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TECHNICAL MEMORANDUM NO. 1 – INVENTORY OF EXISTING CONDITIONS

MASTER PLAN UPDATE
PORTLAND INTERNATIONAL AIRPORT

Prepared for
Port of Portland
Portland, Oregon

September 2008

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INTRODUCTION

This technical memorandum presents an inventory of existing conditions (Inventory) related to the role of Portland International Airport (the Airport, or PDX) within the region, its current operations and facilities, and surrounding land uses and activities. The Inventory begins with background information on the Airport, including its history and historical activity, recent air service development, capital improvements, the Airport's economic impact in the region, an overview of Airport operations, and recent and ongoing noise management efforts. Following the background information is a description of existing activities, facilities, and land uses.

Unique to this Master Plan, and consistent with the overall Airport Futures planning process, the use of land both surrounding and within the existing Airport property area is considered in the Inventory. Thus, the Inventory for this Master Plan is being prepared in parallel with the City of Portland's Legislative Land Use Plan process. The information contained in this technical memorandum will be useful not only in developing the Master Plan facility requirements and the analysis of Airport alternatives, but also in developing the City of Portland's Land Use Plan for PDX.

In this Inventory, existing conditions are considered within the context of multiple study areas. The Port of Portland (the Port) and the City of Portland (the City) have defined a number of study areas that are useful in understanding the Airport's relationship to land use, natural resources, and regional transportation. In addition, the existing conditions within the Airport study area, referred to in this document as the Airport Master Plan Study Area, are described. The study areas are defined and described within their respective sections of this Inventory document, which is organized as follows:

1. Background
2. Land Use Study Areas
3. Natural Resources Study Areas
4. Regional Transportation Study Areas
5. Airport Master Plan Study Area

The information presented in this Inventory was provided by staff from the Port and the City and includes information from reports prepared either by the Port or its consultants. The facilities are described as they existed in 2007 or as they are planned to exist by the time this Inventory is completed in late 2008.

1. BACKGROUND

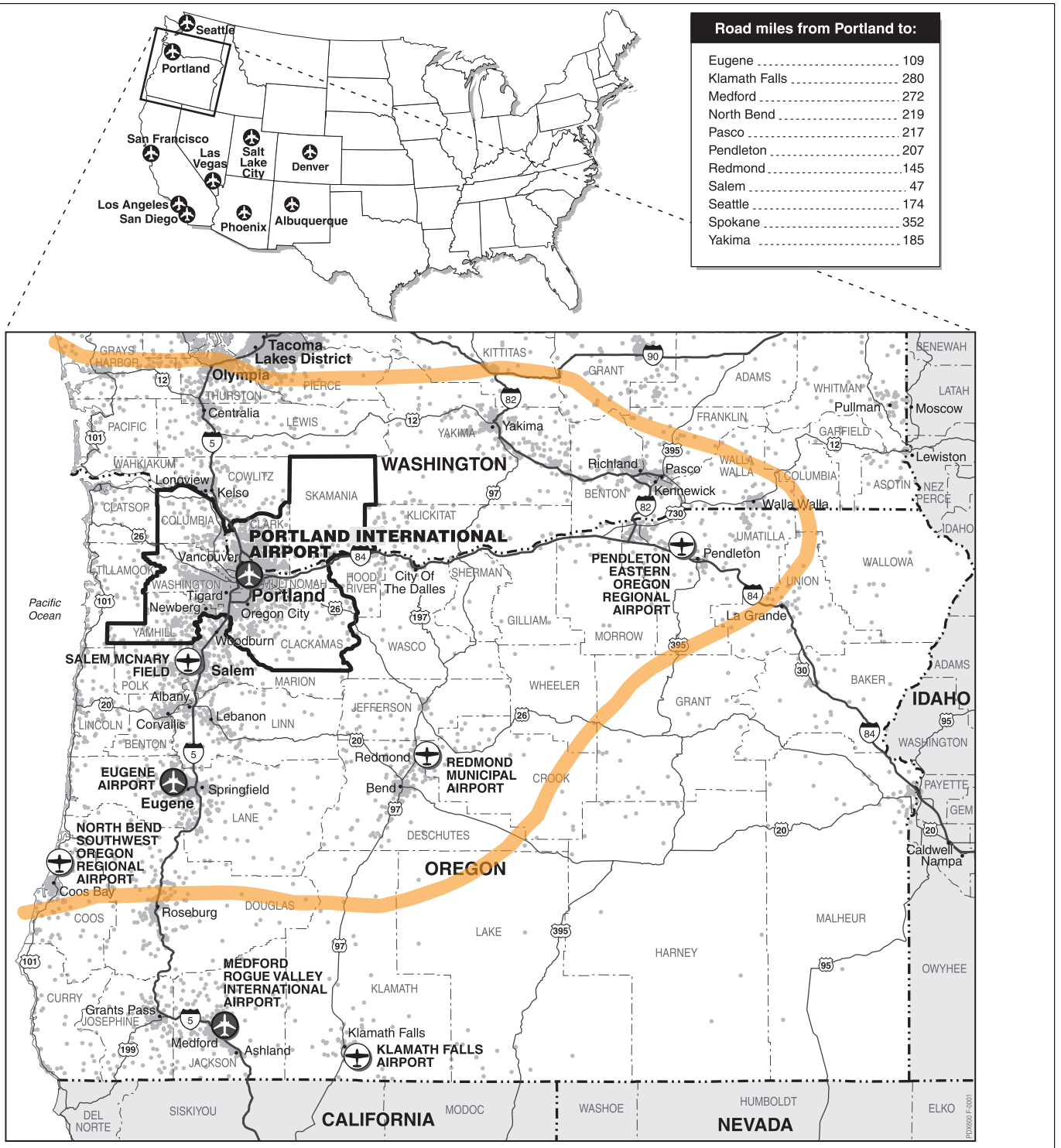
The focus of this Inventory is on describing and documenting the existing conditions within four designated study areas surrounding Portland International Airport. Three study areas—land use, natural resources, and regional transportation have primary and secondary study areas and the Airport Master Plan study area consists of a single area. The primary and secondary study areas are generally defined within their respective sections. Background information is provided on the following topics to allow for a better understanding of the study areas.

- Airport setting and surrounding land use
- Airports surrounding PDX
- Airport history
- Historical activity
- Ownership/Management
- Recent air service developments
- Recent capital improvements
- Noise management overview
- Airport economic impacts

1.1 Airport Setting and Surrounding Land Use

Portland International Airport is located just south of and along the Columbia River, west of Interstate 205 (I-205), north of the Columbia Slough waterway and east of I-5, as shown on Figure 1-1. Centrally located within the Portland/Vancouver metropolitan area, PDX is approximately 5 miles northeast of downtown Portland and 3 miles southeast of downtown Vancouver, Washington. The Airport property, which encompasses approximately 3,400 acres, lies completely within the City of Portland and Multnomah County, Oregon.

From a general land use perspective, PDX is located within the 11,000-acre Columbia Corridor, the State's largest industrial area. Largely created from filled floodplain following the construction of dikes along the Columbia River, the corridor extends westward to the Willamette River, eastward to the Sandy River, and south to Columbia Boulevard. The Columbia Corridor is composed of three distinct industrial districts, of which the 5,700-acre Airport District is distinguished as Oregon's hub location for air transportation. PDX occupies 3,400 acres of the 5,700-acre Airport District.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Figure 1-1

Airport Service Region

Master Plan Update
Portland International Airport

Source: U.S. 2000 Census Data and Port of Portland

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PDX and its immediate surroundings accommodate a variety of commercial uses, including office, hotel, and retail uses on NE Airport Way west and east of I-205. Similar uses are currently being developed on Airport property in the Cascade Station/Portland International Center (CS/PIC) Plan District to the south of NE Airport Way and east of NE 82nd Avenue. Scattered single-family residential properties are also located to the immediate south and west of PDX. The area to the south of Columbia Boulevard is developed primarily in single-family residential neighborhoods, with nodes of higher-density housing and commercial uses along major thoroughfares.

A number of islands are located within the Columbia River near PDX. To the northwest, the Hayden/Tomahawk Islands contain a mix of industrial and commercial uses, single- and multi-family residential uses, and some undeveloped areas. The 825-acre portion of Hayden Island, west of the Burlington Northern Railroad tracks, is owned by the Port of Portland and remains undeveloped as a marine strategic reserve. North of the Columbia River, the City of Vancouver and unincorporated portions of Clark County, Washington, are primarily developed with commercial and residential uses in the downtown area west of I-5.

To the southeast, between Sandy Boulevard and the Columbia River eastward to Blue Lake Park, lies a mixture of industrial, commercial, and agricultural uses. Farther to the east and south are the cities of Maywood Park, Fairview, Wood Village, Troutdale, and Gresham.

The Columbia Corridor has a number of riparian areas, generally related to the Columbia Slough, and several golf courses, four of which are adjacent the Airport District on the west and south. A strip of open space containing portions of the 40-mile Loop Trail lies along the northern edge of PDX between NE Marine Drive and the Columbia River. Other vacant acreage still in interim agricultural uses is located to the immediate south and west of PDX. Six undeveloped islands are located to the east and northeast of PDX, including Lemon, Sand, Government, and McGuire islands on the Oregon side, and Ackerman (previously known as Sand) and Lady islands on the Washington side. These islands accommodate disbursed recreation use and can only be accessed via watercraft.

Other landmarks in the area surrounding PDX include Pearson Airfield, Pearson Air Museum, Fort Vancouver National Historic Site, Officers Row, Vancouver Barracks, and the Vancouver Water Resources Education Center to the north of the Columbia River, which together compose the Vancouver National Historic Reserve established by the U.S. Congress in 1996. Adjacent and north of the Reserve is Clark College, the second largest community college in Washington State, with over 12,000 full-time and part-time students. The cities of Camas and Washougal are located to the east of Vancouver and are within the environs of PDX. The Georgia Pacific paper mill, located in downtown Camas, is easily recognized from the air and is used by pilots for visual navigation.

