10 (577 feet).

2023 Noise Exposure Contours

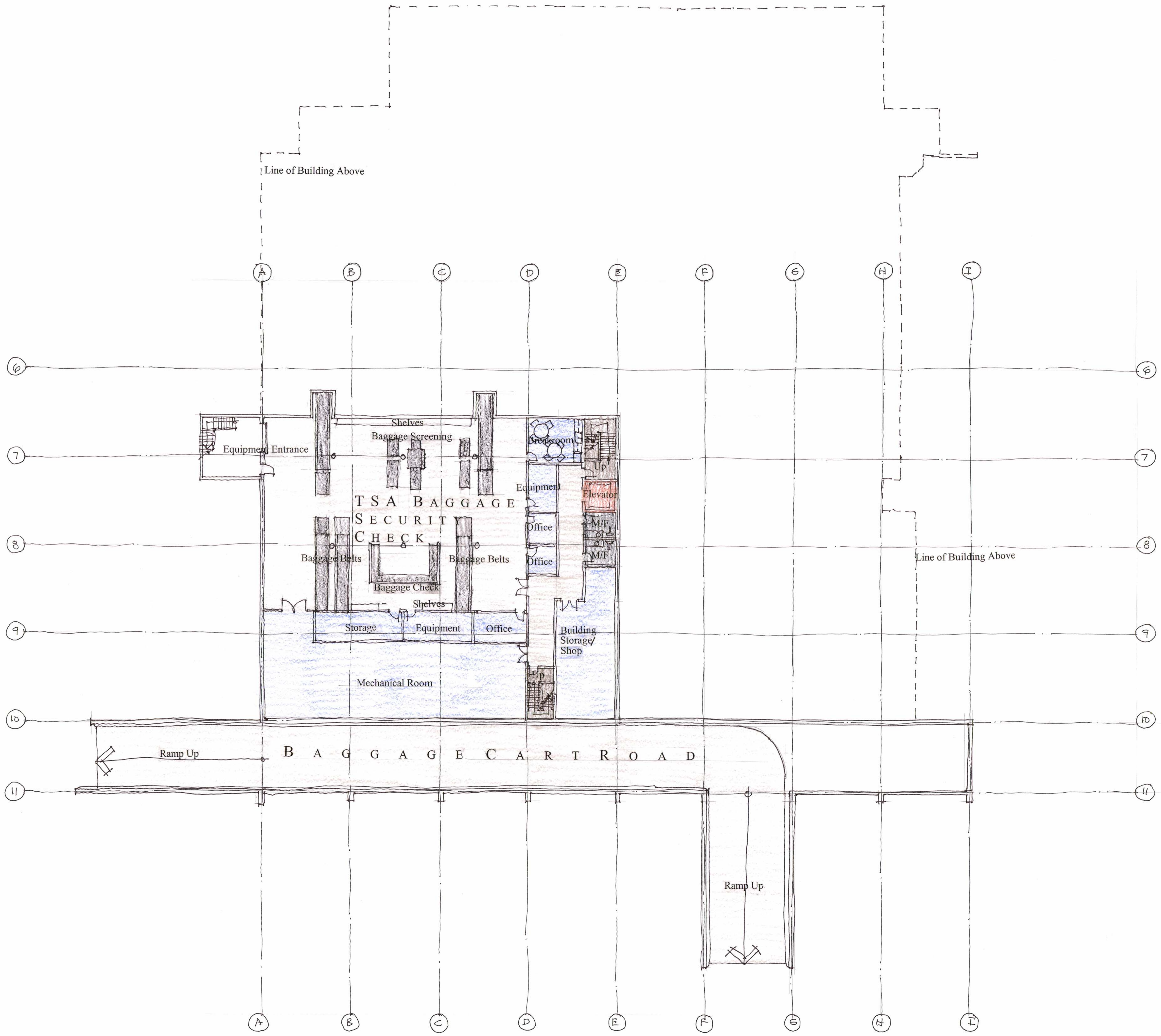
Exhibit 5D presents the plotted results of the INM contour analysis for 2023 using input data as previously described. The surface areas falling within the 2023 contours are shown in **Table 4**.

The 2023 DNL noise exposure contours are different in shape to the 2003 and 2008 contours. Due to the 1,460-foot extension of Runway 4, the 1,500-foot extension to Runway 22 and the addition of the 8,000-foot parallel Runway 4R-22L, the contours have reduced in size along all runways. The reduction in size is a result of the addition of an 8,000-foot parallel Runway 4R-22L. Due to the transition of aircraft to the new Runway 4R-22L, the contours have decreased significantly in size along Runway 10-28 and Runway 4L-22R. The 70 and 75 DNL contours are mostly contained on airport property. The 70 DNL contour extends beyond airport property to the southeast, off of Runway 22L (16 feet). The 65 DNL contour extends beyond airport property to the southeast off Runway 22L (109 feet). The 60 DNL contour extends beyond airport property to the southeast, off Runway 28 (590 feet); to the southeast, off Runway 22L (718 feet); it also bulges off airport property to the south of Runway 4R-22L (606 feet). The 55 DNL contour extends beyond airport property to the southeast, off Runway 28 (3,728 feet); to the northeast, off Runway 22 (3,726 feet); to the southeast, off Runway 22L (3,300 feet); it also bulges off airport property to the south of Runway 4R-22L (1,372 feet).

SUMMARY

The noise exposure maps were prepared using the FAA Integrated Noise Model, Version 6.1, based upon data obtained from the Airport staff and the Airport Master Plan. Noise exposure contours have been prepared for Roberts Field/Redmond Municipal Airport for the years 2003, 2008 and 2023. The 1,460-foot extension to Runway 4 is included in the 2008 and 2023 aircraft noise analysis. The 1,500-foot extension to Runway 22 and the addition of a 8,000-foot parallel Runway 4R-22L are included in the 2023 aircraft noise analysis. The 65 DNL contour in the 2003, 2008 and 2023 analysis are mostly contained on airport property.

Appendix E
TERMINAL EXPANSION DIAGRAMS



Building Area Summary

Basement	12,700 GSF
Covered Roadway	6,100 GSF

ROBERTS FIELD

REDMOND MUNICIPAL AIRPORT

TERMINAL MASTER PLAN

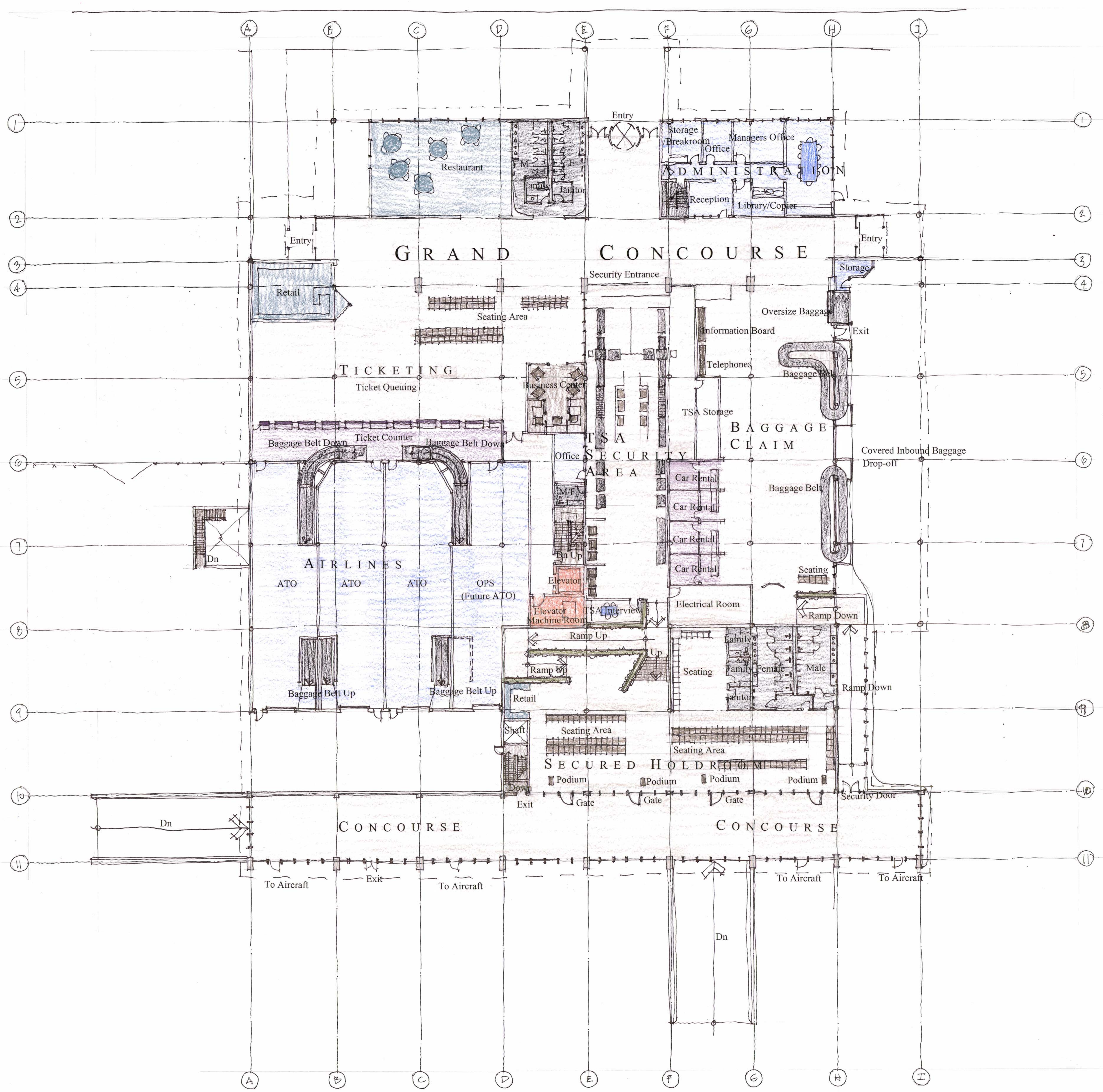
PHASE I - BASEMENT PLAN

HNTB CORPORATION
COFFMAN ASSSOCIATES

SHEET
1 OF 4

DATE 10/11/2004
JOB NO. 39916

16' 8' 0 16' 32'
SCALE: 1" = 16'-0"



Building Area Summary

Ground Floor	55,300 GSF
Basement	12,700 GSF
Covered Roadway	6,100 GSF

Roberts Field
Redmond, Oregon

ROBERTS FIELD

REDMOND MUNICIPAL AIRPORT

TERMINAL MASTER PLAN

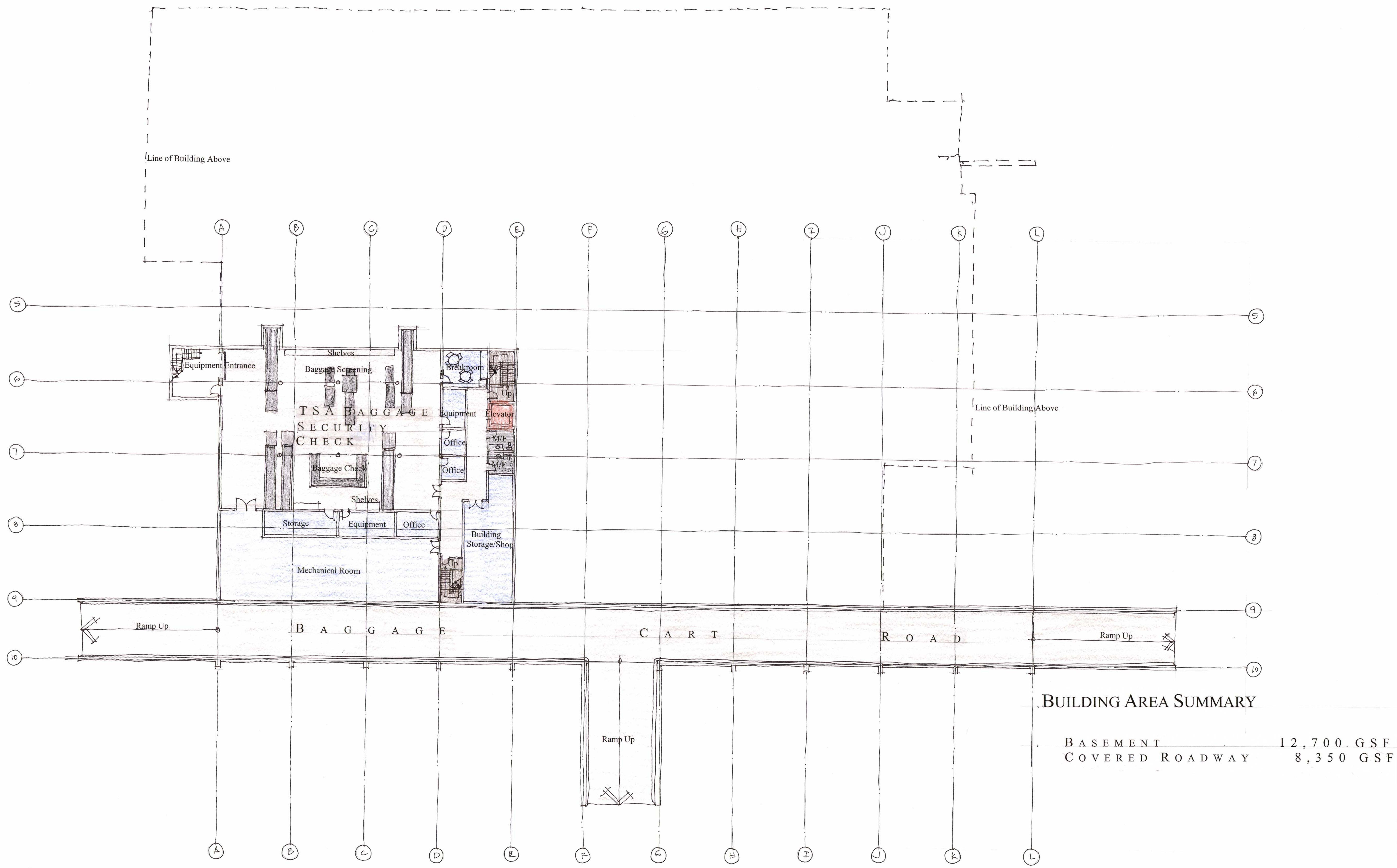
PHASE I - GROUND FLOOR PLAN

HNTB CORPORATION
COFFMAN ASSSOCIATES

SHEET
2 OF 4

DATE 10/11/2004
JOB NO. 39916

16' 8' 0 16' 32'
SCALE: 1" = 16'-0"