1.2 Airports Surrounding PDX

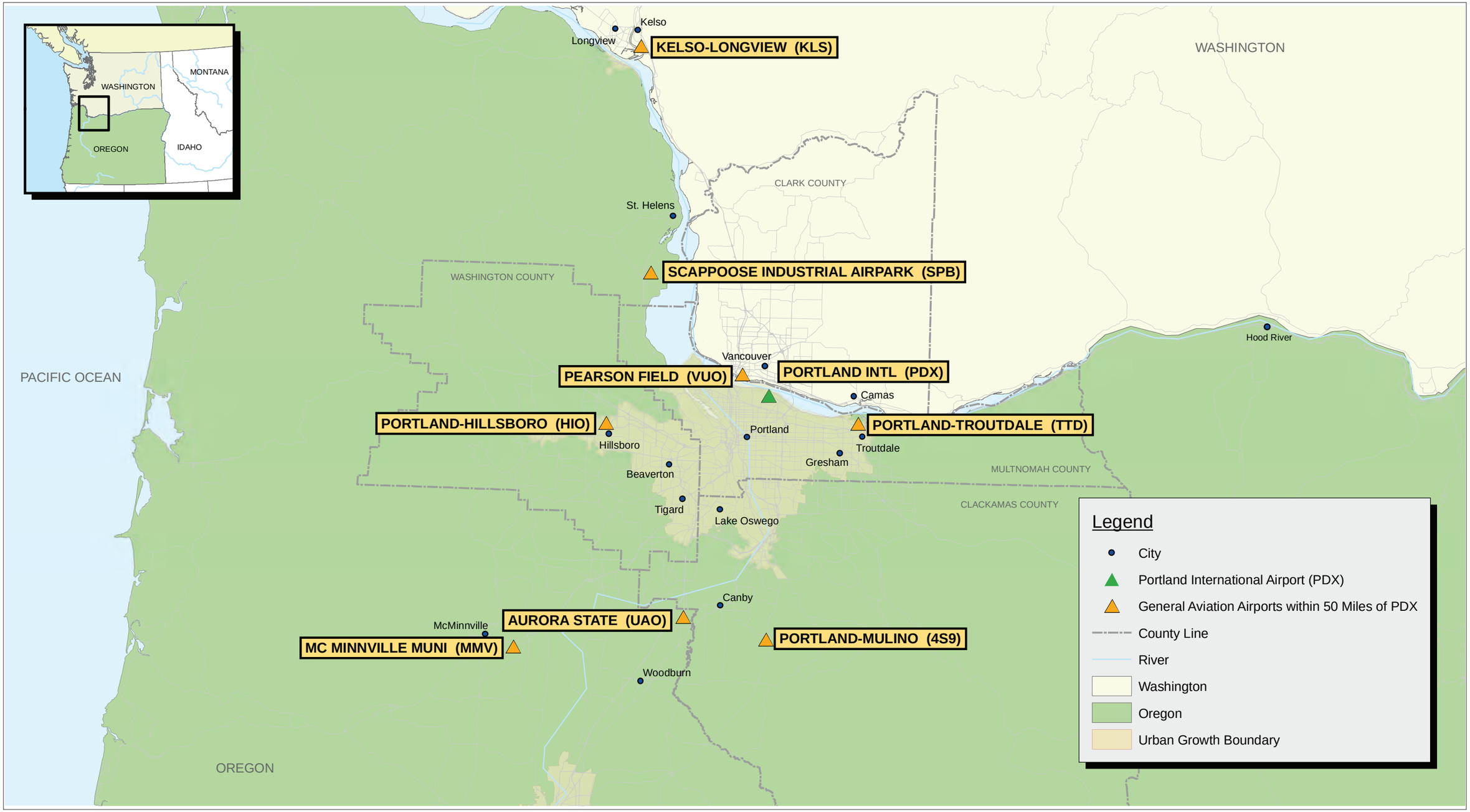
PDX is the largest of eight commercial service airports in Oregon and second only to Seattle-Tacoma International (SEA) among airports within the larger bi-state (Oregon/Washington) region. SEA is located approximately 160 miles north of PDX and 12 miles south of downtown Seattle. SEA consists of approximately 2,300 acres and has two parallel runways, 11,901 and 9,426 feet long, respectively, with a third 8,500-foot parallel runway scheduled to open in November 2008. SEA is owned and operated by the Port of Seattle.

A number of commercial service airports within the Oregon/Washington region serve primarily regional airline passenger and cargo traffic, although a few provide service outside the region. In Oregon, the commercial service airports, in order of annual passenger traffic, include: Portland International, Eugene, Rogue Valley International-Medford, Roberts Field-Redmond Municipal, Salem Municipal, SW Oregon Regional (North Bend/Coos Bay), Klamath Falls, and Eastern Oregon Regional Airport at Pendleton. The locations of Oregon's commercial service airports and the service region for PDX are shown on Figure 1-1. The top eight commercial service airports in Washington State, in order of annual passenger traffic, include: Seattle-Tacoma International, Spokane International, Tri-Cities (Pasco), Bellingham International, Yakima Air Terminal, Boeing Field, Pangborn Memorial (Wenatchee), and Kenmore Air Harbor Seaplane Base (near Seattle on Lake Washington).

Public use general aviation airports within 50 miles of PDX include Aurora State Airport, Hillsboro Airport, McMinnville Airport, Mulino Airport, Scappoose Industrial Airpark, and Troutdale Airport in Oregon and Kelso/Longview Regional Airport and Pearson Field in Washington. Each of these airports is shown on Figure 1-2. These public use general aviation airports within 50 miles of PDX, and the three commercial service airports closest to PDX (i.e., airports in Salem, Eugene, and Redmond, Oregon), are briefly described below.

1.2.1 Aurora State Airport

Aurora State Airport (UAO) is a 144-acre general aviation airport located approximately 25 miles southwest of PDX and 1.5 miles northwest of Aurora, Oregon. Owned and operated by the State of Oregon and the Oregon Department of Aviation, airfield facilities include a 5,004-foot long by 100-foot wide asphalt runway. Other facilities include a flight school, fuel services, aircraft rentals, and aircraft sales. Three FBOs operate at UAO: Aurora Aviation, Aurora Jet Center, and Willamette Aviation. Aurora State Airport is the third-busiest airport in Oregon, after PDX and HIO. Aurora State Airport does not have an Airport Traffic Control Tower (ATCT) on site.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 8.5 Miles
Scale: 1" = 8.5 Miles

Figure 1-2

General Aviation Airports within 50 Miles of PDX

Master Plan Update
Portland International Airport

Source: HNTB Corporation

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1.2.2 Hillsboro Airport

Hillsboro Airport (HIO) is a general aviation, ATCT controlled airport located approximately 17 miles west of PDX. Owned and operated by the Port of Portland, HIO has two intersecting runways (Runway 12-30 and Runway 2-20). Runway 12-30 is approximately 6,600 feet long and 150 feet wide. Runway 2-20 is approximately 4,050 feet long and 150 feet wide. A third runway has been proposed and the preliminary design and National Environmental Policy Act (NEPA) process associated with this new runway are under way. Airport facilities include a terminal building, aircraft storage and maintenance hangars, aircraft parking aprons, and support facilities, such as fuel storage, automobile parking, and roadway access. Emergency services are provided by the City of Hillsboro. HIO has three full-service fixed base operators (FBOs) that provide various fueling, parking, aircraft hangar storage, flight training, aerial tour, and aircraft maintenance services.

HIO serves as a general aviation reliever for PDX and also serves as an alternative base of operations for general aviation aircraft. While it is not a commercial service airport, HIO is the second busiest airport in the State of Oregon, accommodating 213,000 aircraft operations in 2007. HIO is one of the premier helicopter pilot training facilities in the United States and is a significant base of operation for business aviation users, including major corporations such as Nike and Intel.

1.2.3 Kelso/Longview Regional Airport

Kelso-Longview Regional Airport (KLS) is a general aviation, non-towered airport, located approximately 37 miles north of PDX and approximately 2 miles southeast of Kelso, Washington. Owned by the City of Kelso, KLS has a 4,391 by 100 foot asphalt paved runway. Facilities include hangars for aircraft storage. KLS provide aircraft fueling, aircraft maintenance and flight training services.

1.2.4 McMinnville Airport

McMinnville Airport (MMV) is a 650-acre general aviation, non-towered airport located approximately 36 miles southwest of PDX and approximately 3 miles southeast of the city of McMinnville, Oregon. Owned and operated by the City of McMinnville, MMV has 5,420 by 150 foot and 4,676 by 150 foot asphalt paved intersecting runways. The longer runway is equipped with a lighted instrument landing system. Landside facilities include several hangars for aircraft storage and maintenance and the FBO building.

1.2.5 Mulino Airport

Mulino Airport is a 275-acre general aviation, non-towered airport located approximately 26 miles south of PDX. Owned by the Port of Portland and managed by the Oregon Department of Aviation, Mulino Airport has a 3,425 by 100 foot paved asphalt runway.

Facilities include just over 30 T-hangars and 25 tiedown spots for aircraft. Over 40 light general aviation aircraft are based out of Mulino Airport.

1.2.6 Scappoose Industrial Airpark

Scappoose Industrial Airpark (SPB) is a general aviation, non-ATCT airport located approximately 18 miles northwest of PDX. Owned by the Port of St. Helens, a local municipal corporation, the airfield facilities include a 5,100-foot long by 100-foot wide asphalt runway. The runway is marked with basic striping, and equipped with medium intensity runway edge lights. Airport facilities provide for aircraft maintenance, flight training, manufacturing of aircraft components, aircraft storage in hangars, and fuel services. SPB is the second busiest non-ATCT general aviation airport in Oregon, with approximately 75,000 aircraft operations per year. SPB provides reliever capabilities for HIO and PDX.

1.2.7 Troutdale Airport

Troutdale Airport (TTD) is a general aviation, ATCT-controlled airport located approximately 10 miles east of PDX. Also owned and operated by the Port of Portland, TTD provides for fixed-wing flight training, general aviation services for 20 businesses, aerial tours, and recreational flying. Facilities include a 5,400-foot long by 150-foot wide runway, an ATCT, terminal building, and aircraft hangars. TTD shares the same airspace as PDX and also serves as a general aviation reliever for PDX.

1.2.8 Pearson Field

Pearson Field (VUO) is a 134.4-acre general aviation airport located in Vancouver, Washington. VUO is located approximately 3.5 miles northwest of PDX, east of I-5, and north of Highway 14 and the Columbia River. Pearson Field is operated by the City of Vancouver. Airfield facilities include a 3,250-foot long by 60-foot wide runway, which is marked with basic striping and equipped with medium intensity runway edge lights. Other facilities include 150 T-hangars and aircraft tiedown facilities. With 175 based aircraft, Pearson Field in the largest airport within southwest Washington.

Because of the proximity of Pearson Field to PDX, the airspace for the two airports overlaps, creating potential operational conflicts (e.g., approaches to PDX Runway 10L pass over Pearson Field). These conflicts are avoided by strict Federal Aviation Administration (FAA) air traffic control procedures.

1.2.9 Eugene Airport

Eugene Airport (EUG) is a commercial service, ATCT-controlled airport located 7 miles northwest of Eugene and approximately 106 miles southwest of PDX. EUG is owned and operated by the City of Eugene. Airfield facilities include two asphalt parallel runways (one is 8,009-feet long by 150 feet wide and the other is 6,000-feet long by

150 feet wide); a taxiway system; and aircraft parking aprons. Navigation aids include high and medium intensity runway edge lighting.

EUG provides non-hub commercial service to a six-county region, as well as serving air cargo and general aviation needs. EUG offers daily flights to Denver, Las Vegas, Los Angeles, Phoenix, Portland, Redmond, Salt Lake City, San Francisco, and Seattle-Tacoma by Allegiant Air, Delta Connection, Horizon Air, United Express, and US Airways Express. EUG also has a passenger terminal that provides restaurants and concessions, access to parking, and access to ground transportation. A new air cargo building was completed in December 2007. General aviation facilities include aircraft storage buildings and aprons, transient/based aircraft tiedowns, and general aviation general parking. The full-service FBO on site is Flightcraft, which provides fueling and maintenance services. Approximately 170 general aviation aircraft are currently based at EUG. The Eugene Airport Master Plan Update, completed in April 2000, includes plans to improve and expand the airport's general aviation facilities in the future.

1.2.10 Roberts Field-Redmond Municipal Airport

Roberts Field-Redmond Municipal Airport (RDM) is a commercial service, ATCT-controlled airport located approximately 116 miles southeast of PDX. RDM is owned and operated by the City of Redmond and serves three counties. The airfield consists of two intersecting asphalt runways, 7,040-feet long by 150 feet wide and 7,006-feet long by 100 feet wide, respectively; a taxiway system; and three helipads. Navigation aids includes high and medium intensity runway edge lighting.

Horizon Air, United Express, Delta Connection, and Allegiant Air provide daily flights to and from the airports in Eugene, Las Vegas, Los Angeles, Portland, Salt Lake City, San Francisco, and Seattle-Tacoma. Facilities include a passenger terminal, which includes a restaurant and provides access to parking and ground transportation. The City of Redmond plans to expand the airport terminal in the future.

RDM also serves general aviation and air cargo needs. General aviation services include chartered flights, fueling, and maintenance. Fixed base operators include Butler Aircraft Company and Redmond Air. Air cargo service is provided by Airpac Airlines (Airborne Express), Ameriflight (UPS), and Empire Airlines (FedEx).

1.2.11 Salem Municipal Airport

Salem Municipal Airport (SLE), also known as McNary Field, is a civil aviation facility that accommodates the Oregon Air National Guard. SLE is also certified as a commercial service airport by the FAA. Salem Municipal Airport offers a few passenger flights through Delta Connection carrier SkyWest Airlines to Salt Lake City. SLE also offers limited cargo services through United Parcel Service and FedEx. SLE is a 751-acre ATCT-controlled airport located approximately 51 miles southwest of PDX and

60 miles northeast of Eugene. Owned and operated by the City of Salem, airfield facilities include two parallel asphalt runways, 5,100-feet long by 150 feet wide and 5,145-feet long by 100-feet wide, respectively; a taxiway system; and aircraft parking aprons. Navigation aids include high and medium intensity runway edge lighting. Airport facilities include an aircraft rescue and fire fighting (ARFF) facility, fuel facilities, maintenance and utility facilities, and a terminal building providing ground transportation services, vehicle parking, and concessions. Flight training, fuel sales, and pilot supply services are also provided at SLE. The airport has three FBOs: Salem Air Center, Salem Aviation Fueling, and Val Avionics.

1.3 Airport History

In 1930, the Port constructed Portland's first municipal airport. It was located on the east side of the Willamette River at Swan Island, which was created with dredge spoils from the Columbia River. Charles Lindbergh flew the "Spirit of St Louis" to the new airport to formally dedicate the facility.

With the introduction of the new DC-3 twin-engine airplane, commercial aviation soon outgrew Swan Island. In 1935, the federal government ordered the Port to find a new site for the airport. Realizing the economic importance of the emerging aviation industry, Portland voters approved a $300,000 bond issue to purchase 700 acres east of the city in what is now known as the Columbia Corridor. It took 4 years, $3 million, and the assistance of the federal Works Progress Administration (WPA) to complete the Portland-Columbia Airport. The new airport opened in 1940.

In anticipation of the expected boom in air travel, the Port began construction of a new $6 million passenger terminal complex, dedicated in 1958. The new terminal was designed to accommodate 1.5 million passengers annually and was served by seven domestic airlines. Portland entered the "Jet Age" in 1959 when the Pan American World Airways Boeing 707, known as the "Liberty Bell", inaugurated twice-weekly Portland-Honolulu jet service. The Port also developed a system of general aviation airports to meet the growing demand in commercial and general aviation. The Port purchased Troutdale Airport in 1942 and assumed operations at Hillsboro Airport in 1966.

By the 1970s, activity at Portland-Columbia Airport, now officially known as Portland International Airport, was once again outgrowing its facilities. In 1977, a major airport expansion program was completed. This expansion program included an approximate doubling of the space in the terminal building; construction of an 11,000-foot-long runway to accommodate fully loaded widebody jets; and a new air cargo complex. The number of airlines serving PDX increased and international airline service was established.

In the early 1990s, PDX began experiencing double-digit percentage increases in passengers. To accommodate this growth, the Port completed a $100 million expansion of Concourses D and E, and embarked on the PDX 2000 Expansion Project, an ambitious program of terminal, parking, and access improvements. By 1997, PDX accommodated service by 21 passenger airlines and 12 all-cargo carriers, significantly increasing the scope of its national and international service, as it became an important regional hub and Pacific Rim gateway.

After the events of September 11, 2001 (9/11), PDX experienced a sharp decline in passenger traffic, cargo movements, and aircraft operations. However, by 2007, PDX slightly exceeded its pre-9/11 passenger numbers. While cargo service has also recovered, it has not regained the cargo tonnage associated with pre-9/11 conditions as a result of changes in the industry, such as consolidation and an increasing trend in the volume of cargo being transported by truck. As the aviation industry has sought ways to mitigate the economic impacts of 9/11 and the increase in fuel costs, aircraft load factors have increased as the number of aircraft operations at PDX has declined, from a high of 329,000 in 1997 to 264,000 in 2007. In effect, passenger aircraft at PDX have generally increased in size over the last 10 years and operate with fewer empty seats.

1.4 Historical Aviation Activity

A brief inventory of historical aviation activity at the Airport is provided below. A more complete presentation and analysis of historical and forecast aviation activity are provided in ***Technical Memorandum No. 2—Aviation Activity Forecasts***.

Table 1-1 summarizes overall PDX enplaned passengers, cargo tonnage, and aircraft operations for 1990, 1995, 2000, 2006, and 2007. From 1990 to 2007, PDX was one of the fastest growing commercial-service airports in the country, with substantial passenger growth particularly during the middle part of the 1990s.

Between 1990 and 2007, the total number of passengers increased from 6.4 MAP to 14.7 MAP, an average annual increase of 5.0%. This growth is attributed to the combination of a strong local economy and decreasing airfares, which, in turn, resulted in a significant increase in leisure travel. For example, in 1990, equal shares of business and leisure travelers used PDX; currently, leisure travelers account for approximately 56% of all passengers using the Airport.

Between 1990 and 2007, total cargo volume increased from 162,000 tons to 280,000 tons, an average annual increase of 3.3%. This growth resulted from the increasing trend toward the use of larger aircraft to transport cargo.

Table 1-1

AIRPORT ACTIVITY

Description	1990	1995	2000	2006	2007	Average Annual Increase (Decrease) 1990 – 2007	Overall Percent Change 1990 – 2007
Enplaned Passengers (thousands)							
Domestic	3,044	5,327	6,646	6,764	7,045	5.1%	131.4%
International	131	275	240	259	288	4.7%	119.9%
Total	3,175	5,602	6,886	7,022	7,332	5.0%	130.9%
Total Million Annual Passengers (MAP)							
Total (enplaned and deplaned)	6.4	11.2	13.8	14.0	14.7	5.0%	128.1%
Inbound/Outbound Air Cargo (thousands of short tons)							
Freight	136	229	253	276	274	4.2%	101.5%
Mail	26	41	58	9	6	(8.3%)	(76.9%)
Total Air Cargo	162	270	311	285	280	3.3%	72.8%
Aircraft Operations (thousands)							
Passenger airlines							
Mainline *(a)*	92	119	117	100	102	0.6%	10.9%
Regional affiliate *(a)*	84	94	98	86	90	0.4%	7.1%
Cargo airlines	13	23	39	33	33	5.6%	153.8%
General Aviation	60	48	34	28	28	(4.4%)	(53.3%)
Military	15	12	9	5	4	(7.5%)	(73.3%)
Other *(b)*	6	6	17	8	8	1.7%	33.3%
Total Aircraft Operations	270	302	314	260	265	(0.1%)	(1.9%)

Note: Columns may not add to totals shown because of rounding.

(a) Includes domestic and international activity. Operations data were based on PDX airline landing reports.

(b) Includes nonscheduled and empty flights. Other operations accounted for 3.7% of commercial airline (passenger and all-cargo) operations in 2007 and are assumed to account for this share in future years.

Source: Port of Portland, Airport records.