ROBERTS FIELD Redmond, Oregon

ROBERTS FIELD

REDMOND MUNICIPAL AIRPORT

TERMINAL MASTER PLAN

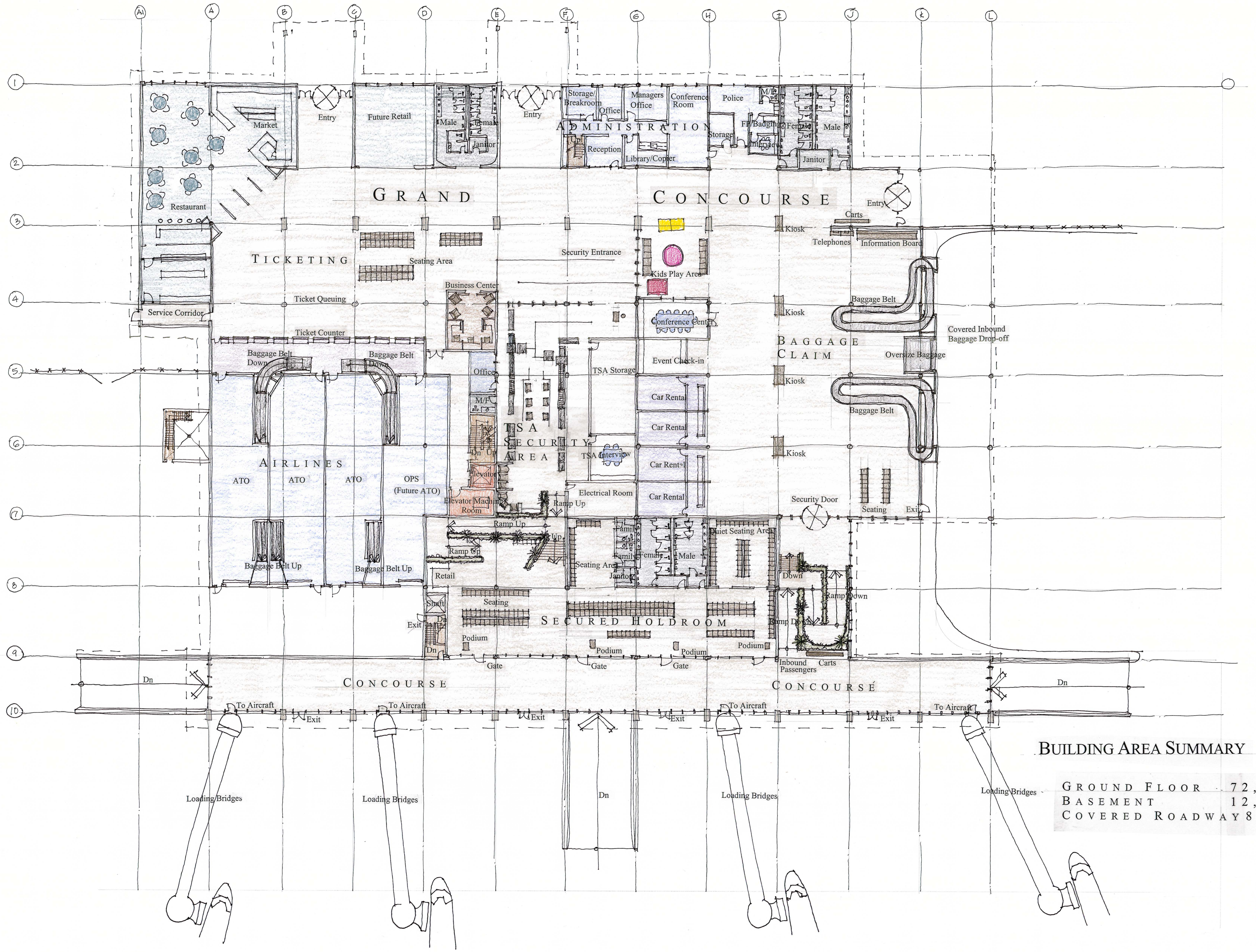
PHASE II - BASEMENT PLAN

HNTB CORPORATION
COFFMAN ASSSOCIATES

SHEET
3 OF 4

DATE 10/11/2004
JOB NO. 39916

SCALE: 1" = 16'-0"



Roberts Field — Redmond, Oregon

ROBERTS FIELD

REDMOND MUNICIPAL AIRPORT

TERMINAL MASTER PLAN

PHASE II - GROUND FLOOR PLAN

HNTB CORPORATION
COFFMAN ASSOCIATES

SHEET 4 OF 4

DATE 10/11/2004 JOB NO. 39916

SCALE: 1" = 16'-0"

ROBERTS FIELD
Redmond, Oregon

Appendix F
ENVIRONMENTAL EVALUATION

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technical memorandum

ENVIRONMENTAL OVERVIEW FOR REDMOND MUNICIPAL AIRPORT (ROBERT'S FIELD), REDMOND, OREGON

Prepared for: Coffman Associates

Prepared by: William M. Jones, Ph.D.
Nancy Olmsted, MS

Date: March 28, 2005

INTRODUCTION

This technical memorandum supports Task 7.1 of the contract scope of work for the Redmond Municipal Airport Master Plan Update.

Purpose. As part of the Master Plan update for the Redmond Municipal Airport, the Federal Aviation Administration (FAA) recommends early consideration of environmental consequences. This inventory summarizes those aspects of the environment that may occur at the airport and how they might be considered within the alternatives planning process. The categories presented are in accordance with the FAA's Airport Environmental Handbook (FAA 5050.4A). The purpose of this inventory is to provide an overview of environmental issues that may need more detailed analysis within the NEPA or the permitting process when specific project improvements are identified. Consequently, this analysis does not address mitigation or the resolution of environmental impacts.

Study Area. Redmond Municipal Airport (Roberts Field) is located within the City of Redmond municipal boundaries in Deschutes County, Oregon. The project area comprises Sections 14, 15, 22, 23, 26, and 27, Township 15 South, Range 13 East.

While most of the proposed master plan improvements remain within the airport boundaries, the City of Redmond is in the process of investigating lands outside of the airport boundary, along the eastern boundary of Section 23 for additional land to locate improvements. The study area used for most categories in this inventory, though, is within these project bounds. In some cases, the study area extends to a larger entity related to the resource category, as noted within the inventory descriptions.

Methods. Each of the 24 environmental categories listed in FAA Order 5050.4A have been investigated within this study. Data, maps, aerial photographs, published and non-published literature have been researched and obtained as listed in the report bibliography (Appendix B). Much of the data that has been collected are from direct contact (telephone and e-mail) with public agencies (local, regional, state and federal) that will likely have regulatory or approval responsibility when projects are identified and formal NEPA documentation is required (see Appendix C and D for a list of personnel and agencies contacted and their correspondence).

None of the resource information has been field checked for this preliminary review. Field verification will be conducted prior to any further NEPA compliance or permitting activity.

Findings. There are several environmental resources within the FAA Order 5050.4A that are not relevant to the Redmond Municipal Airport Master Plan either because they do not exist within the airport project vicinity or are being investigated as a separate study for the planning effort. Operational noise and land use compatibility are being investigated as separate studies of this master plan update. The Coastal Zone Management Program resource is not relevant for this airport because of its distant location from the Pacific Coastline. Coastal Barriers as an environmental resource to investigate does not apply to FAA's Northwest Mountain Region.

INVENTORY

I. NOISE

Authority:

Agency: FAA, USEPA

Under a separate study that follows Federal Aviation Regulation (FAR) Part 150 guidelines, noise exposure maps were prepared using data obtained from the Airport staff and the Airport Master Plan. In this study noise exposure contours were developed for Roberts Field/Redmond Municipal Airport for the years 2003, 2008 and 2023. The study indicated that the 65 DNL (Yearly Day-Night Average Sound Level) contour, which is the threshold of incompatibility, for the years 2003, 2008 and 2023 was mostly contained on airport property.

2. COMPATIBLE LAND USE

Authority: Uniform Relocation Assistance and Real Property Acquisition Policies of 1970 and Deschutes County and City of Redmond Ordinances and Codes

Agency: Deschutes County and City of Redmond Ordinances and Codes

Federal Aviation Regulation (FAR) Part 150 provides guidelines for determining compatible land uses around an airport based upon DNL. Further, the Oregon Department of

Environmental Quality (DEQ) defines noise sensitive land uses as property normally used for sleeping or used as schools, churches, hospitals, or public libraries. Residential uses usually present the most noise sensitive uses. The 65 DNL has been identified as the threshold of incompatibility.

Ideally, land uses adjacent to airports should be compatible with airport activities. Above all, land uses should not allow noise-sensitive activities

Though the airport is located within the City of Redmond's urban growth boundary (UGB) along its eastern border, it has the potential to impact land use and development in both the City of Redmond and Deschutes County. Review of both land use ordinances and zoning codes do not appear to be incompatible with the proposed airport master plan improvements.

Review of the land use codes and ordinances for the City of Redmond indicate that the allowable land use is compatible with airport activities. The airport proper has an Airport Control Zone designation. The zone allows airport compatible activities subject to safety restrictions for distance from airport landing strip, development height and visibility, electronic interference, and encroachment into aviation airspace.

Surrounding the airport within the UGB are several city zoning classifications including light and heavy industrial development, tourist commercial development, open space park reserve, parks, and the County Fairgrounds (see Appendix A for City Zoning Map). Land zoned for light and heavy industrial use allows many types of manufacturing and fabrication activities including those that are compatible with airport activities. Similarly the tourist commercial development zone allows activities that would support airport functions such as eating establishments, gas stations and auto services, restaurants, etc.

The remaining city zones in the vicinity of the airport also appear not to preclude compatible land uses. The open space park reserve zone and parkland permit low impact activities such as recreation, park trails, livestock grazing and crop production, and reserve of areas of cultural and historic significance. Since a portion of the County Fair Grounds facilities are within the Airport Control Zone any development would be subject to the safety restrictions for that zone.

Deschutes County has designated two zones adjacent to the airport. The predominant zoning is for exclusive farm use (EFU) as an alfalfa subzone (see Appendix A for County Zoning Map). The other zone is for rural industrial development, which is designated for a small parcel located along the City's eastern UGB. The EFU zone restricts all activities within the zone to agricultural purposes. Proposed airport master plan activities that might encroach on the EFU zoned land may have an impact unless the activity proposed is for the airport runway safety area. The rural industrial zone permits activities similar to the City of Redmond's light industrial zone.

While land uses adjacent to the Roberts Field/Redmond Municipal Airport appear to be compatible with airport activities, the FAR Part 150 noise study that has been conducted for the Master Plan indicates that higher noise levels that could negatively impact sensitive land uses would be contained within airport property. The noise study results indicate that the 65 DNL noise contour (the noise threshold above which noise sensitive activities would be impacted) for each of the three years studied (2003, 2008, 2023) would mostly remain within airport property.

3. SOCIAL IMPACTS

Authority: Uniform Relocation Assistance and Real Property Acquisition Policies of 1970 and Deschutes County and City of Redmond Ordinances and Codes

Agency: Deschutes County and City of Redmond Ordinances and Codes

Social impacts are often associated with the relocation of residents or businesses or other community disruptions. The airport does not have an adjacent residential population. It is surrounded by commercial and industrial land uses as described above. Therefore, residential displacement is not expected. The lands that the airport may need to acquire are zoned for purposes other than residential development.

For those parcels that the airport may need to purchase, compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act will be required. From this preliminary assessment, it appears that the airport planning area has sufficient land area that few if any relocation of existing residences or businesses would be needed.

4. INDUCED SOCIO-ECONOMIC IMPACTS

Authority: Uniform Relocation Assistance and Real Property Acquisition Policies of 1970

Agency: Deschutes County and City of Redmond Ordinances and Codes

The likelihood of significant negative induced socio-economic impacts is low. These impacts, where they occur, include shifts in patterns of population movement and growth, increases in public services demand, and major changes in business and economic activity. If the planning alternatives focus on a preferred alternative that creates significant impacts in noise, land use or direct social impacts, only then would there be greater induced socio-economic impacts. Again, there would have to be significant direct impacts to result in significant induced impacts.

5. ENVIRONMENTAL JUSTICE

Authority: Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,

Agency: U.S. Environmental Protection Agency, Region X

The potential for displacement of minority or low-income populations at a higher percentage than the general population is low. In the immediate airport vicinity, there is no residential development. The closest residential population is the City of Redmond.

The principal areas of analysis to determine potential environmental justice impacts to the racial groups are guided by the following three concepts from the U.S. Department of Transportation (USDOT), *Environmental Justice – The Facts*, July 3, 2002.

1. Avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects including social and economic effects on minority and low-income populations,

2. Ensure the full and fair participation by residents in the affected community, and

3. Prevent the denial or, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

From the standpoint of Concept 1, the age cohort and income level of residents within the City of Redmond include a low percentage of minority populations and elderly. The residential location of these groups is spread throughout the City of Redmond. Therefore, should any displacements occur (which is remote), there would not be a disproportionate adverse effect on these groups.

From the standpoint of Concept 2, the master plan project will have numerous public meetings and open houses as well as other media outreach (newsletters, meetings with neighborhood groups). Neighborhood residents and others will be encouraged to attend all meetings and to contact the City should they have any questions regarding the project.

From the standpoint of Concept 3, the City will identify any direct or secondary impacts to residents in the project study area. For those residents that have the potential to be negatively impacted, the City would take compensatory actions in the form of financial compensation for property and improvements to be acquired in part or full, relocation benefits, and other measures to ensure that all residents would be fairly treated.