Between 1990 and 2007, total aircraft operations decreased from 270,000 operations to 265,000 operations, an average annual decrease of 0.1%. This lower growth rate resulted from several factors, including significant declines in general aviation, as these operations shifted to smaller regional airports, and military activity. During the same period, the number of mainline airline passenger aircraft operations increased an

average of 0.6% per year, from 92,000 to 102,000 operations, and the number of regional affiliate airline passenger aircraft operations increased an average of 0.4% per year, from 84,000 to 90,000 operations.

1.5 Ownership/Management

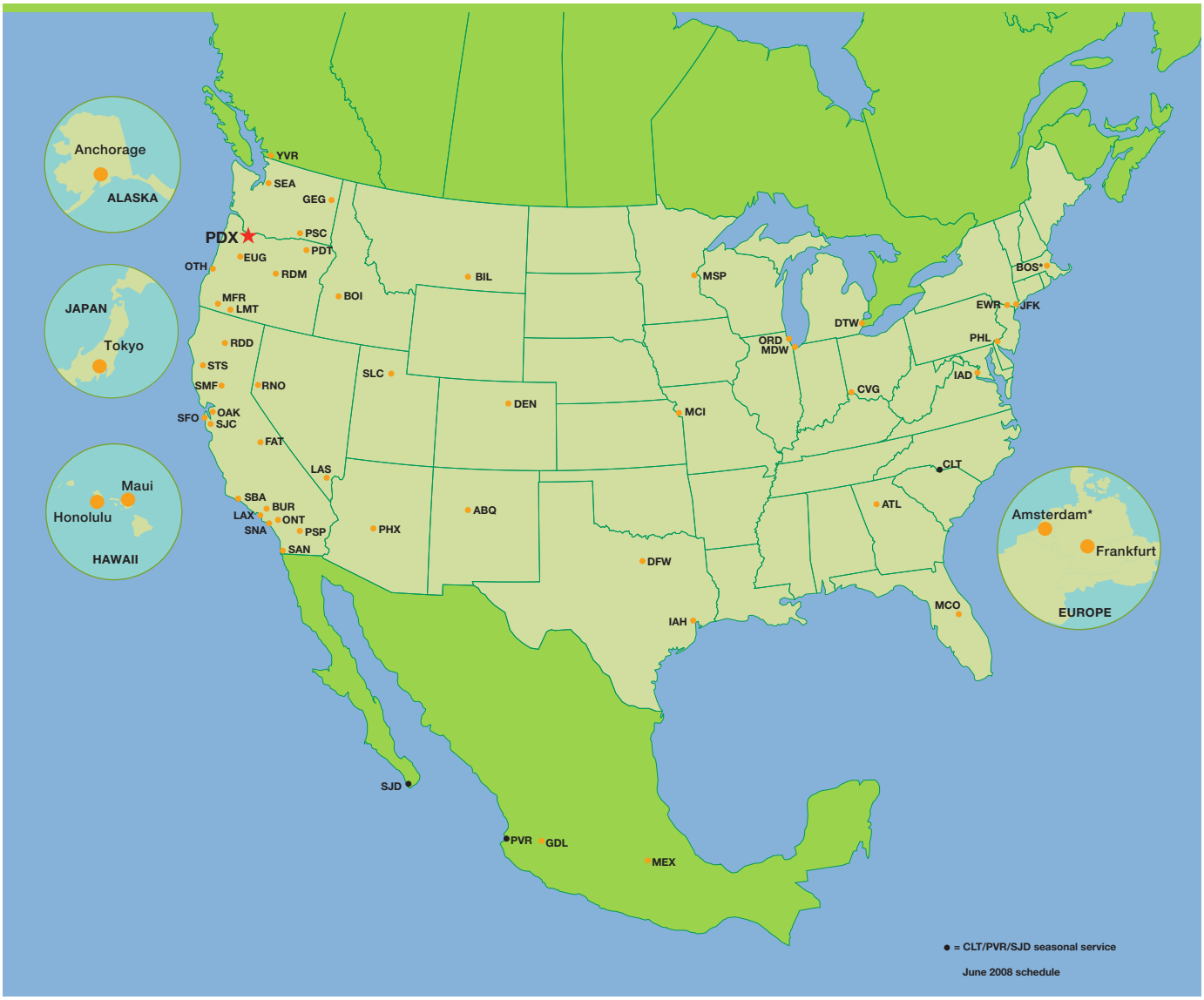
PDX is owned and operated by the Port of Portland. The Port is a regional governmental entity encompassing Clackamas, Multnomah, and Washington counties. The Port is directed by a nine-member Commission appointed by the Governor of Oregon and confirmed by the Oregon Senate. At least two commissioners must live within each of the three counties. The remaining three members may live in any part of the State of Oregon. Commissioners serve 4-year terms and are eligible for reappointment. The Commission appoints the Port's Executive Director and holds monthly public meetings. The mission of the Port is to provide competitive cargo and passenger access to regional, national, and international markets while enhancing the region's quality of life. In addition to PDX, the Port also owns and manages Hillsboro and Troutdale airports. Mulino Airport is owned by the Port, but managed by the State of Oregon. All Port airports are managed by the Port's Aviation Division.

1.6 Recent Air Service Developments

Portland International Airport has accommodated increased passenger airline aircraft operations over the last several years. Between May 2006 and May 2007, the number of daily departing seats was up 7%. Service to new domestic and international markets was initiated, and the frequency of service to some existing international markets was increased. Portland is now the smallest of 12 U.S. cities with both transpacific and transatlantic nonstop service.

In recent years, PDX has provided expanded passenger access to international destinations. In 2003, the Port secured nonstop service from PDX to Frankfurt, Germany via Lufthansa German Airlines; in 2008, nonstop service from PDX was added to Amsterdam via Northwest Airlines. In 2005, nonstop service was added to Guadalajara, Mexico via Mexicana de Aviacion and, more recently, nonstop service was added to Mexico City. PDX recently began offering nonstop service to Tokyo, Japan via Northwest Airlines. Passengers can also fly nonstop on seasonal service to Cabo San Lucas and Puerto Vallarta, Mexico. Daily nonstops are also provided to Vancouver, British Columbia.

Domestically, passengers can travel nonstop to all of PDX's top 30 markets. In May 2006, service was added to six new domestic destinations (Missoula, Montana and Sonoma County, California, as well as Orlando, Charlotte, Philadelphia, and Boston) and enhanced service to two existing markets (Los Angeles via Los Angeles International Airport and New York via John F. Kennedy International Airport). Figure 1-3 shows the domestic and international destinations served nonstop from PDX.



North America Destinations

ABQ	(1:WN)	EWR	(3:CO)	MDW	(3:WN)	RDM	(10:UAX,QX)
ANC	(3:AS)	FAT	(1:QX)	MFR	(10:QX,UAX)	RNO	(4:QX,WN)
ATL	(4:DL)	GDL	(1:MX)	MSP	(5:NW)	SAN	(4:AS)
BIL	(1:QX)	GEG	(9:QX,WN)	OAK	(11:WN,AS,QX)	SBA	(1:QX)
BOI	(8:QX,WN)	HNL	(2:NW,HA)	OGG	(1:HA)	SEA	(40:QX,UAX)
BOS	(1:AS)	IAD	(1:UA)	ONT	(5:QX)	SFO	(11:UA,QX,AS)
BUR	(4:QX)	IAH	(4:CO)	ORD	(8:UA,AA)	SJC	(10:WN,QX,AS)
CLT	(1:US)	JFK	(2:B6,DL)	OTH	(4:QX)	SLC	(9:DL,WN)
CVG	(1:DL)	LAS	(11:AS,US,WN)	PDT	(1:QX)	SMF	(12:WN,QX)
DEN	(15:UA,F9,AS,WN)	LAX	(13:AS,QX,UAX)	PHL	(2:US)	SNA	(4:AS)
DFW	(5:AA)	LMT	(3:QX)	PHX	(11:US,AS,WN)	STS	(1:QX)
DTW	(1:NW)	MEX	(1:MX)	PSC	(2:QX)	YVR	(7: QX,AC)
EUG	(8:UAX,QX)	MCI	(1:WN)	RDD	(1:QX)	PVR/SJD	(1:AS/1:AS)

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Figure 1-3

International and Domestic Non-Stop Destinations Served from PDX

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

While PDX has experienced considerable growth in air service, service is not expected to continue expanding at a similar rate in the future. Future air service development will depend on the success of the recent route additions, the strength of the economy, and the absence of adverse external events, as well as many other issues and trends considered during preparation of the aviation activity forecasts. Cargo services at PDX continue to provide a strong logistics network for shippers and freight forwarders, which include domestic and international passenger carriers, cargo integrators (such as FedEx and UPS), and all-freighter service providers.

1.7 Recent Capital Improvements

Since the last Master Plan was adopted in 2000, the Port has invested over $600 million in improvements at PDX. Major projects completed during this period include expansion of the south terminal, including the PDX light rail (LRT) station, the P-1 parking garage, commercial roadway expansion, the ground run-up enclosure, a deicing collection system, a new employee parking area, pay-on-foot and other intelligent transportation systems, the concourse connector, bicycle/pedestrian facilities, the realignment of Airport Way, numerous projects related to the construction or improvement of aircraft ramps, taxiways, lighting and navigation systems, technology systems, and parking system operation.

Airport capital improvements are funded by revenue from Airport operations, airport revenue bonds, federal and State grants, and passenger facility charge (PFC) revenues.

1.8 Noise Management Overview

Efforts to reduce aircraft noise impacts related to operations at PDX are documented in the PDX Federal Aviation Regulations (FAR) Part 150 Noise Compatibility Study update. The FAR Part 150 noise compatibility study is a voluntary noise exposure and land use study that airport operators use to assess aircraft noise and to mitigate noise impacts and noncompatible land use around airports. As part of the FAR Part 150 process, which is similar to the master planning process, aircraft noise impacts on surrounding communities are quantified and evaluated. Noise exposure maps are developed for a baseline year, as well as 5 years into the future, to address projected noise impacts. Compatibility between aircraft operations and noise-sensitive land uses are addressed through recommendations that include operational measures (e.g., noise abatement procedures) and land use compatibility measures (e.g., noise mitigation procedures, such as soundproofing).

The most recent PDX FAR Part 150 study update was approved by the Port of Portland Commission in August 2005. It was then approved by the FAA in June 2007. Recommendations in the study included revising current aircraft departure and arrival procedures, working with the cities of Portland and Vancouver to enhance local noise

overlay ordinances, limiting the development of new noise-sensitive land uses within the noise impact overlay zones, and developing a FlyQuiet program, which is intended to encourage pilot participation in the PDX noise abatement program.

To implement the recommended measures from the FAR Part 150 study, the Port's Noise Management Department actively monitors aircraft noise exposure, educates stakeholders about aircraft noise, and responds to inquiries and complaints regarding aircraft noise. This education and outreach effort is conducted through collaboration with the local communities (e.g., affected residents and neighborhood associations), as well as industry groups (e.g., aircraft operators, The Boeing Co., the FAA).

Tools used to monitor aircraft noise related to PDX operations include the Aircraft Noise Operations Monitoring System (ANOMS) and an Aircraft Noise Tracking System (ANTS). ANOMS collects aircraft flight track information as well as noise data from monitoring stations set up in various community locations surrounding PDX. ANTS is a database application specifically used to track and document the information associated with resident comments and inquiries related to aircraft operations and noise.

In addition, to assist the community in learning more about noise issues, the Port's Noise Management Department supports the Citizen Noise Advisory Committee (CNAC). This committee provides a forum wherein citizens can raise questions or concerns regarding aircraft noise in a public forum. Aircraft noise related issues are also communicated via *Port Currents* (a Port of Portland publication) and other project-related newsletters, as well through presentations and speaking engagements at meetings of neighborhood associations, civic groups, and various other organizations.

1.9 Airport Economic Impacts

Portland International Airport is a major economic contributor of jobs, personal income, State and local taxes, and revenue for the Portland/Vancouver metropolitan area. The economic impacts in the metropolitan area resulting from Airport activity are summarized below and in Table 1-2. The economic impacts generated by Airport activity in the airline/airport, freight transportation, passenger ground transportation, and contract construction/consulting service categories, as well as the impact of the approximately 3.4 million visitors arriving at PDX in 2005, are shown. All data are current as of the 2005 calendar year and estimated based on interviews, local economic data, and airport statistics.*

*Martin Associates, *The Economic Impacts of Portland International Airport and the Local and Regional Economy,* October 2006.

Table 1-2

ECONOMIC IMPACTS GENERATED BY PDX, 2005

Impacts	Airport Generated	Visitor Industry	Total Impact
Jobs			
Direct	10,763	27,807	38,571
Induced	5,383	8,875	14,259
Indirect	2,556	2,526	5,082
Total	18,702	39,208	57,911
Personal Income (Millions)			
Direct	$332.4	$477.2	$ 809.6
Induced	444.0	374.2	818.2
Indirect	90.7	51.9	142.5
Total	$867.0	$903.3	$1,770.3
Business Revenue (Millions)	$3,253.0	$1,652.4	$4,905.4
Local Purchases (Millions)	$189.6	$79.2	$268.8
State and Local Taxes (Millions)	$87.7	$86.1	$173.8
Federal Government Aviation - Specific Taxes (Millions)	$220.0	NA	$220.0

NA = Not applicable

Note: Columns may not add to totals shown because of rounding.

Source: Martin Associates, *The Economic Impacts of Portland International Airport and the Local and Regional Economy*, October 2006.

1.9.1 Jobs/Employment

The economic impact related to jobs and employment includes consideration of direct, induced, indirect, and related employment attributable to Airport activity. Direct employment refers to jobs directly generated by Airport activity. Induced employment refers to jobs created throughout the Portland-Vancouver Metropolitan Area as a result of Airport employee spending. Indirect employment refers to jobs generated from the purchase of goods and services by firms dependent upon airport activity. Related employment refers to jobs with firms in the Portland area that locate in Portland because PDX serves as a catalyst for economic development. Airport activity at PDX accounted for approximately 58,000 jobs in 2005. Of all jobs, approximately 11,000 were direct Airport-generated jobs. The majority of these jobs (77%) were concentrated in the airline/airport service category.

1.9.2 Personal Income

Personal income is the income received by individuals directly employed due to Airport activity and the re-spending of this income throughout the region. The majority (38%) of the total personal income of $867.0 million in 2005 was concentrated in the airline/ airport service category.

1.9.3 State and Local Taxes

Tax payments to the State and local governments by firms and individuals involved in providing services in support of airport activities were considered. In 2005, State and local taxes relating to Airport activity and visitors totaled approximately $174 million.

1.9.4 Revenue

Revenue is generated directly by Airport activity and visitors. In 2005, business revenue of firms providing airline passenger, freight, and ground support services and their associated costs of doing business totaled approximately $3.3 billion. The majority of this revenue (67%) was generated in the airline/airport service category. Visitors accounted for approximately $1.7 billion in revenue, bringing the total business revenue generated by PDX to approximately $4.9 billion in 2005.

2. LAND USE STUDY AREAS

The land use study areas include primary and secondary areas.

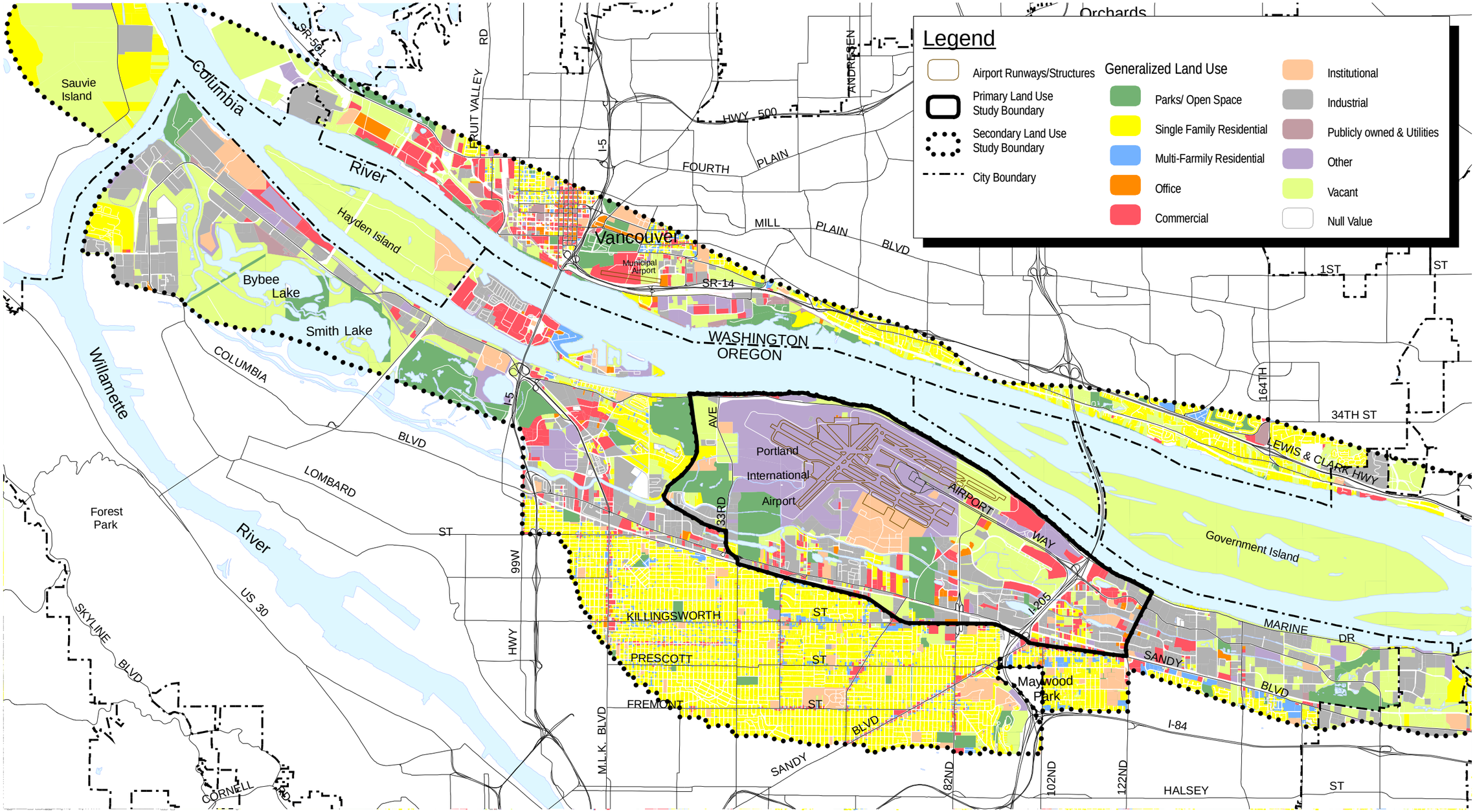
The **primary land use study area** boundary, shown on Figure 2-1, is bordered to the north by the Columbia River, the east by NE 122nd Avenue, the west by the Peninsula Slough, and the south by NE Lombard Avenue. The primary land use study area shares the same boundaries as the primary regional transportation study area.

The **secondary land use study area** boundary, shown on Figure 2-1, combines the area within the most current day night average sound level (DNL) 55 noise contour and the area inside the City of Portland's "h" overlay. The "h" overlay—also known as the Aircraft Landing Overlay Zone—is designated by the City of Portland as an area in which the height of structures and vegetation in the vicinity of PDX is regulated. The area exposed to DNL 55 (expressed in A-weighted decibels) is the same as the State of Oregon Department of Environmental Quality's spatial guidelines for studying noise impacts.

2.1 Land Use Setting

The area around the Airport is the largest industrial area in the City. The area is designated as an Industrial Sanctuary by the City and as regionally significant industrial land by the metropolitan planning organization, Metro. Figure 2-1 shows the land use map. Although industrial uses dominate the area around PDX, the area is also home to four golf courses, as well as concentrations of offices, hotels, and large format retail. When the Airport was first operating in the 1940s, the area was mostly agriculture with scattered rural residential development. Some of these homes still exist, although a number of them were converted to commercial or industrial uses in the intervening years.