6. AIR QUALITY

Authority: Section 176 Clean Air Act Amendments of 1977; 1982 Airport Act

Agency: FAA, Oregon Department of Environmental Quality

Redmond Municipal airport is not located within or adjacent to a U.S. Environmental Protection Agency (EPA), defined non-attainment (or maintenance) area.

FAA is responsible for assuring that federal airport actions conform to state Plans for controlling area-wide air pollution impacts. Oregon is a state that does not have applicable indirect source review (ISR) requirements, so the need for air quality analysis is assessed based upon the activity levels of the facility. An air quality analysis is required for general aviation airports if the levels of activity forecast in the time frame of the proposed action are greater than 180,000 operations forecast annually.

The Department of Environmental Quality (DEQ) Air Quality Section located in Bend, Oregon has been contacted regarding this project. Additional analysis may be required only if the project did not conform to the SIP or that the proposed project resulted in emissions levels that exceeded state or national standards.

7. WATER QUALITY

Authority: Federal Water Pollution Control Act, as amended by the Clean Water Act (CWA) of 1977; 1982 Airport Act

Agency: Oregon Department of Environmental Quality

The Redmond Municipal Airport is located within the Deschutes River hydrographic basin, a water quality limited river. The CWA Section 303 D listing for the Deschutes River indicates that sections of the Deschutes River closest to the airport have been listed for high temperature (Summer), high pH (winter, spring, fall), and low dissolved oxygen (Summer). Consequently, fish spawning and rearing may be negatively impacted by these water quality limitations.

The DEQ plans to develop a Total Maximum Daily Load ("TMDL") for temperature in the Deschutes River, which in turn will be the basis for waste load allocations ("WLAs") and Load Allocations ("LAs") for point and nonpoint sources, respectively, affecting temperatures in the river. The target year for establishment of temperature TMDLs, WLAs, and LAs for the Deschutes River is 2006.

There is concern by the EPA and DEQ (both contacted) for potential water quality impacts to surface and ground water. Dick Nichols, DEQ Water Quality Manager, Bend, Oregon, is concerned about stormwater disposal, particularly that portion that could be contaminated by de-icing chemicals or fuel spills. Use of dry wells for storm water disposal is regulated by OAR 340-44 and by federal SDWA UIC program and may not be legal to use in some cases. In addition, Mr. Nichols identifies current and past fuel handling areas that may have had releases of hazardous materials or petroleum products that pose a hazard to groundwater quality and need to be addressed.

Similarly, EPA Region X's Theogene Mbabaliye (responding for the NEPA Section) has expressed concern that pollutants be prevented from entering ground or surface water bodies. They also identified a more general concern for water quality impacts related to the master plan improvements. Increasing impervious surface run-off from road and facility construction would need to be contained and treated before discharge.

8. SECTION 4F

Authority: Section 4(f) of the Department of Transportation Act 1966

Agency: U.S. Environmental Protection Agency, Region X

Section 4(f) of the Department of Transportation Act aims to protection of key public lands including federal, state or local public parks, recreation areas, wildlife or waterfowl refuges, or historic sites from impacts associated with transportation projects.

The Redmond Municipal Airport does not have public recreation or parkland within the airport boundaries. Three small parks are located near the airport and land that is currently zoned Open Space Park Reserve. In addition, the Deschutes County Fairgrounds is adjacent to the airport along the southern boundary. It is not likely that the proposed master plan improvements will impact the existing parks. The fairgrounds, however, appears to have a portion of its site within the proposed master plan improvements. The City of Redmond may need to address this public use area if any of the proposed improvements would require use of the fairgrounds.

9. HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

Authority: National Historic Preservation Act of 1966, as amended and Archeological and Historic Preservation Act of 1974

Agency: Oregon State Historic Preservation Office, Confederated Tribes of the Umatilla, Confederated Tribes of Warm Springs, Burns Paiute Tribe

Proposed development will be coordinated in accordance with Section 106 of the National Historic Preservation Act (NHPA). Of concern are above ground structures of historical and cultural significance and below ground archaeological sites of historic and cultural significance. Authority for the designation of above ground structures as a national historic landmark is in Section 106 of the National Historic Preservation Act. Requirements for making a designation require documentation of structures in the project area that may potentially be impacted and evaluation of the level of effect on identified structures. In order to perform the analysis that is required, specific airport improvements identified will need to be designed to a point that it is possible to assess their impact on existing structures.

The National Historic Preservation Act (NHPA), amended in 1992, also directs federal agency consultation with Indian tribes. Historic properties of religious and cultural significance to Indian tribes may be eligible for listing in the National Register with any Indian tribe that attaches religious and cultural significance to historic properties that may be affected by an undertaking. Consequently, federally recognized Indian tribes must be consulted where there is a potential for impact to cultural and historic sites.

10. BIOTIC COMMUNITIES

Authority: Fish and Wildlife Coordination Act

Agency: Oregon Department of Fish and Wildlife (ODFW)

This section includes discussion of the following aspects of the biotic communities: watershed, creeks and waterways; wildlife habitat types and structure; vegetation including noxious or invasive plant species and control; wildlife use and potential wildlife hazards; and sensitivity of the biotic communities relative to the region's natural resource goals and policies.

The value of the waterways is discussed under water quality and endangered species sections of this report. Local wildlife habitat for the Redmond Municipal Airport is homogeneous comprised almost entirely of improved pasture, perennial grass seed hay or grass/for plant communities. An exception to this is two small areas (approximately 1.4 acres) identified as freshwater emergent wetlands (National Wetland Inventory [NWI]), which is further discussed in a following wetland section.

As much of the airport property has been altered through historic ranching, agriculture, industry and the use of the site as an airfield, the biotic communities within the airport boundaries have been disrupted. Further disruption will need to be carefully studied for specific projects. The EPA recommends that the evaluation "should describe the current quality and potential capacity of habitat, its use by fish and wildlife on and near the proposed project area, and identify known fish and wildlife corridors, migration routes, and areas of seasonal fish and wildlife congregation." Further the evaluation should include "effects on fish and wildlife from habitat removal and alteration, aquatic and terrestrial habitat fragmentation caused by roads, land use, management activities, and human activity." Finally, project evaluation should include the "potential impacts on plant species and their habitats."

Although much is documented about the sensitivity of the biotic communities, airport actions may provide an opportunity for habitat improvements. Other sites should be considered for natural resource preservation or restoration should the property acquisition continue in the surrounding airport boundary.

11. ENDANGERED AND THREATENED SPECIES

Authority: Section 7 Endangered Species Act, as amended

Agency: Nation Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries; marine species), U.S. Fish and Wildlife Service (USFWS; land species)

Under Section 7 of the Endangered Species Act (ESA) projects that may potentially impact listed species under the Act must be evaluated (biological assessment) and should a taking be determined (biological opinion) appropriate mitigation to prevent, reduce or minimize the taking be required. NOAA Fisheries, USFWS and the Oregon Natural Heritage Information Center (ONHIC) have been contacted to identify any listed, proposed, and/or candidate species in the vicinity of the Redmond Municipal Airport. Review of the information indicates that there would be a potential impact on ESA listed species from the proposed master plan improvements.

NOAA Fisheries' Kasey Brown responded that there would be no impact to MCR Steelhead and Chinook salmon in the area because these anadromous fish are unable to access the Deschutes River above the series of dams (Pelton, Round Butte) in the Lake Billy Chinook area. Currently the dams are impassable for anadromous listed fish.

However, a recent agreement (July 13, 2004) between Portland General Electric (PGE), the Confederated Tribes of the Warm Springs and 20 other agencies suggests that accessibility for Chinook salmon and steelhead will be returned relatively soon. The agreement between these agencies is to restore access by anadromous fish above the dams. It is a project to be initiated in 2005 and will require up to 50 years to accomplish. Reintroduction of these anadromous fish is to begin in 2007. Therefore, there will likely be a nexus between these listed fish and the airport master plan improvements should they be constructed after 2007.

The USFWS lists only the bald eagle as an ESA listed species. There is one ESA Candidate Species that is listed – Oregon Spotted frog. Bald eagles will need to be assessed with a biological assessment (BA) and appropriate compliance measures taken. Candidate species will need to be identified and a claim that should the candidate species formally be listed, a BA will be prepared and appropriate compliance measures will be taken.

The ONHIC lists the Townsends Big-eared Bat as an ESA species of concern. Like the Oregon Spotted frog, the Townsends Big-eared Bat will need to be evaluated with a BA and appropriate compliance measures taken should it be listed.

12. ESSENTIAL FISH HABITAT

Authority: Section 305 Magnuson-Stevenson Act of 1996, as amended

Agency: NOAA Fisheries

Under Section 305 of the Magnuson-Stevens Act, federal agencies that authorize, fund, or undertake any action that may adversely affect any essential fish habitat (EFH) are required to consult with NOAA Fisheries to receive recommendations on measures necessary to conserve or enhance EFH. Statutorily defined, EFH is those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. EFH is designated on the basis of information indicating that certain aquatic habitats or conditions are necessary to sustain the fishery.

Response from NOAA Fisheries indicates that there is currently no EFH concern because Chinook salmon are unable to access the Deschutes River above the Pelton and Round Butte dams. Once access to the upper Deschutes River occurs (projected to be 2007), Chinook salmon will have access and there will be a need to address EFH.

13. MIGRATORY BIRDS

Authority: Migratory Bird Treaty Act of 1918, as amended

Agency: ODFW, USFWS

Migratory birds are protected under the Migratory Bird Treaty Act. It is specifically prohibited to pursue, hunt, take, capture, kill, attempt to take, capture or kill any migratory birds or any part, nest, or eggs of any such bird. For general aviation airports, it is typically upheld by taking measures to exclude (or at least not attract) migratory birds from the airport operations areas. Measures must be taken to limit the open ponded areas or types of landscape vegetation that would be an attractant to the birds as they migrate.

There are few water bodies in the area that would attract migratory birds. The Central Oregon Irrigation District (COID) operates an irrigation canal (North Unit Main Canal) that is located east of the airport. While the irrigation canal will need to be assessed since the proposed new runway (Runway 4R-22L) will include some of the canal within its runway safety area. Appropriate mitigation measures will need to be taken should the canal be found to attract migratory birds.

14. WETLANDS

Authority: Executive Order 11990, Protection of Wetlands, Section 404 Clean Water Act

Agency: US Army Corps of Engineers (COE), Oregon Department of State Lands (DSL).

The National Wetlands Inventory (NWI) has been reviewed to determine whether there are any wetlands in the vicinity of the Redmond Municipal Airport. The NWI identifies two small wetlands in the area. Both are located along the COID's North Unit Main Canal, which is east of the airport. Data on the wetlands indicate that they are freshwater emergent wetlands and total about 1.4 acres (see Appendix A for NWI Wetland Map). .

Only one of the two identified wetlands appears to be within the proposed master plan improvement projects area. That wetland would be located within the runway safety area for the proposed new runway (Runway 4R-22L). Further study would be necessary to determine more accurately the type and size of the wetland, the potential impact from airport improvements and whether any mitigation measures would need to be taken.

15. FLOODPLAINS

Authority: Executive Order 11988, Floodplain Management; DOT Order 5650.2 Floodplain Management and Protection

Agency: DEQ, COE, DSL

The intent of Executive Order 11988 is to mandate federal agencies to try to avoid flood loss and impact on human health and welfare by identifying and avoiding development within the 100-year floodplain, where practicable. The Order defines floodplains as "the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore including at a minimum that area subject to a one percent or greater chance of flooding in any given year", i.e. the area that would be inundated by a 100-year flood.

The Redmond Municipal Airport is not located within a 100-year floodplain according to the Flood Insurance Rate Map (FIRM) of the Federal Emergency Management Agency (FEMA). Map number 41017C0150 C indicates that the airport is in an area that is outside of the 500-year flood plain (see Appendix A for FEMA Floodplain Map).

16. COASTAL ZONE MANAGEMENT PROGRAM

Authority: Uniform Relocation Assistance and Real Property Acquisition Policies of 1970 and Deschutes County and City of Redmond Ordinances and Codes

Agency:

The project area is outside of the Coastal Zone Management Program and therefore does not require evaluation.

17. WILD AND SCENIC RIVERS

Authority: Wild and Scenic Rivers Act (P.L. 90-542, as amended)

Agency: National Park Service, Bureau of Land Management, U.S. Fish & Wildlife Service, U.S. Forest Service

Three reaches of the Deschutes are designated under the Wild and Scenic River Act as scenic (30 miles) and recreational (143.3 miles). The closest designated reach begins at Odin Falls, which is approximately six and one-half (6 ½) miles downstream and in a northwesterly direction from the airport. The closest that any reach of the Deschutes River comes to the airport is approximately 4.2 miles west of the airport.

Given its proximity and distance from the Deschutes River, airport improvements are not expected to have an impact on reaches designated Wild and Scenic Rivers.

18. FARMLANDS

Authority: Farmland Protection Policy Act (FPPA), P.L. 97 98

Agency: Deschutes County, City of Redmond, Oregon Department of Land Conservation and Development (DLCD), U.S. Department of Agriculture (USDA)

This section relates to the degree to which the lands within the Redmond Municipal Airport qualify as protected agricultural lands, prime or unique farmlands. The FPPA, P.L. 97 98, authorizes the USDA to develop criteria for identifying the effects of federal programs on the conversion of farmland to nonagricultural uses. Federal agencies are directed to use the developed criteria to identify and take into account the adverse effects of federal programs on the preservation of farmland; to consider appropriate alternative actions which could lessen adverse effects; and to assure that such federal programs, to the extent practicable, are compatible with state, units of local government, and private programs and policies to protect farmland.

Guidelines developed by the USDA became effective August 6, 1984, and apply to federal activities or responsibilities that involve undertaking, financing or assisting construction or improvement projects or acquiring, managing, or disposing of federal lands and facilities. For Airports Program actions, this includes proposed Airport Improvement Program projects and requests for conveyances of government land. The guidelines do not cover permitting or licensing programs for activities on private or nonfederal lands. Airport Layout Plan (ALP) approval, involving only development shown on an ALP which is not to be federally funded, even if farmland is involved, is exempt from FPPA. Some categorically excluded actions on prime or unique farmlands will still require coordination under the FPPA.

With respect to the federal requirements, USDA's Natural Resource Conservation Service (NRCS) was contacted to determine whether there would be any potential impacts to NRCS agricultural land. Todd Peplin, District Conservationist for NRCS, indicated that the Redmond Municipal Airport is located on publicly owned, non-agricultural lands. Since NRCS authority covers private agricultural lands, there will not be an impact to agricultural lands.

There are state and local regulations that may also regulate the use of agricultural lands. Local zoning ordinances must comply with statewide land use goals, which includes Goal 3 – Agricultural Lands. Jurisdictions are required to inventory such lands and preserve and maintain them through farm zoning (Oregon Revised Statutes [ORS] Chapter 215 and Oregon Administrative Rules [OAR] Chapter 660, Division 33). Area restrictions on use for other non-agricultural activities depend on the type of agricultural land. Exclusive farm use (EFU) is considered high-value farmland and is restricted primarily to agricultural activities.

Currently the Redmond Municipal Airport land owned by the City of Redmond does not include agricultural lands. Airport expansion to develop some of the proposed master plan improvements may impact agricultural land that Deschutes County currently zones as exclusive farm zone use (EFU) for alfalfa. An assessment of the impact that the improvements may have on the EFU zoned land will be needed, as well as a determination of appropriate mitigation measures.

19. ENERGY SUPPLY AND NATURAL RESOURCES

Authority: Local utility service requirements

Agency: City of Redmond

There is some potential for changes in energy demands, for example for the terminal building heating or for airfield lighting should the airport alternatives require increased demands for electricity. Any change to the airport layout or terminal facilities or industrial tenants could have an increased demand on the gas, electrical, communications or sewer systems.

For increased gas or fuel consumption due to the movement of air or ground vehicles, the total volume of this cannot be determined until alternative scenarios are identified and clarified.

20. LIGHT EMISSIONS

Authority: none specifically

Agency: NA

The majority of airfield lighting is for the benefit of airborne craft, and is typically placed with an orientation that does not affect nearby residents. Lighting is oriented toward the sky or the approach.

Placement of future lighting at the airfield has the potential to annoy people in the vicinity of the installation. Impacts are a result of increased operations and upgraded facilities. Should this occur, decisions on the placement of new lights must be made in consideration of the proximity to sensitive receptors such as residences or commercial facilities. Measures to shield or make adjustments to the light angle will often lessen the annoyance. Only under special circumstances would high intensity strobe lights be necessary and placement of these must be carefully evaluated with input from the community.

21. SOLID WASTE

Authority: City of Redmond Ordinances, Deschutes County Ordinances

Agency: Deschutes County, DEQ

Solid waste collection and disposal activities must be conducted at sufficient distance from the existing runways and taxiways to avoid interference with runway operations. The Deschutes County solid waste facility is located approximately two miles north of the Redmond Municipal Airport. According to Brett McKnight, DEQ's Manager of Land and Hazardous Waste, the solid waste facility is "outside the Department's area of concern for solid waste and airport operations." Therefore, there will be no impact on solid waste facilities from the airport master plan improvements.

There is, however, expected to be an increase in the generation of solid waste as airport facilities and non-airport ancillary facilities are developed. Generation of solid waste will need to be handled and properly disposed.

22. CONSTRUCTION IMPACTS

Authority: City of Redmond Ordinances

Agency: City of Redmond

There is a potential for construction impacts such as increases in localized noise levels, localized air quality reduction, increase in erosion or pollutant runoff, and/or disruption of local traffic patterns. Fortunately, the location of the airport away from residential neighborhoods and adjacent to undeveloped land will keep construction impacts to a minimum. All construction must conform to the City of Redmond construction standards and FAA AC Advisory Circular 150/5370-10, *Standards for Specifying Construction of Airports*.

23. HAZARDOUS MATERIALS

Authority: CERCLA; SARA; RCRA; TRIS; UST/AST

Agency: EPA, DEQ

Potential pollutants are associated with the airport industrial area operations. There are several areas of concern and potential environmental impact from master plan improvements. Some of the concerns have been raised in the previous section on water quality.

In addition, there is concern regarding existing facilities. Mr. Nichols (DEQ) identified the former military structures on the airport as potentially having asbestos. Dismantling these structures will require compliance with regulations for asbestos disposal. Similarly, both Mr. Nichols and Mr. McKnight have raised concerns regarding past and future fuel and hazardous waste spills. Such spills in the past and potential spills in the future will both need to be addressed.

For past spills, there will need to be site evaluations to determine evidence of spills. Evidence of hazardous waste spills will be subject to hazardous waste clean-up requirements.

Spill prevention plans and clean-up plans will need to be developed to reduce hazardous material spills and clean up spills that happen. Plans will need to be part of the improvement planning effort.

24. CUMMULATIVE IMPACTS

Authority: NA

Agency: FAA, US EPA

Overall there is a potential for cumulative environmental impacts in the Redmond Municipal Airport vicinity. The degree of impact will need to be measured by the City as specific projects are designed and formal NEPA environmental documentation is initiated.

NRPS

Appendix A

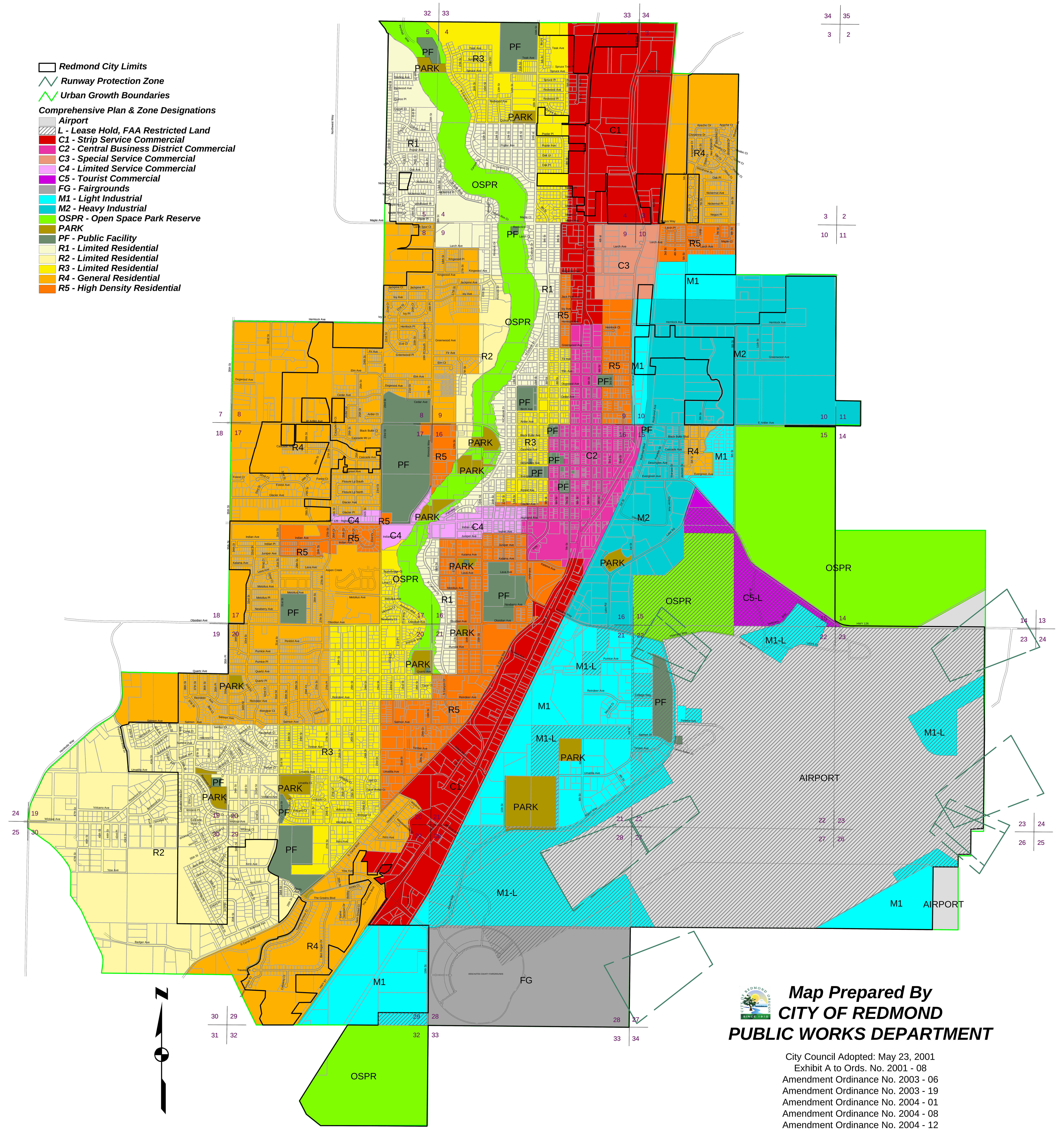
Tables, Maps and Figures

Table 1. Environmental Resources Summary

Section	Environmental Element	Potential Environmental Consequence
I. Noise	Airport noise – primarily air-side	Separate Study to determine noise impact
2. Compatible Land Use	Land use activities	Land is not incompatible with proposed master plan improvements
3. Social Impacts	Residential neighborhoods, commercial areas	Not likely to require relocation of residents because few live in airport project area
4. Induced Socio-economic Impacts	Shifts in population movement and distribution, business and economic activity	Potential positive induced impacts from increase growth, economic activity
5. Environmental Justice	Disproportionate impact on low-income and minority populations	Not expected to have such an impact given the airport location away from residential neighborhoods
6. Air Quality	Air quality from master plan improvements	There will be a potential impact on air quality
7. Water Quality	Water quality from master plan improvements	There will be a potential impact on water quality
8. Section 4F	Protection of parks, recreational facilities, wildlife or waterfowl refuges, historic sites	There are no parks within the airport project area. There are some parks in the vicinity but they are not expected to be impacted.
9. Historic, Architectural, Archaeological and Cultural Resources	Above ground and below ground cultural and historic sites	Proposed master plan development will undergo consultation per Section 106 of NHPA.
10. Biotic Communities	Habitat preservation	Airport master plan improvement impacts on habitat will need to be assessed. There is an opportunity for habitat improvements.
11. Endangered and Threatened Species	ESA listed species: bald eagle, chinook salmon ESA candidate species: Oregon Spotted Frog, ESA species of concern: Townsends Big-eared Bat,	There will need to be biological assessments for the listed species. Candidate species may need biological assessments. Species of concern will not need to be assessed unless they become listed.
12. Essential Fish Habitat	ESA listed chinook salmon	Will only become a concern after the Pelton Dam and Round Butte Dam improvements are in place and chinook salmon reintroduced in the upper Deschutes River beginning in 2007.

Section	Environmental Element	Potential Environmental Consequence
13. Migratory Birds	Birds that might be impacted by airport improvements	Potential impact to be studied for specific master plan improvements
14. Wetlands	Wetlands that might be impacted by airport improvements	One small wetland associated with COID's irrigation canal may be within the area identified for a new runway (Runway 4R-22L)
15. Floodplains	100-year floodplain	No impact on floodplains. Airport is not located within the 100-year floodplain.
16. Coastal Zone Management Program	NA	NA
17. Wild and Scenic Rivers	Preservation of rivers or reaches of rivers due to their unique aesthetic, recreational or cultural value	Airport improvements not likely to impact the Deschutes River because of the distance away from the river.
18. Farmlands	Encroachment on agricultural lands.	There may be potential encroachment on agricultural lands currently designated for exclusive farm use (EFU) by Deschutes County.
19. Energy Supply and Natural Resources	Impact on electricity and natural gas consumption.	There is a potential to increase energy use, but specific impact evaluation will need to be conducted on a project-by-project basis.
20. Light Emissions	Impact from additional lighting and potential for light pollution.	There is a potential to increase light emissions, but specific impact evaluation will need to be conducted on a project-by-project basis.
21. Solid Waste	Solid waste generation and disposal	There is a potential for increase solid waste generation and need for appropriate disposal.
22. Construction Impacts	Temporary construction impacts such as increases in localized noise levels, localized air quality reduction, increase in erosion or pollutant runoff, and/or disruption of local traffic patterns	There is a potential for temporary construction impacts, but given the airport location they will likely be minor.
23. Hazardous Materials	Hazardous material generation and spills from airport operations	There are potential hazardous materials impacts from dismantling old military structures, clean-up of past hazardous material spills, and future spill and hazardous material waste disposal.
24. Cumulative Impacts	Combined impact of airport master plan on environmental resources.	Overall potential impacts. The degree of cumulative impact will need to be assessed during the NEPA environmental documentation phase for specific projects.