The land use on and around the Airport can be characterized generally as airfield, industrial, commercial, land residential, as shown on Figure 2-2. These characterizations are highly generalized and are intended for illustrative purposes only. For example, the residential neighborhoods are separated from the industrial area by a wide transportation corridor that includes Columbia Boulevard, NE Lombard Street, and the railroad tracks. This transportation corridor not only functions as a buffer between the neighborhoods and the industrial area, but also as a barrier in terms of neighborhood access to the Columbia Slough and the 40-mile trail system.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 1 Mile
Scale: 1" = 1 Mile

Figure 2-1

Land Use Study Areas

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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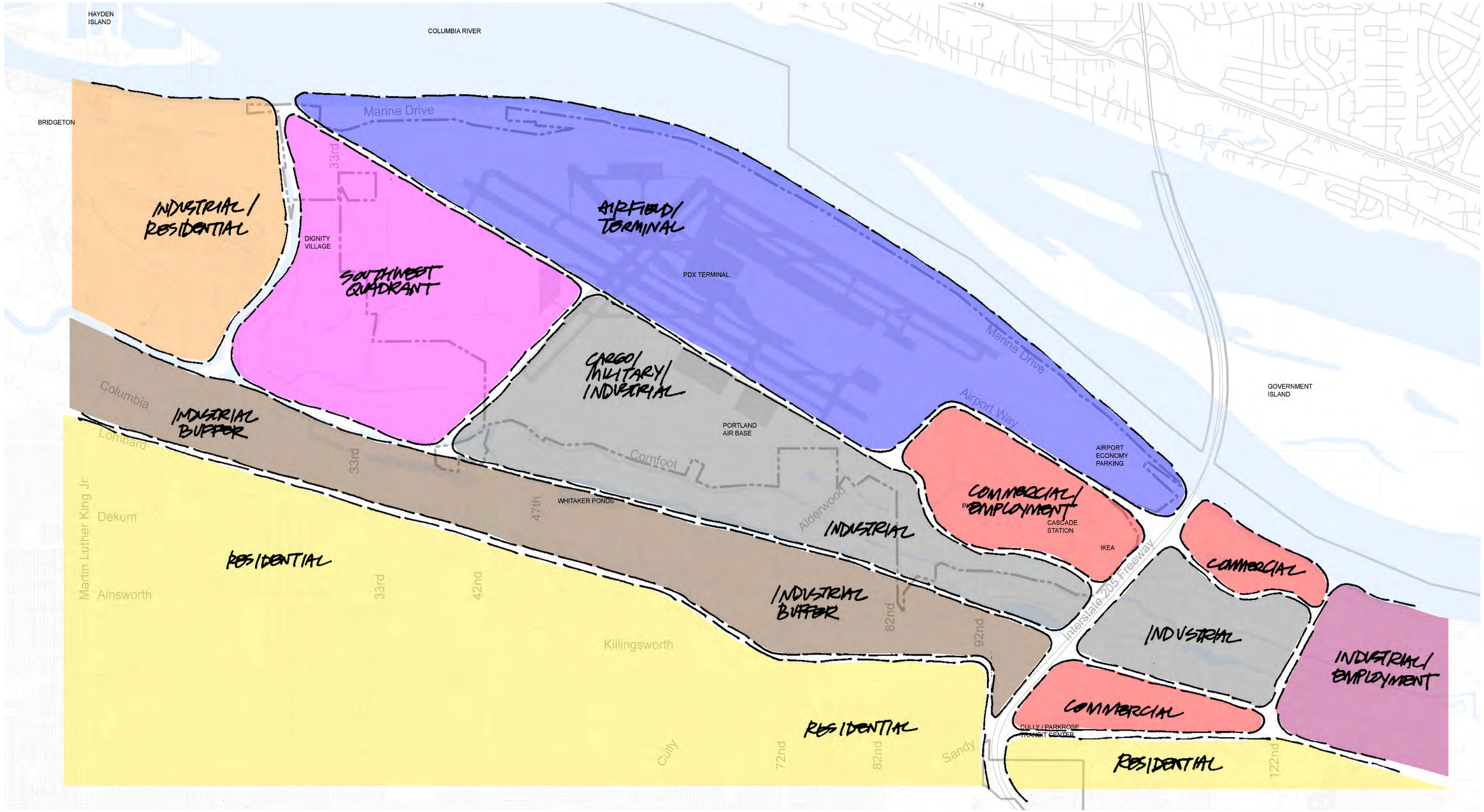

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Figure 2-2

Generalized Land Use Characteristics

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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2.2 Socioeconomic Profile

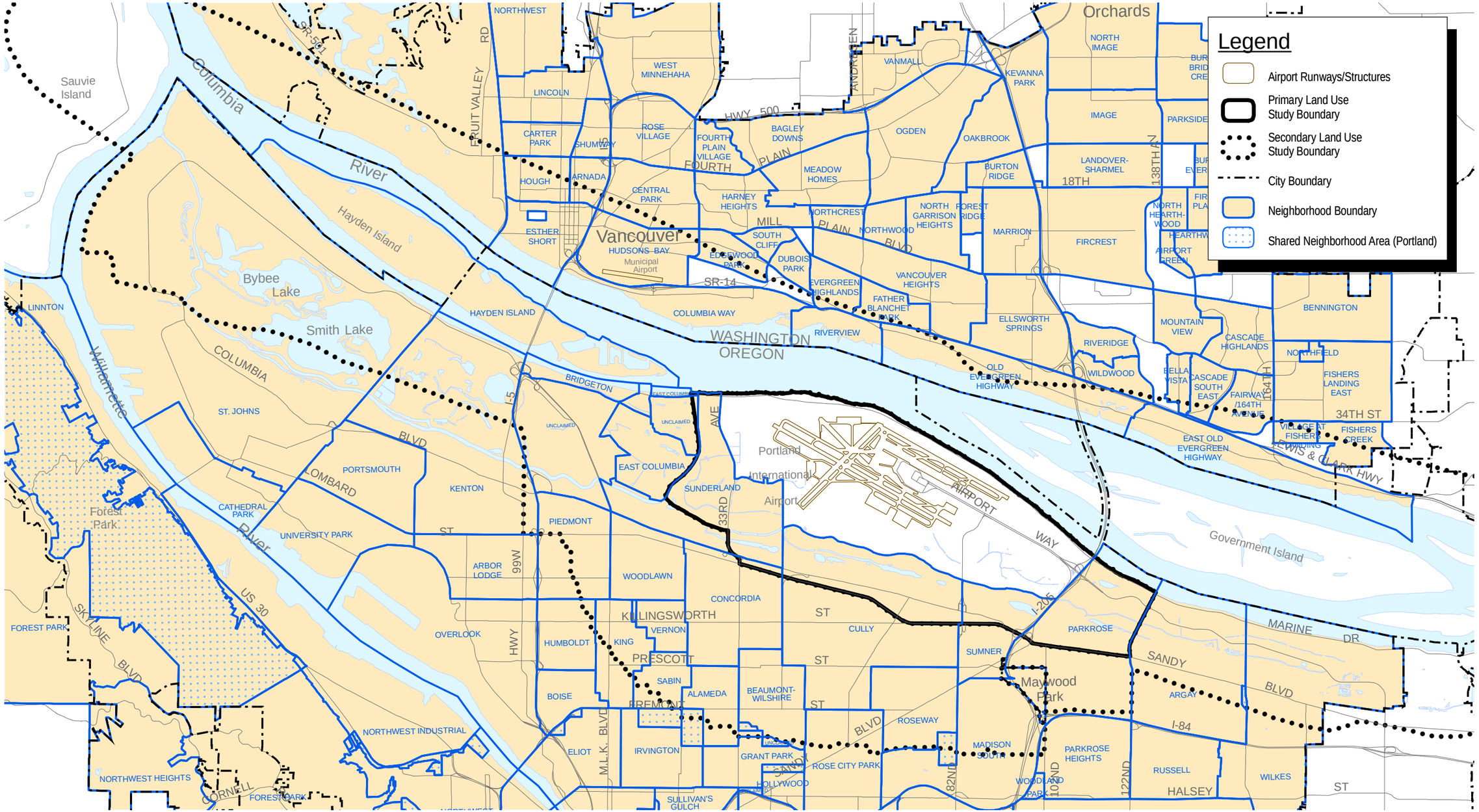
Portland International Airport is located in northeast Portland. The primary land use study area borders seven Portland residential neighborhoods. The secondary land use study area includes 24 Portland and 16 Vancouver residential neighborhoods. The secondary study area encompasses 49,411 acres with approximately 98,000 residents, according to the 2000 U.S. Census. The neighborhoods in the Portland/Vancouver metropolitan area are shown on Figure 2-3. U.S. Census data for 2000 for Multnomah County are shown in Table 2-1.

Overall, the demographic profile and growth patterns for the land use study areas mirror those of Multnomah County and the growth patterns are also similar to those of Washington, Clackamas and Clark counties, with a few exceptions. The Portland-Vancouver metropolitan region has experienced tremendous population growth since 1990. The populations of Washington, Clackamas, and Clark counties each grew by 30% between 1990 and 2000. Multnomah County's and the study area's populations also increased, but at about 14%. Multnomah County is mostly urbanized, and therefore more constrained in population growth than the other three counties in the region.

Similar to the region as a whole, the study area is becoming more ethnically diverse. However, diversity in the study area is increasing at a higher rate than in the region. The percentage of white residents decreased almost 10% between 1990 and 2000, while the Hispanic population more than doubled. Compared to the surrounding region, the study area has a much higher percentage of African-American residents, with more than twice that of Multnomah County and the rest of the region.

The relationship between the counties' per capita income remained the same between 1990 and 2000, with Washington County having the highest and Multnomah the lowest; per capita income in the study area was lower than in Multnomah County as a whole. The study area has a higher concentration of households living at or below the poverty level, although the number below the poverty level decreased between 1990 (15.6%) and 2000 (13.1%).

Household size is comparable in the study area is similar to that in the rest of the region; however, both Multnomah County and the study area have fewer households with children than the region as a whole.