2020 Greater Redmond Area Comprehensive Plan and Zone Map



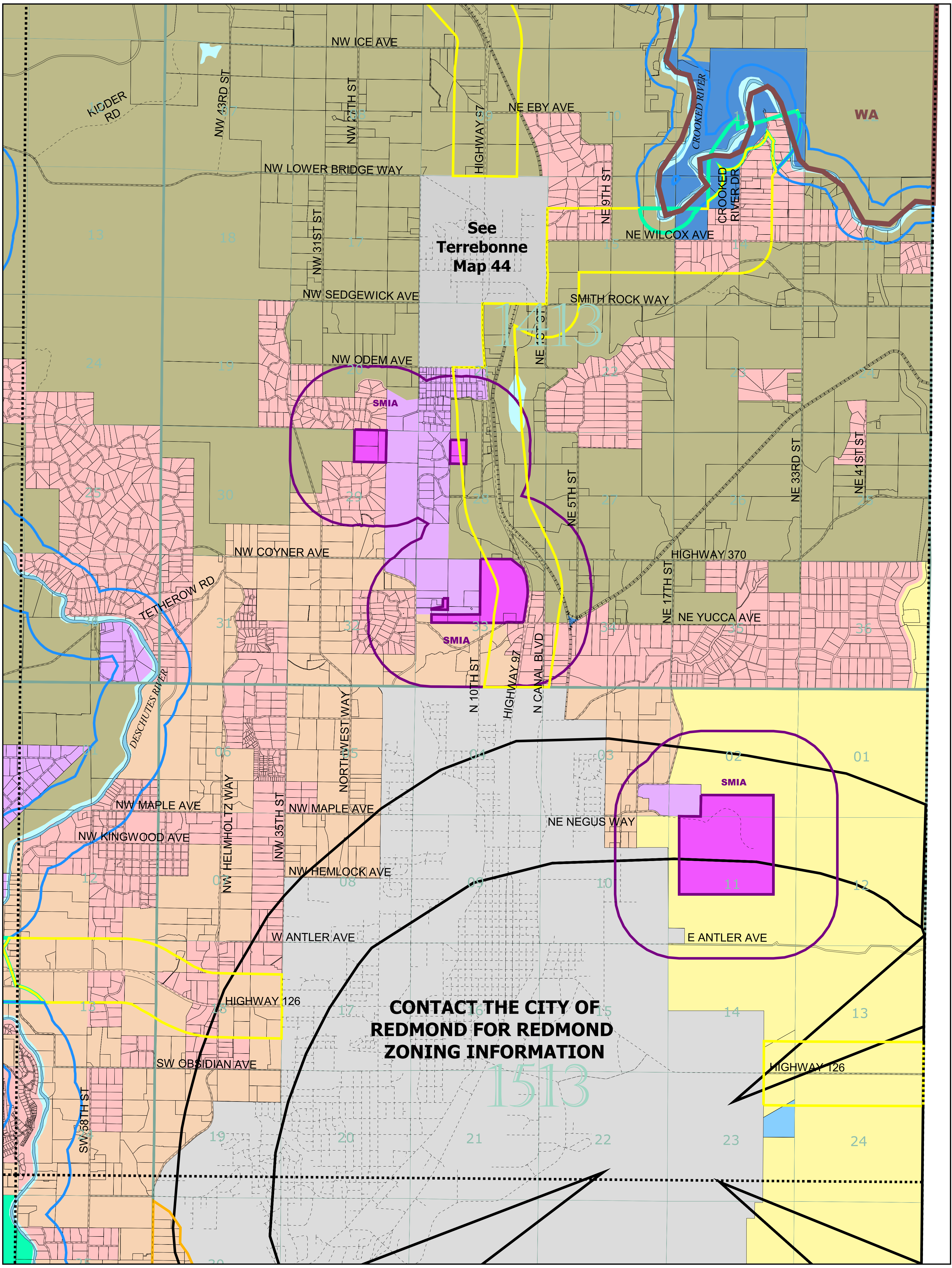
Map Prepared By
CITY OF REDMOND
PUBLIC WORKS DEPARTMENT

City Council Adopted: May 23, 2001
Exhibit A to Ords. No. 2001 - 08
Amendment Ordinance No. 2003 - 06
Amendment Ordinance No. 2003 - 19
Amendment Ordinance No. 2004 - 01
Amendment Ordinance No. 2004 - 08
Amendment Ordinance No. 2004 - 12

Board of County Commissioners Adopted: June 27, 2001
Exhibit C to Ords. No. 2001 - 026

Updated: June 18, 2004

EFU - ALFALFA SUBZONE
EFU - HORSE RIDGE SUBZONE
EFU - LA PINE SUBZONE
EFU - LOWER BRIDGE SUBZONE
EFU - SISTERS/CLOVERDALE SUBZONE
EFU - TERREBONNE SUBZONE
EFU - TUMALO/REDMOND/BEND SUBZONE
OPEN SPACE & CONSERVATION
FOREST USE 1
FOREST USE 2
FLOOD PLAIN
AIRPORT DEVELOPMENT
MULTI USE AGRICULTURE
RURAL RESIDENTIAL
RURAL INDUSTRIAL
SURFACE MINING
LANDSCAPE MANAGEMENT ROAD & WATER
LANDSCAPE MANAGEMENT ROAD
LANDSCAPE MANAGEMENT WATER
CONVENTIONAL HOUSING
WILDLIFE
SURFACE MINING IMPACT AREA
AIRPORT SAFETY

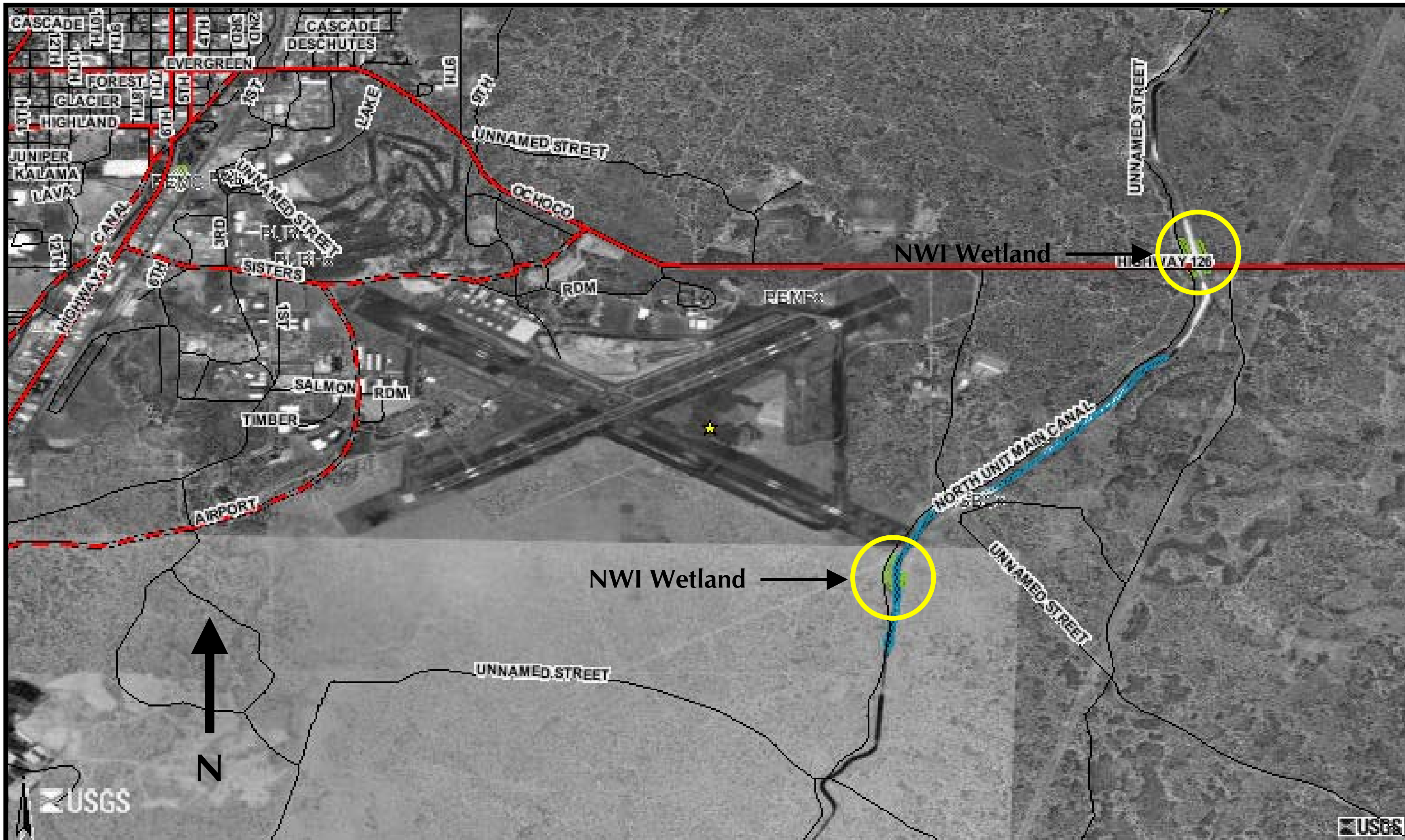


Location Map

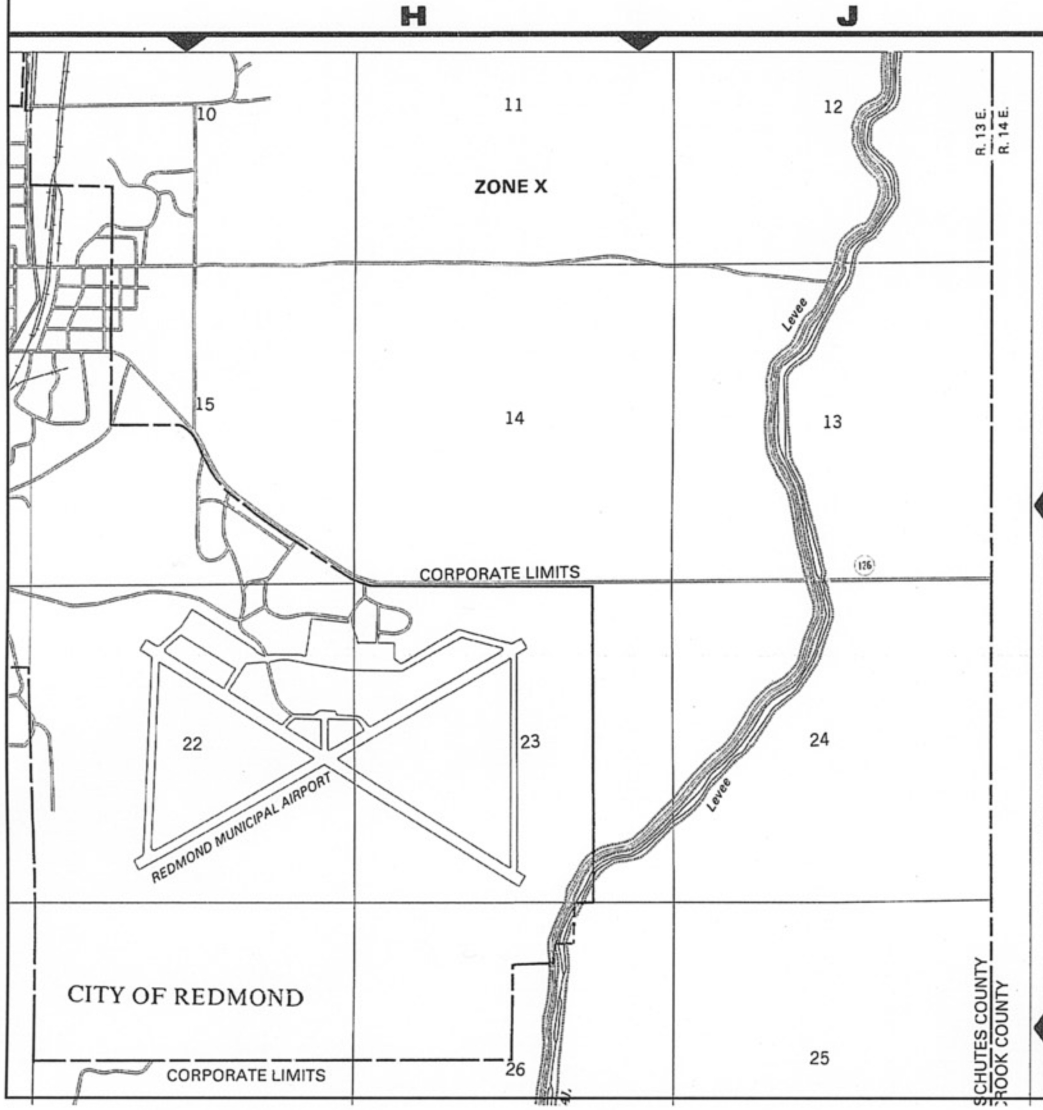
DATE: July 25, 2003

0.75 0 0.75 1.5 Miles

Deschutes County
Geographic Information System



Redmond Municipal Airport (Roberts Field)
Location of National Wetlands Inventory (NWI) Wetlands



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE A99	To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
ZONE V	Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X	Areas determined to be outside 500-year flood plain.
ZONE D	Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

~513~ Base Flood Elevation Line; Elevation in Feet*

(D)—(D) Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*

RM7× Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Certain areas not in Special Flood Hazard Areas may be protected by flood

APPROXIMATE SCALE IN FEET

2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

DESCHUTES COUNTY, OREGON AND INCORPORATED AREAS

PANEL 150 OF 825

PANEL LOCATION

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
UNINCORPORATED AREAS	410055	0150	C

MAP NUMBER 41017C0150 C

EFFECTIVE DATE: AUGUST 16,1988

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

NRPS

Appendix B

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Odell, Rachel. *Deal Reached on Future of Fish*. The Bulletin. July 13, 2004

Peplin, Todd. Project E-mail response. Natural Resource Conservation Service. November 11, 2004

Appendix C

Agency Contact List

NRPS natural resource planning services, inc.
3030 SW Moody Avenue, Suite 105
Portland, Oregon 97201-4867
www.nrpsi.com
Phone: 503.222.5005
Fax: 503.222.6050
Email: info@nrpsi.com

AIRPORT MASTER PLAN UPDATE FOR ROBERTS FIELD - REDMOND MUNICIPAL AIRPORT AGENCY CONTACTS

Name	Position	Agency	Mailing Address	Phone/E-mail	Status
Charisse Snapp	Cultural Resources Program Manager	Burns Paiute Tribe	Burns Paiute Tribe HC-71 100 Pasigo St. Burns, OR 97720	541-573-2008 ext 247/	Not Contacted
John Herlocker	Assistant Manager	Central Oregon Irrigation District	Central Oregon Irrigation District 2598 N. Highway 97 Redmond, OR 97756	541-548-6047/john@coid.org	Contacted
Catherine Dickson	Cultural resources	Confederated Tribes of the Umatilla	Confederated Tribes of the Umatilla P.O. Box 638 Pendleton, OR 97801	541-966-2331/catherinedickson@ctuir.com	Not Contacted
Teara Farrow	Acting Program Manager	Confederated Tribes of the Umatilla	Confederated Tribes of the Umatilla P.O. Box 638 Pendleton, OR 97801		Not Contacted
Sally Bird	Cultural Resources Program Manager	Confederated Tribes of Warm Springs	Confederated Tribes of Warm Springs P.O. Box C Warm Springs, OR 97761	541-553-2006/sbird@wstribes.org	Not Contacted
Kevin Harrison	Director	Deschutes County, Community Development Dept.	Community Development Dept., Deschutes County 117 NW Lafayette Bend, Oregon 97701	541-385-1401/Kevin_Harrison@deschutes.org	Contacted
Peter Brewer	Air Quality Manager	Oregon Dept. Environmental Quality – Air Quality Section	Oregon Dept. Environmental Quality – Air Quality Section 2146 NE 4th Bend OR 97701	541-388-6146/brewer.peter@deq.state.or.us	Contacted
Brett McKnight	Manager, Land and Hazardous Waste	Oregon Dept. Environmental Quality – Land	Environmental Quality – Land Quality Section 2146 NE 4th	541-388-6146/mcknight.brett@deq.state.or.us	Contacted

Name	Position	Agency	Mailing Address	Phone/E-mail	Status
		Quality Section	Bend OR 97701		
Dick Nichols	Water Quality Manager	Oregon Dept. Environmental Quality – Water Quality Section	Oregon Dept. Environmental Quality – Water Quality Section 2146 NE 4th Bend OR 97701	541-388-6146/nichols.dick@deq.state.or.us	Contacted
Charlie Riordan	Sate Airports Manager	Oregon Dept. of Aviation	Oregon Dept. of Aviation Oregon Dept. of Aviation 3040 25 St. SE Salem, OR 97302-1125	800-874-0102/ charles.h.riordan@state.or.us	Contacted
Steve Marx	Fisheries Biologist Upper Deschutes River Basin	Oregon Dept. of Fish and Wildlife	Oregon Dept. of Fish and Wildlife High Desert Region 61374 Parrell Road Bend, OR 97702	541-388-6363/steven.d.marx@state.or.us	Contacted
Steven George	Wildlife Biologist Upper Deschutes River Basin	Oregon Dept. of Fish and Wildlife	Oregon Dept. of Fish and Wildlife High Desert Region 61374 Parrell Road Bend, OR 97702	541-388-6363/steven.w.george@state.or.us	Contacted
Mark Radabaugh		Oregon Dept. of Land Conservation and Development	Oregon Dept. of Land Conservation and Development Empire Corporate Park 20300 Empire Ave., suite 1 Bend, OR 97701	541-388-6157/mark.radabaugh@state.or.us	Contacted
Nicole Navas		Oregon Dept. State Lands	Oregon Dept. State Lands Eastern Region 20300 Empire Avenue Suite 1 Bend, Oregon 97701	541-388-6236/nicole.navas@dsl.state.or.us	Contacted
Karen Quigley	CIS Officer	Oregon Legislative Commission on Legislative Commission on Indian Services Indian Services	State of Oregon, 167 State Capitol Salem, OR 97310	503-986-1067/karen.m.Quigley@state.or.us	Contacted for information only
Dennis Griffin	State Archaeologist	Oregon State Historic Preservation Office (SHPO)	State Historic Preservation Office 725 Summer St. NE, Suite C, Salem, OR 97301	503-986-0674/Dennis.Griffin@state.or.us	Not Contacted
Sarah Jalving	Review and Compliance Specialist	Oregon State Historic Preservation Office (SHPO)	State Historic Preservation Office 725 Summer St. NE, Suite C, Salem, OR 97301	503- 986-0679/sarah.jalving@state.or.us	Not Contacted
Carrie	Airport Manager	Redmond Municipal	Redmond Municipal Airport	541-548-0646/carrien@ci.redmond.or.us	Contacted

Name	Position	Agency	Mailing Address	Phone/E-mail	Status
Novick		Airport	P.O. Box 726 Redmond, OR 97756-0100		
Merina Christofferson	Regulatory Project Manager	US Army Corps of Engineers	US Army Corps of Engineers 1600 Executive Parkway, Suite 210 Eugene, OR 97401	541-465-6882/ Merina.E.Christoffersen@nwp01.usace.army.mil	Contacted
Robert Towne	Field Manager for the Deschutes Resource Area	US Bureau of Land Management	Bureau of Land Management 3050 Northeast Third St. Prineville, OR 97754	541-416-6766/Robert_towne@or.blm.gov	Contacted
Mollie Chaudet	Biologist for the Deschutes Resource Area	US Bureau of Land Management	Bureau of Land Management 3050 Northeast Third St. Prineville, OR 97754	541-416-6766/Mollie_Chaudet@or.blm.gov	Contacted
Jonathan Freedman	EIS Review Coordinator	US Environmental Protection Agency	US Environmental Protection Agency EPA Region 10 1200 Sixth Avenue, ECO-088 Seattle, Washington 98101	206-553-0266/freedman.jonathan@epa.gov	Contacted
Teena Reichgott	Manager NEPA Review Unit, ETPA 088	US Environmental Protection Agency	US Environmental Protection Agency EPA Region 10 1200 Sixth Avenue, ECO-088 Seattle, Washington 98101	206-553-1601/ Reichgott.Christine@epamail.epa.gov	Contacted
Tony Fournier		US Environmental Protection Agency	NEPA Review Unit, ETPA 088 Office of Ecosystems, Tribal and Public Affairs EPA Region 10 1200 Sixth Avenue Seattle, WA 98101	206-553-1601/Fournier.Tony@epamail.epa.gov	Contacted
Cayla Morgan	SEA-ADO Environmental Specialist	US Federal Aviation Administration	Federal Aviation Administration Northwest Mountain Region 1601 Lind Avenue Southwest Renton, Washington 98055	425-227-2653/ Cayla.Morgan@faa.gov	Contacted
Jerry Cordova	Biologist	US Fish and Wildlife Service	US Fish & Wildlife Service Bend Field Office 20310 Empire Avenue, Suite A100 Bend, Oregon 97701	541-383-7146/jerry_cordova@fws.gov	Contacted
Todd Peplin	District Conservationist	US Natural Resource Conservation Service, USDA	US Natural Resource Conservation Service 625 SE Salmon Ave., #4 Redmond, OR 97756-9580	541-923-4358, ext. 123/todd.peplin@or.usda.gov	Contacted
Kassandra (Kasey) Brown	Biologist	US NOAA Fisheries	NOAA Fisheries Eastern Oregon Habitat Branch 3502 Highway 30	541-975-1835/kassandra.brown@noaa.gov	Contacted

Name	Position	Agency	Mailing Address	Phone/E-mail	Status
			La Grand, Oregon 97850-5268		
Scott Hoefer	Biologist	US NOAA Fisheries	NOAA Fisheries Eastern Oregon Habitat Branch 3502 Highway 30 La Grand, Oregon 97850-5268	541-975-1835/scott.hoefer@noaa.gov	Contacted
Spencer Hovekamp	Branch Chief	US NOAA Fisheries	NOAA Fisheries Eastern Oregon Habitat Branch 3502 Highway 30 La Grand, Oregon 97850-5268	541-975- 1835/spencer.hovekamp@noaa.gov	Contacted

Appendix D

Regulatory Agency Correspondence

Redmond Airport Comment FormFrom: MCKNIGHT Brett
[MCKNIGHT.Brett@deq.state.or.us]
Sent: Friday, November 05, 2004 10:35 AM
To: Bill Jones
Subject: Redmond Airport Comment Form

<<Redmond Airport Comment Form.doc>>
Bill- attached is the completed form that includes comments from Solid Waste; Clean-up and Hazardous Waste Programs here in the Bend office.
With regards to Hazardous Waste comments, they would be specific towards any new or expansion of an industrial operation that may be identified when the master plan is further along, such as adding a major aircraft servicing and repair operation. That sort of activity if/when identified in a master plan may trigger hazardous waste generator requirements; however, those requirements are best addressed when those facilities are at design/operational stages and not at the master plan stage.
Let me know if you have any questions.

Redmond, Oregon

INTERGOVERNMENTAL REVIEW OF AIRPORT MASTER PLAN STUDY
ROBERTS FIELD, REDMOND MUNICIPAL AIRPORT

AGENCY REVIEW

Project Name: Roberts Field Redmond Municipal Airport Master Plan Study
Airport Location: 2522 SE Jesse Butler Circle, Redmond OR 97756-8643
Airport Director: Carrie Novick

Date Sent: October 25, 2004
Please Return by: November 5, 2004
Return to Bill Jones by one of the following methods:

Mailing Address:	Natural Resource Planning Services, Inc. 3030 SW Moody Avenue, Suite 105 Portland, Oregon 97201-4867
E-mail Address:	bill@nrpsi.com
Fax number:	503-222-6050

To Agency Addressed: If you intend to comment but cannot respond by the return date, please notify Bill Jones at Natural Resource Planning Services, Inc. immediately either by phone (503-222-5005) or e-mail (bill@nrpsi.com). If no response is received by the due date, we will assume that you have no comment.

Should you have additional questions Contact Bill Jones at NRPS by phone or e-mail

---

PROGRAM REVIEW AND COMMENT

We have reviewed the Roberts Field Redmond Municipal Airport Master Plan Study information and have reached the following conclusions on its relationship to our plans and programs (mark an **X** in appropriate box):

1		It has no adverse effect.
2		We have no comment.
3		Effects, although measurable would be acceptable.
4		It has adverse effects.
5	**X**	We are interested, but require more information to evaluate the proposal.
6		Additional comments for project improvement

If you marked an X in either box 4, 5, or 6, please explain in the Remarks Section at the end of this Form.

Date: November 1, 2004

Agency Name: Oregon DEQ

Agency Address: 2146 NE 4^{th} Avenue

Name Agency Representative: Dick Nichols

Title: Bend WQ Section Manager

Phone Number: 541-388-6146, X251.

E-Mail Address: Nichols.dick@deq.state.or.us

REMARKS SECTION

[If filling out electronically, you can simply type your comments in the space below. If filling out by hand, attach additional sheets as necessary]

We are particularly concerned about stormwater disposal, particularly that portion that could be contaminated by de-icing chemicals or fuel spills. Use of dry wells for storm water disposal is regulated by OAR 340-44 and by federal SDWA UIC program and may not be legal to use in some cases.

Dismantling of existing buildings, particularly former military structures, may involve asbestos removal which must be done by a certified contractor and is regulated by both DEQ and federal regs.

Current and past fuel handling areas may have had releases of hazardous materials or petroleum products that pose a hazard to groundwater quality.

INTERGOVERNMENTAL REVIEW OF AIRPORT MASTER PLAN STUDY
ROBERTS FIELD, REDMOND MUNICIPAL AIRPORT

AGENCY REVIEW

Project Name: Roberts Field Redmond Municipal Airport Master Plan Study
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Should you have additional questions Contact Bill Jones at NRPS by phone or e-mail

---

PROGRAM REVIEW AND COMMENT

We have reviewed the Roberts Field Redmond Municipal Airport Master Plan Study information and have reached the following conclusions on its relationship to our plans and programs (mark an **X** in appropriate box):

1		It has no adverse effect.
2		We have no comment.
3	**X**	Effects, although measurable would be acceptable.
4		It has adverse effects.
5		We are interested, but require more information to evaluate the proposal.
6		Additional comments for project improvement

If you marked an X in either box 4, 5, or 6, please explain in the Remarks Section at the end of this Form.

Date: 11/5/2004

Agency Name: Dept. of Env. Qual.

Agency Address: 2146 NE 4th Bend OR 97701

Name Agency Representative: Brett McKnight

Title: Eastern Region Haz. Waste Manager

Phone Number: 541-388-6146 ext. 236

E-Mail Address: Mcknight.brett@deq.state.or.us

REMARKS SECTION

[If filling out electronically, you can simply type your comments in the space below. If filling out by hand, attach additional sheets as necessary]

1. The Deschutes County solid waste facilities serving the Redmond area are located approximately two miles north of the airport. The airport master plan study area for the Redmond airport is outside the Department's impact area of concerns for solid waste facilities and airport operations.

2. Adding existing and/or closed industrial operations into the airport master plan may warrant individual site assessment activities for each industrial site; determining if releases of hazardous substances and/or petroleum have historically occurred or not that would prompt state clean-up requirements.

From: Kasey Brown [kassandra.brown@noaa.gov]
Sent: Wednesday, October 27, 2004 4:06 PM
To: bill@nrpsi.com; mike@nrpsi.com
Cc: Spencer Hovekamp
Subject: NOAA Fisheries response to Redmond Municipal Airport Master Planning

Dear Mr. Wallace and Mr. Jones,

This email is written in response to your letter and e-mail, received October 22nd and 25th, respectively, both regarding the proposed Redmond Municipal Airport project. It is my understanding that the airport facility will likely undergo expansion as part of the Master Planning process in order to meet FAA safety standards. Please consider this e-mail NOAA Fisheries' response to the species list request and the request for comments during the Master Planning phase.

NOAA Fisheries anticipates that there will be no effect to Middle Columbia River (MCR) steelhead, listed as threatened under the Endangered Species Act, or to Essential Fish Habitat (EFH) designated for Chinook salmon under the Magnuson-Stevens Fishery Conservation and Management Act, as a result of this proposed short-term construction project, barring unforeseen circumstances.

First, MCR steelhead and Chinook EFH will not be present in the area of the proposed project. It appears from the materials that the airport expansion will encroach into the area of the North Unit Main Canal, which crosses both the existing and proposed Runway Protection Zone and flows into the Crooked River more than six river miles away. However, the Crooked and Deschutes Rivers join to flow into Lake Billy Chinook further downstream. MCR Steelhead are unable to access Lake Billy Chinook due to the currently impassable fish barriers presented by Round Butte and Pelton dams, and are only present in the Deschutes River below the dams. Likewise, Chinook EFH in the Deschutes River currently halts at the dams.

Second, we trust and expect that the City of Redmond, your staff at Natural Resource Planning Services, Inc., and others involved, will exercise due care and use sound management strategies and best available technologies to adequately protect the environment during the planning and implementation of the airport expansion. These protective measures include, but are not limited to, ensuring that airplane or other fuel spills are prevented, and that surface runoff from impervious surfaces are treated, thereby minimizing the risk of pollutants reaching the Crooked River.