AIRPORT FUTURES
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Figure 2-3

Portland and Vancouver Neighborhoods

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Portland International Airport

Source: City of Portland, Bureau of Planning

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Table 2-1

MULTNOMAH COUNTY 1990 AND 2000 U.S. CENSUS DATA

	2000 Region	Percent Increase (Decrease) since 1990	2000 Multnomah County	Percent Increase (Decrease) since 1990	2000 Primary Land Use Study Area	Percent Increase (Decrease) since 1990
Total Area (acres)			297,683		44,907	NA
Total Population	1,789,463	27%	660,486	13.1%	98,191	14.0%
Total Housing Units	738,458	27%	288,561	12.8%	42,080	14.6%
Occupied Housing Units	696,669	(1%)	272,098 (94%)	(1.0%)	38,973 (93%)	0.0%
Vacant Housing Units	41,789	20%	16,463 (6%)	20.0%	3,107 (7%)	0.0%
Households	696,669	26%	272,098	12.3%	38,973	14.0%
% of Population Living at Poverty Level	8.8%	(3%)	12.4%	(5.7%)	13.1%	(16.0%)
Housing Costs > 30% of Income	31.0%	24%	34.0%	21.5%	33.2%	18.9%
Per Capita Income	$23,607	56%	$22,606	56.3%	$20,988	67.6%
Households with Children <18yrs	35.9%	5%	29.1%	4.0%	30.7%	1.0%
Average Household Size	2.6	1%	2.37	(1.2%)	2.5	0.2%
Age Distribution						
0-17	25.3%	(1%)	22.3%	0.2%	23.3%	(8.1%)
18-21	5.0%	(3%)	5.5%	0.5%	4.9%	1.0%
22-34	19.9%	(7%)	22.3%	0.2%	20.3%	(3.6%)
35-59	36.3%	13%	35.7%	(0.1%)	36.6%	20.0%
60 and Over	13.5%	(14%)	14.3%	0.1%	15.0%	(17.7%)
Racial/Ethnic Composition						
White	83.9%		79.0%		71.1%	
African-American	2.7%		5.4%		12.9%	
American-Indian and Alaska Native	0.8%		1.0%		1.0%	
Asian, Native Hawaiian, Pacific Islander	5.1%		6.0%		5.8%	
Other, Two or More Races	7.5%		8.6%		9.2%	
Total Hispanic (any race)	7.4%		7.5%		7.3%	

Source: U.S. Department of Commerce, Bureau of the Census, 1990 and 2000 Census.

2.3 Zoning

The zoning map for the area surrounding PDX is shown on Figure 2-4. The primary and secondary land use study areas are predominantly zoned industrial, with pockets of residentially and commercially zoned land. The Port owns 65% of the land in the primary study area, not including rights-of-way.

Port-owned property at PDX is zoned primarily General Industrial 2, with a few hundred acres of General Employment 2. General Industrial 1 zoning implements the Industrial Sanctuary area designation of the Portland Comprehensive Plan. The General Industrial 2 zoning category provides for areas of mostly industrial uses for manufacturing purposes, while nonindustrial uses are restricted to avoid potential conflicts and reserve land for future industry. General Employment 2 zoning implements the Mixed Employment area designation of the Portland Comprehensive Plan. The General Employment 2 zoning category allows for a wide range of employment opportunities without conflicts from residential uses. Some commercial uses are allowed to support a wide range of services and employment opportunities.

Within the primary land use study area, the total space allocated for each zoning classification is shown in Table 2-2.

Table 2-2

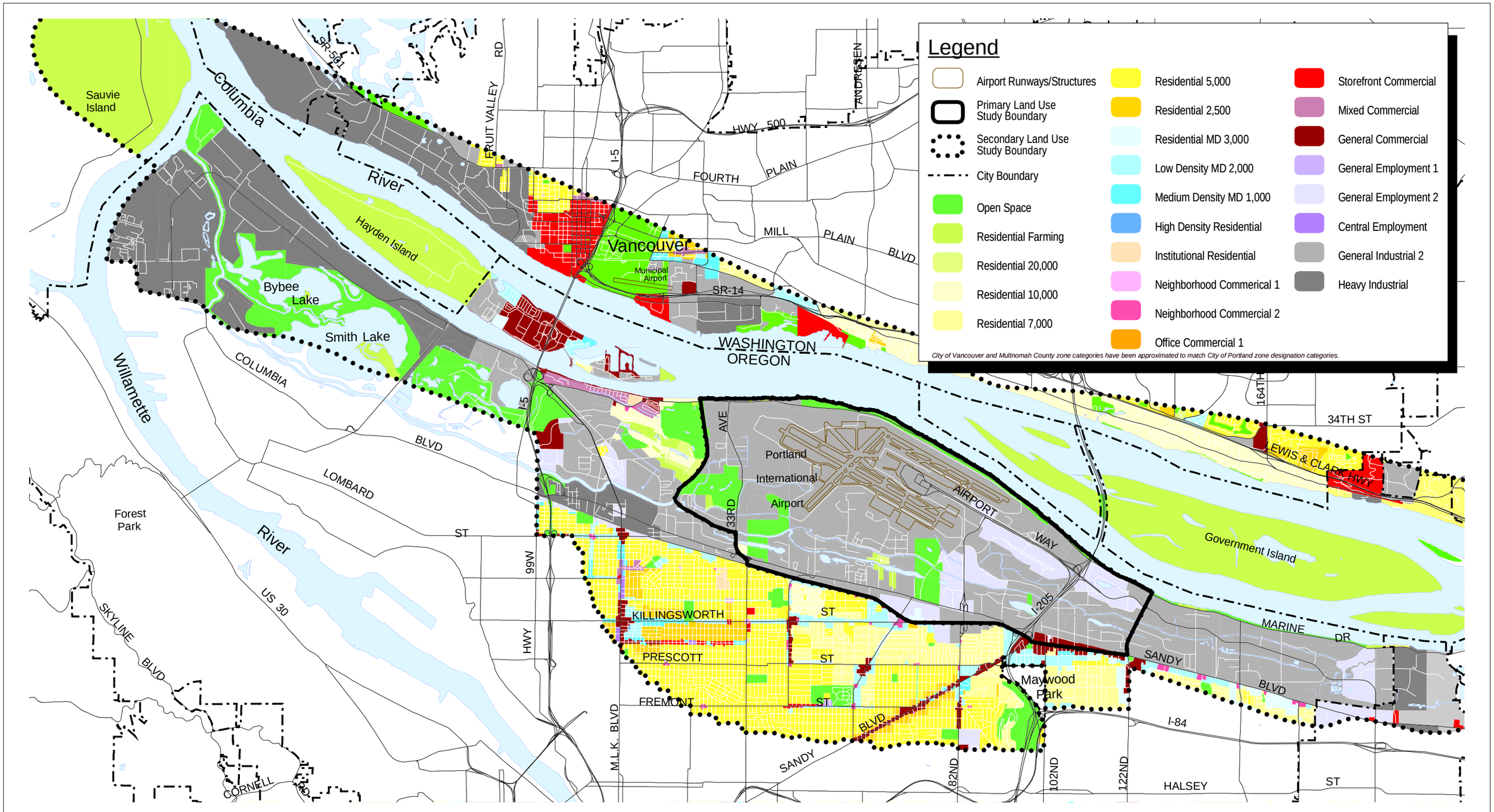
PRIMARY LAND USE STUDY AREA ZONING BY ACRES

Zone	Total Acres	Port Owned Acres
General Commercial	36.1	0.0
General Employment 2	529.8	319.2
General Industrial 2	4,174.3	3,055.7
Open Space	505.6	107.5
Residential 10,000	8.3	0.2
Residential 20,000	7.1	0.0
Residential MD 3,000	10.9	0.8
Residential Farming/Forest	34.9	0.8
Total acres	5,307.0	3,484.2

Source: City of Portland, Bureau of Planning.

2.4 Noise and Height Overlay Zones

Overlay zones provide an additional level of regulation to the base zone to address specific circumstances. In 1991, the Portland City Council adopted the Aircraft Landing Overlay Zone (h) and the Portland International Airport Noise Impact Overlay Zone (x), illustrated on Figure 2-5.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 1 Mile
Scale: 1" = 1 Mile

Figure 2-4

Portland and Vancouver Zoning

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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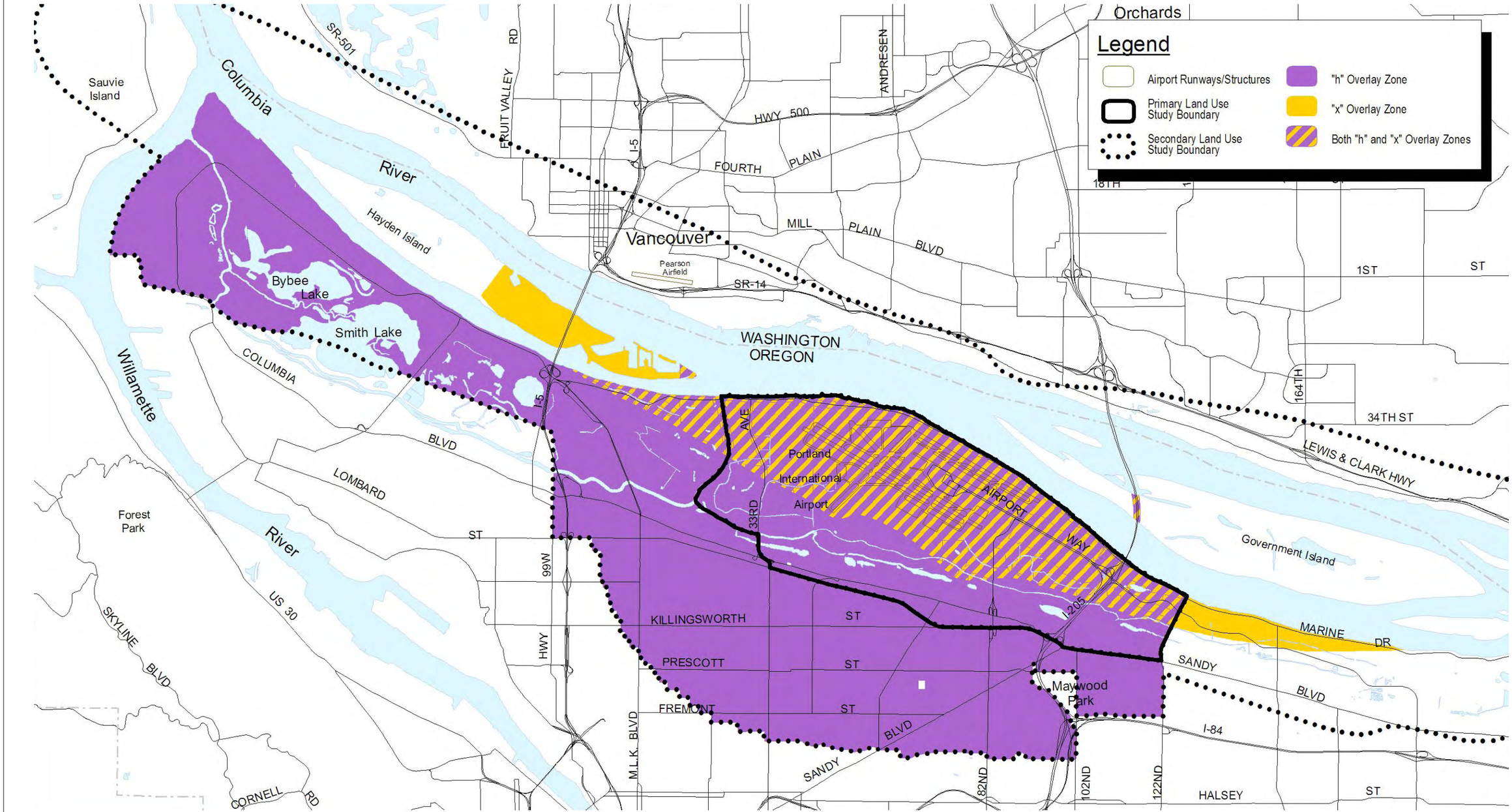