Please feel free to contact us with any questions as specific projects are identified and more detailed planning, scheduling, and design are implemented.

Thank you,

Kassandra (Kasey) Brown
NOAA Fisheries Biologist
NOAA Fisheries Office
3502 Highway 30
La Grande, OR 97850
541-975-1835 x 225
kassandra.brown@noaa.gov

INTERGOVERNMENTAL REVIEW OF AIRPORT MASTER PLAN STUDY
ROBERTS FIELD, REDMOND MUNICIPAL AIRPORT

AGENCY REVIEW

Project Name: Roberts Field Redmond Municipal Airport Master Plan Study
Airport Location: 2522 SE Jesse Butler Circle, Redmond OR 97756-8643
Airport Director: Carrie Novick

Date Sent: October 25, 2004
Please Return by: November 5, 2004
Return to Bill Jones by one of the following methods:

Mailing Address:	Natural Resource Planning Services, Inc. 3030 SW Moody Avenue, Suite 105 Portland, Oregon 97201-4867
E-mail Address:	bill@nrpsi.com
Fax number:	503-222-6050

To Agency Addressed: If you intend to comment but cannot respond by the return date, please notify Bill Jones at Natural Resource Planning Services, Inc. immediately either by phone (503-222-5005) or e-mail (bill@nrpsi.com). If no response is received by the due date, we will assume that you have no comment.

Should you have additional questions Contact Bill Jones at NRPS by phone or e-mail

---

PROGRAM REVIEW AND COMMENT

We have reviewed the Roberts Field Redmond Municipal Airport Master Plan Study information and have reached the following conclusions on its relationship to our plans and programs (mark an **X** in appropriate box):

1		It has no adverse effect.
2		We have no comment.
3		Effects, although measurable would be acceptable.
4		It has adverse effects.
5	X	We are interested, but require more information to evaluate the proposal.
6		Additional comments for project improvement

If you marked an X in either box 4, 5, or 6, please explain in the Remarks Section at the end of this Form.

Date: November 3, 2004

Agency Name: Oregon Department of Fish and Wildlife

Agency Address: 61374 Parrell Rd

Name Agency Representative: Steven George

Title: Deschutes District Wildlife Biologist

Phone Number: 541-388-6363

E-Mail Address: Steven.w.george@state.or.us

REMARKS SECTION

[If filling out electronically, you can simply type your comments in the space below. If filling out by hand, attach additional sheets as necessary]

No information was provided on habitat loss and mitigation as a result. No information was provided on prevention methods for wildlife strikes.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

November 10, 2004

Reply To
Attn Of: ETPA-088

Dr. Bill Jones
NRPS
3030 SW Moody Ave.
Suite 105
Portland, OR 97201-4867

Subject: Roberts Field-Redmond Municipal Airport Master Plan

Dear Dr Jones:

Thank you for the opportunity to provide preliminary comments on the Roberts Field-Redmond Municipal Airport Master Plan. These comments are provided to assist you in your efforts to identify potential environmental impacts and concerns from the proposed project. If you need additional information on National Environmental Policy Act (NEPA) requirements and the Agency=s responsibilities under Section 309 of the Clean Air Act, please let us know and we will be glad to provide that information to you under separate cover. Section 309 specifically directs the U.S. Environmental Protection Agency (EPA) to review and comment in writing on the environmental impacts associated with all major federal actions.

Roads

Roads construction and maintenance have the potential for significant environmental impacts. As the planning of the Roberts Field-Redmond Municipal Airport continues, we recommend that you evaluate the impacts roads associated with the proposed project would have on waterbodies in the area. In particular, evaluate how the project may contribute sediments to streams, interrupt the subsurface flow of water, particularly where roads cut into steep slopes, how roads may fragment habitats and wildlife disturbance, and introduce or exacerbate noxious weeds. In addition, project planning should evaluate how vehicle uses may result in increased noise and air pollution. Project planning should consider all impacts associated with automobile activities and describe what actions will be taken to manage their impacts in the project area.

Water Quality

The proposed project should be evaluated for its potential to alter stream discharge and degrade riparian and water quality. The introduction of sediments to stream systems can alter thermal processes, consequently degrading water quality, and impacting fish and their habitat. Section 303(d) of the Clean Water Act (CWA) requires the state of Oregon identify those waterbodies which are not meeting or not likely to meet State water quality standards. Project planning should evaluate which water bodies could potentially be affected by the project that are listed on the State=s current 303(d) list and whether Oregon Department of Environmental Quality (ODEQ) has developed a water quality restoration plan (Total Maximum Daily Load) for the waterbodies and the pollutants of concern. If a Total Maximum Daily Load (TMDL) has not been established for those water bodies on the 303(d) list, then in the interim until one is established, the project should demonstrate that there will be no net degradation of water quality to these listed waters.

Antidegradation provisions of the CWA apply to those water bodies where water quality standards are currently being met. This provision prohibits degrading the water quality unless an analysis shows that important economic and social development necessitates degrading water quality. Project evaluation should determine how the antidegradation provisions would be met.

Activities such as road building may impact waters that serve as the sources of drinking water for communities. The 1996 amendments to the Safe Drinking Water Act (SDWA) requires federal agencies that manage lands that serve as drinking water sources, protect these source waters. Project evaluation should identify all drinking water sources, any potential contamination of these sources that may result from the proposed project, and measures that will be taken to protect these sources.

Endangered Species Act

The proposed project may impact endangered, threatened or candidate species listed under the Endangered Species Act (ESA), their habitats, as well as state sensitive species. Project evaluation should identify the endangered, threatened, and candidate species under ESA, and other sensitive species within the proposed project area. In addition, project evaluation should describe the critical habitat for these species, identify any impacts the proposed projects will have on these species and their critical habitat, and how it will meet all requirements under ESA, including consultation efforts with the U.S. Fish and Wildlife Service, and National Oceanographic Atmospheric Administration.

Habitat

The proposed airport projects may have impacts on fish and wildlife habitat, and habitat connectivity. Project evaluation should describe the current quality and potential capacity of habitat, its use by fish and wildlife on and near the proposed project area, and identify known fish and wildlife corridors, migration routes, and areas of seasonal fish and wildlife congregation. Project evaluation should include effects on fish and wildlife from habitat removal and alteration, aquatic and terrestrial habitat fragmentation caused by roads, land use, management activities, and human activity. In addition, project evaluation should include the potential impacts on plant species and their habitats.

Cumulative Impacts

The Roberts Field Project evaluation should assess impacts over the entire area of impact, and it may be of particular importance to consider the effects of other past, present and future projects in the area together with your proposed action, including those by entities other than those affiliated with the airport itself. Only by considering all actions together can one conclude what the impacts on environmental resources are likely to be.

EPA has issued guidance on how we are to provide comments on the assessment of cumulative impacts, *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*, which can be found on EPA=s Office of Federal Activities home page at: http://www.epa.gov/compliance/resources/nepa.html. The guidance states that in order to assess the adequacy of the cumulative impacts assessment, five key areas should be considered. EPA tries to assess whether the cumulative effects analysis:

1. Identifies resources if any, that are being cumulatively impacted;
2. Determines the appropriate geographic (within natural ecological boundaries) area and the time period over which the effects have occurred and will occur;
3. Looks at all past, present, and reasonably foreseeable future actions that have affected, are affecting, or would affect resources of concern;
4. Describes a benchmark or baseline;
5. Includes scientifically defensible threshold levels.

Indirect Impacts

Project evaluation should identify and evaluate potential consequences of the proposed projects Aoutside@ the project area boundaries. Because the proposed project could result in impacts outside the airport boundary, the projects could generate air and water quality impacts in other areas. These and other indirect impacts should be evaluated.

Consultation with Tribes

The proposed projects may affect historical or traditional cultural places of importance to tribes in the area. Project evaluation should identify historic resources, and assure that treaty rights, and privileges are addressed appropriately. If the proposed project will have impacts on tribes and federal actions will be required, project development should be conducted in consultation with all affected tribal governments, consistent with Executive Order (EO) 13175 (*Consultation and Coordination with Indian Tribal Governments)*. EO 13175 states that the U.S. government will continue Ato work with Indian tribes on a government-to-government basis to address issues concerning Indian tribal self-government, trust resources, and Indian tribal treaty and other rights.@ Consistent with the July 28, 1999 memorandum from the Council on Environmental Quality (CEQ) to Heads of Federal Agencies, we strongly urge you to consider inviting affected tribal governments to participate in project development process as cooperating agencies. This would provide for the establishment of a mechanism for addressing intergovernmental issues throughout the project development process.

Public Participation and Environmental Justice

Project evaluation should include potential impacts on low income or people of color communities. If the project will result in a major federal action, the evaluation should consider how to meet environmental justice requirements consistent with Executive Order (EO) 12898 (*Federal Actions to Address Environmental Justice in Minority and Low-Income Populations)*.

We appreciate the opportunity to participate early in the planning process for this project and are available to discuss issues or answer questions that may arise while you proceed with your project development. Should you have any questions regarding our comments please contact me at (206) 553-6322 or by electronic mail at mbabaliye.theogene@epa.gov.

Sincerely,

Theogene Mbabaliye
Environmental Intern

INTERGOVERNMENTAL REVIEW OF AIRPORT MASTER PLAN STUDY
ROBERTS FIELD, REDMOND MUNICIPAL AIRPORT

AGENCY REVIEW

Project Name: Roberts Field Redmond Municipal Airport Master Plan Study
Airport Location: 2522 SE Jesse Butler Circle, Redmond OR 97756-8643
Airport Director: Carrie Novick

Date Sent: October 25, 2004
Please Return by: November 5, 2004
Return to Bill Jones by one of the following methods:

Mailing Address:	Natural Resource Planning Services, Inc. 3030 SW Moody Avenue, Suite 105 Portland, Oregon 97201-4867
E-mail Address:	bill@nrpsi.com
Fax number:	503-222-6050

To Agency Addressed: If you intend to comment but cannot respond by the return date, please notify Bill Jones at Natural Resource Planning Services, Inc. immediately either by phone (503-222-5005) or e-mail (bill@nrpsi.com). If no response is received by the due date, we will assume that you have no comment.

Should you have additional questions Contact Bill Jones at NRPS by phone or e-mail

---

PROGRAM REVIEW AND COMMENT

We have reviewed the Roberts Field Redmond Municipal Airport Master Plan Study information and have reached the following conclusions on its relationship to our plans and programs (mark an **X** in appropriate box):

1		It has no adverse effect.
2		We have no comment.
3		Effects, although measurable would be acceptable.
4		It has adverse effects.
5	X	We are interested, but require more information to evaluate the proposal.
6		Additional comments for project improvement

If you marked an X in either box 4, 5, or 6, please explain in the Remarks Section at the end of this Form.

Date: 26 October 2004

Agency Name: Department of State Lands

Agency Address: 20300 Empire Avenue, Suite 1

Name Agency Representative: Nicole Navas

Title: Resource Coordinator

Phone Number: 541-388-6236

E-Mail Address: nicole.navas@dsl.state.or.us

REMARKS SECTION

Under the Oregon Removal-Fill Law (ORS 196.800 - 196.990), removal, filling, or alteration of 50 cubic yards or more of material within the bed or banks of the waters of this state or any amount of material within waters designated Essential Salmonid Habitat or State Scenic Waterway requires a permit from the Department of State Lands. Waters of the state include the Pacific Ocean, rivers, lakes, most ponds and wetlands, and other natural water bodies.

If the proposed project will have impacts to wetlands and/or waterways (potentially including canals/ditches), the project will require authorization from the Department.

ROBERTS FIELD
Redmond, Oregon

INTERGOVERNMENTAL REVIEW OF AIRPORT MASTER PLAN STUDY
ROBERTS FIELD, REDMOND MUNICIPAL AIRPORT

AGENCY REVIEW

Project Name: Roberts Field Redmond Municipal Airport Master Plan Study
Airport Location: 2522 SE Jesse Butler Circle, Redmond OR 97756-8643
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PROGRAM REVIEW AND COMMENT

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5	X	We are interested, but require more information to evaluate the proposal.
6		Additional comments for project improvement

If you marked an X in either box 4, 5, or 6, please explain in the Remarks Section at the end of this Form.

Date: November 1, 2004

Agency Name: Central Oregon Irrigation District

Agency Address: 2598 N. Hwy. 97, Redmond, OR 97756

Name Agency Representative: John R. Herlocker

Title: Assistant Manager

Phone Number: 541-548-6047 or 541-480-8149

E-Mail Address: john@coid.org

REMARKS SECTION

[If filling out electronically, you can simply type your comments in the space below. If filling out by hand, attach additional sheets as necessary]

1. The Central Oregon Irrigation District along with the Redmond School District own approximately 250 acres adjacent to and North of the Redmond Airport property. The proposed Business Park suggests that Hwy. 126 and other transportation routes to be realigned as a result of this project. There may be alternatives to realignment that have not been discussed that may be advantageous to other properties. The District would welcome the opportunity to be a party to these discussions.
2. In addition, due to runway expansion, what if any, land use restrictions may affect surrounding properties? Would adjacent lands be limited to the types of zoning or land uses as a result of the Airport project?
3. The aerial photo suggests improvements to the runway may occur on the old Juniper Golf Course where the District has water rights assigned. This needs to be confirmed. If in fact this is the case, then measures to transfer these water rights must take place before construction begins.

Appendix G
LEASE SUMMARIES

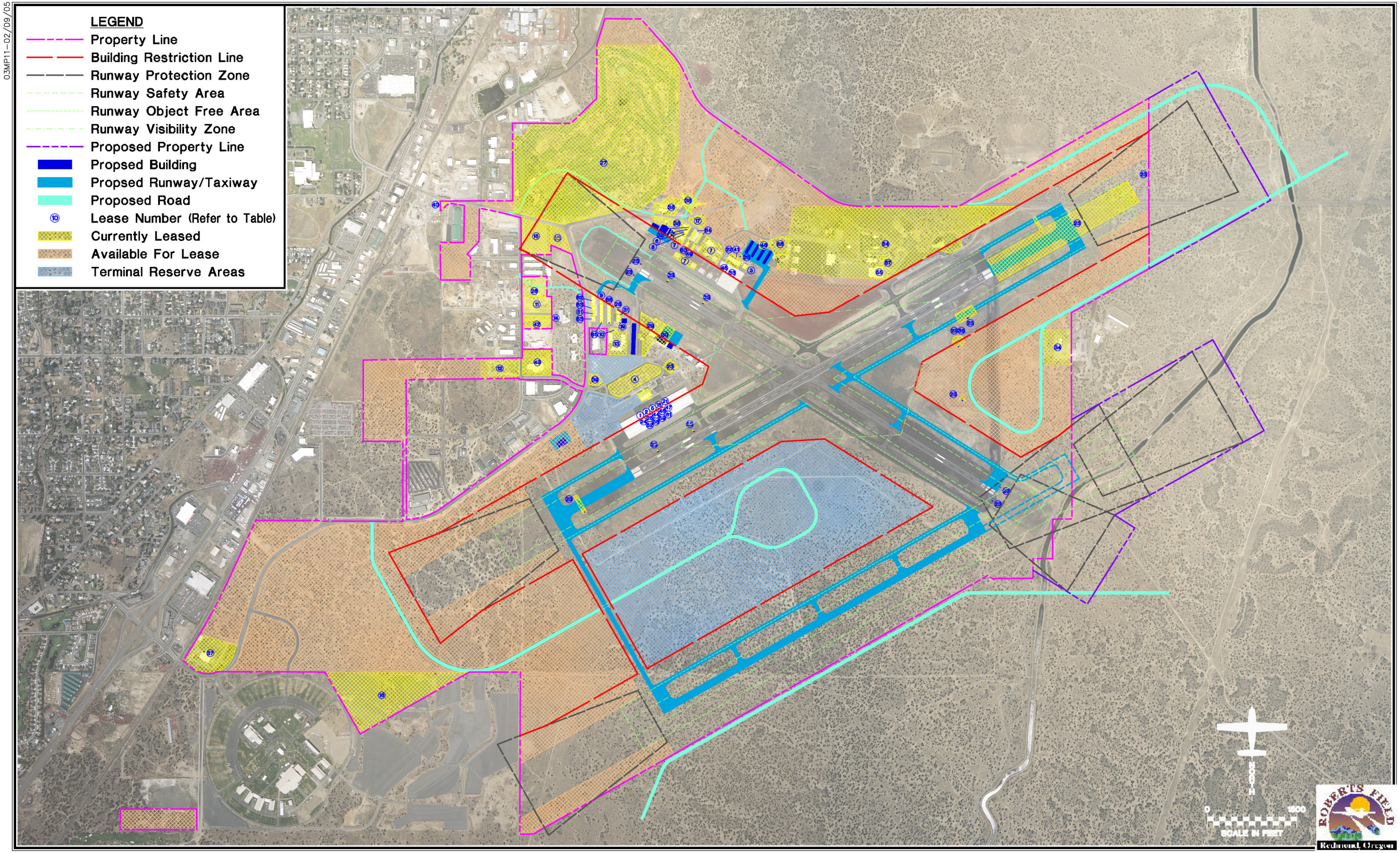
ROBERTS FIELD
Redmond, Oregon

ROBERTS FIELD (RDM) - REDMOND, OREGON
LEASE SUMMARY

LEASE NO.	LEASE NAME	LEASE TYPE	LEASE TERM	LEASE EXPIRATION	LEASE DESCRIPTION
1	Aeronautical Radio, Inc.	Terminal Space	$500 Per Year - Renegotiated Every 3 Years	June 30, 2004	Space in Radio Room and Antenna
2	Alaska Airlines	Terminal Space	$500 Per Year - Renegotiated Every 3 Years	December 31, 2004	Space in Radio Room and Antenna
3	American Energy	Executive Hangar	25 Year Lease - 3 Year CPI and 5 Year Reappraisal	June 30, 2023	8,400 Square Feet - Airside
4	APCOA/Standard Parking	Parking Lot Management	RFP Every 5 Years - Management Agreement	June 30, 2004	Public Paid Parking Lot
5	Avis Rent a Car	Terminal Space and Parking	RFP Every 5 Years - % of Gross vs MAG	March 31, 2004	Car Rental Counter Space and Parking
6	Barclay Logging	Executive Hangar	40 Year Lease - Fixed Payment Schedule	August 31, 2027	
7	Butler Aircraft Company	FBO	10 Year Lease with Four 5 Year Options - 3 Year CPI	July 31, 2012	27,272 Square Feet - Airside
8	C-More/McGilvary	Executive Hangar	40 Year Lease - Fixed Payment Schedule 10% Increase Each 5 Year Period	June 10, 2026	
9	C-More and Company	Executive Hangar	20 Year Lease - 3 Year CPI, 5 Year Reappraisal	August 21, 2021	4,320 Square Feet - Airside
10	Central Christian Schools	Easement in Trade	Month to Month		6,617 Square Feet - Airside
11	Cement Products	Industrial Land	10 Year Lease with One 5 Year Option	September 30, 2014	3 Acres
12	COCAAN	Industrial Land	20 Year Lease with Two 20 Year Options - Fixed at $1.00 Per Year	May 31, 2049	5 Acres
13	CSARE	Industrial Land	10 Year Lease with Four 10 and One 5 Year Options - 3 Year CPI, 5 Year Reappraisal	January 31, 2058	2.97 Acres
14	Deschutes County-COCC	Road Right-of-Way	Maintain Landscape	Perpetual Easement	30,000 Square Feet
15	Deschutes County-COCC	Parking Easement-Clear Zone Remainder	40 Year Lease with Two 20 Year Options - In Trade	August 31, 2075	2.21 Acres and 2.37 Acres
16	Deschutes County-Fair	Parking Easement	99 Year Lease - In Trade	August 31, 2095	28.93 Acres
17	Deschutes County Humane	Industrial Land	10 Year Lease with One 10 Year Option - Fixed at $1.00 Per Year	August 31, 2004	1 Acre
18	EAM dba Budget Rent Car	Terminal Space and Parking	RFP Every 5 Years - % of Gross vs MAG	March 31, 2004	Car Rental Counter Space and Parking
19	Emmons, Michael	Executive Hangar	25 Year Lease - 3 Year CPI and 5 Year Reappraisal	April 30, 2027	6,000 Square Feet - Airside
20	Enterprise Rent-A-Car	Off Airport Car Rental	1 Year Agreement with 1 Year Addendum - 5% of Gross	March 31, 2004	Right to do Business at Airport - Use of Taxi, Bus and Shuttle Areas
21	Ernst Brothers	Terminal Space	4 Year Lease with One 5 Year Option - % of Gross vs MAG	February 28, 2011	Restaurant Space in Terminal
22	FAA AFSFO	Industrial Land	5 Year Lease with One 5 Year Option - No Rent	September 30, 2008	0.75 Acres
23	FAA Master Lease	Navigational Aids	Until Government Terminates - No Rent	Indefinite	
24	GSA/TSA	Terminal Space	3 Year Lease - Square Footage Rent, M and O	October 31, 2005	Carrier Space in Terminal
25	Horizon Air	Terminal Space	3 Year Lease - Square Footage Rent, M and O	December 31, 2005	Carrier Space in Terminal
26	Jollo, Ronald	Industrial Land	10 Year Lease with One 10 Year Option	April 30, 2012	3.25 Acres - Landside
27	Juniper Golf Course	Industrial Land	20 Years	August 31, 2005	134.35 Acres
28	KC Aero	Executive Hangar - Old	25 Year Lease - 3 year CPI	July 31, 2020	0.18 Acres - Airside
29	KC Aero	FBO	10 Year Lease with Four 10 and One 5 Year Options - 3 Year CPI, 5 Year Reappraisal	January 31, 2058	62,932 Square Feet - Airside
30	KC Aero	Executive Hangar - New	20 Year Lease with Two 5 Year Options - 3 Year CPI, 5 Year Reappraisal	July 31, 2022	156,558 Square Feet - Airside
31	Leach, Michael	Executive Hangar	20 Year Lease - 3 Year CPI, 5 Year Reappraisal	October 31, 2022	2,750 Square Feet - Airside
32	Lelouis, Anthony	Executive Hangar	40 Year Lease - First 5 Years Fixed , then 5 Year Adjustments	December 31, 2030	1,108 Square Feet - Airside
33	McCabe, Gary	Executive Hangar	20 Year Lease - 3 Year CPI, 5 Year Reappraisal	July 31, 2023	11,762 Square Feet - Airside
34	Military - State of Oregon	Guard Facility	20 Year Lease with 20 Year Option - Fixed Rent at $1.00 Per Year	December 31, 2027	6.4 Acres - Landside
35	NOAA	ASOS	15 Year Lease - No Rent	February 14, 2013	Automated Surface Observing System
36	OCON, Inc.	Outer Marker	10 Year Lease with 10 Year Option - Fixed Fee at $500.00	December 31, 2017	I Acre Parcel that Airport Leases for Outer Marker
37	Peterson Tractor	Industrial Land	30 Year Lease with Three 10 Year Options - Fixed Rent for First Ten Years then FMV	March 31, 2054	9 Acres Industrial Land on Airport Way
38	Public Works - Shops	Industrial Land	5 Year Lease with Three 5 Year Options - Rent in Trade	June 30, 2017	5.62 Acres Land Side on Veterans Way
39	Public Works - Well	Industrial Land	5 Year Lease with Three 5 Year Options - Rent in Trade	August 31, 2024	0.99 Acres Land Side on Airport Way at Terminal Drive
40	Qwest	Industrial Land	20 Year Lease - 3 Year CPI, 5 Year Reappraisal	December 31, 2022	0.28 Acres Land Side on Veterans Way
41	R&L West Group	Executive Hangar	20 Year Lease - 3 Year CPI, 5 Year Reappraisal	July 31, 2023	12,786 Square Feet - Airside
42	Redmond Equipment Co.	Industrial Land	1 Year Lease	August 31, 2004	1.75 Acres Industrial Land at 2064 SW First Street
43	Redmond School District	Industrial Land	35 Year Lease with Three 15 Year Options - Rent at 8.5% of FMV	April 30, 2060	5 Acres Industrial Land on Salmon Avenue
44	RB Associates, LLC	Terminal Space	5 Year Lease - % of Gross vs MAG	August 31, 2004	Deli Space in Terminal
45	SandAir	Executive Hangar	20 Year Lease - 3 Year CPI, 5 Year Reappraisal	May 31, 2023	13,547 Square Feet - Airside
46	SkyWest Airlines	Terminal Space	3 Year Lease - Square Footage Rent, M&O	December 31, 2005	Carrier Space in Terminal
47	Smarte Carte	Units and Baggage Carts	5 Year Lease - Airport Pays Rent and % of Gross	March 31, 2005	Cart Units in Terminal and on Curb
48	Smokey Stover	Industrial Land	3 Year Lease with Three 1 Year Options Plus One 5 Year Extension - In Trade	April 9, 2007	0.5 Acres
49	Timbair Hangars, Inc. #1	Executive Hangar	20 Year Lease with Two 10 Year Options - Fixed Rent for First 5 Years then at FMV	March 31, 2029	Airside
50	Timbair Hangars, Inc. #2	Executive Hangar	20 Year Lease with Two 10 Year Options - Fixed Rent for First 5 Years then at FMV	November 30, 2029	Airside
51	Tognoli, Stefano	Executive Hangar	20 Year Lease with Two 10 Year Options - 5 Year Adjustments to FMV	October 31, 2028	3,800 Square Feet - Airside
52	TSA Washington dba Hertz	Terminal Space and Parking	RFP Every 5 Years - % of Gross vs MAG	March 31, 2004	Car Rental Counter Space and Parking
53	Ullrich, David	Executive Hangar	20 Year Lease with Two 5 Year Options - 3 Year Adjustment to FMV	June 30, 2022	10,208 Square Feet - Airside, South of Tognoli Hangar
54	USDA Forest Service	Air Center	50 Year Lease at $1.00 Per Year	February 15, 2013	
55	USDA Forest Service	Executive Hangar	20 Year Lease at Fixed Rate - Pay Back of Building Cost	June 30, 2021	21,579 Square Feet (+ 3,863) - Built on Part of Air Center Land Lease
56	USDA Forest Service	Terminal Space	3 Year Extension of Original Agreement for Space - No Charge	September 3, 2006	Interactive Video Display in Terminal
57	USDA Forest Service	Office Building	20 Year Lease at Fixed Rate - Pay Back of Building Cost	March 31, 2024	6,204 Square Feet - Built on Part of Air Center Land Lease
58	USDA Forest Service	Warehouse	2 Year Lease with Three 3 Year Options - At FMV	December 31, 2014	5,460 Square Feet
59	US West Communications	Terminal Pay Phones	2 Year Lease with One 1 Year Option and a 3 Year Extension - % of Gross	January 31, 2005	Terminal Pay Phones
60	Vance, Wes	Executive Hangar	20 Year Lease with Two 10 Year Options - First 5 Years Fixed Rent then 5 Year Adjustments	October 31, 2029	1,212 Square Feet
61	Wells Fargo	Terminal Space - ATM	2 Year Agreement - No Rent	March 21, 2005	Terminal Space for ATM
62	Whittier, Robert	Executive Hangar	30 Year Lease with One 10 Year Option - 3 Year Adjustments to FMV	June 30, 2006	0.25 Acres - Airside
63	Willow Properties	Executive Hangar	10 Year Lease with Two 10 Year Options - 3 Years Fixed Rent, then Adjustment to FMV Every 5 Years	September 30, 2017	0.08 Acres - Airside
64	T-Hangars	Old Hangars	$110.00 Per Month		
65	T-Hangars	New Hangars	$185.00 Per Month		

Lease information compiled by Coffman Associates for Airport Master Plan, 2004.

03MP11-02/09/05



AIRPORT LEASE EXHIBIT

Coffman Associates
Airport Consultants

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