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 1 Mile
Scale: 1" = 1 Mile

Figure 2-5

Aircraft Landing "h" and Noise Impact "x" Overlay Zones

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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The Aircraft Landing Overlay Zone limits the height of vegetation and structures in the vicinity of the Airport to provide safe aircraft operating conditions. The Noise Impact Overlay Zone ensures compatible land use designations and development within the noise-impacted areas surrounding the Airport. The boundary for the Noise Impact Overlay Zone was established on the basis of the *1990 Portland International Airport Noise Abatement Plan Update*. The Port mapped the noise contours related to aircraft operations at PDX as part of this plan, and outlined measures to mitigate the impacts of noise. The City established the Noise Impact Overlay Zone for all areas with a DNL of 65 or greater. DNL is the day/night reading of a noise level index that provides an average noise level for a 24-hour period, 365 days per year.

2.5 Industrial Uses and Freight Movement

Portland International Airport is located within the Columbia Corridor. This corridor has historically been, and continues to be, an important industrial district. The corridor has direct access to two north-south interstate highways and connections to east-west links in the national railroad system, the national inland waterway network, and the regional light rail system.

The Airport Industrial District is within the Columbia Corridor. The district is approximately the same area as the primary land use study area. This area is part of the City's and the region's industrial employment base and an important corridor for freight generation and movement by rail and truck. Table 2-3 shows the largest employers in the District and their employee counts in 2003. Figure 2-6 shows the important freight and rail routes and some of the current constraints in the district.

As of 2004, the Airport Industrial District:

- Occupied over 40% of the City of Portland's industrial land
- Was home to nearly a third of the Metro area's transportation jobs
- Contained 770 acres of vacant, buildable land and 430 acres of constrained, partly buildable land

2.6 Airport Way Urban Renewal Area

The Portland Development Commission (PDC) adopted the Airport Way Urban Renewal Plan in 1986, with a plan termination date of May 15, 2011. The goals and objectives of the Plan have guided PDC's redevelopment and public investment activities since adoption. The area's boundary spans NE 82nd Avenue to Portland city limits at NE 185th Avenue and Marine Drive. At 2,726 acres, the Airport Way Urban Renewal Area is the City's second largest urban renewal district.

Table 2-3

LARGEST INDUSTRIAL EMPLOYERS

Largest Employers	Industry Jobs
Horizon Air—Scheduled Air Transportation	500+
Huntleigh USA Detective Guard and Armored Car Services	250-499
United Airlines—Scheduled Air Transportation	250-499
Yellow Freight Systems Trucking Except Local	250-499
Market Transport Ltd. Local Trucking without Storage	250-499
Sapa Anodizing Special Industry Machinery Manufacturing	500+
Nabisco Inc. Bakery Cookies and Crackers	250-499
Jubitz Corp. Admin. Office Gasoline Service Stations	250-499
Halton Company Construction and Mining Machinery	250-499
Owens Brockway Glass Containers	250-499

Source: Inside Prospects, 2003.

The Airport Way Urban Renewal Area is unique in its absence of a substantial housing element and its proximity to major transportation infrastructure. Accordingly, the primary goal for the Urban Renewal Area has been to facilitate development to create a major eastside employment center with the following objectives:

- To facilitate development in the district that generates significant new employment opportunities for new and existing businesses
- To support development of public infrastructure and transit, and to protect the district's natural resources
- To encourage employers to provide quality job opportunities to residents of economically disadvantaged communities
- To use the land near Portland International Airport for a major mixed-use development, consisting of retail, office, and hotel uses, capitalizing on the Metropolitan Airport Express (MAX) light rail line.

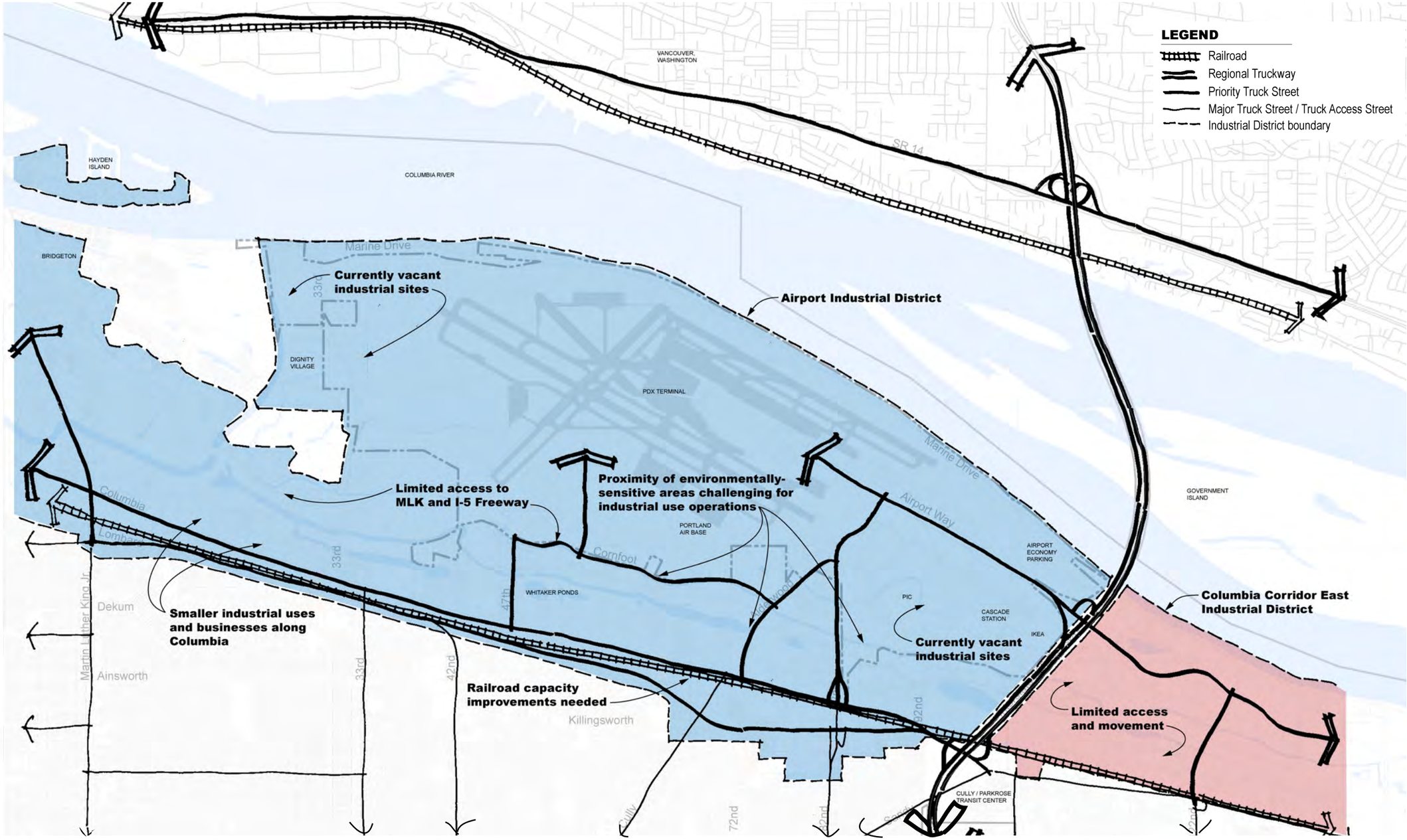

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Figure 2-6

Existing Conditions - Freight

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

September 2008

2.7 Cultural Resources

Cultural resources are an important component of the Airport Futures planning process. The Portland-Vancouver region was inhabited for thousands of years prior to the arrival of European settlers in the late 1700s. The lower part of the Columbia River Basin was a natural gathering place for Native American tribes from across the northwestern United States. The Columbia and Willamette rivers provided a rich source of salmon, roots, and edible plants, which were traded widely among northwestern Native Americans.

The south shore of the Columbia River, where the Airport is located, is significant to the Chinookan people. It is estimated that the Chinookan populations reached 17,840 in 1800, the highest Native American population densities in the Columbia River Basin. Of special importance is the Columbia Slough, which was a critical waterway used for trading, fishing, and travel.

The State of Oregon protects areas of historical significance through State Land Use Goal 5 "Natural Resources, Scenic and Historic Areas, and Open Spaces." State Goal 5 states that "cultural area refers to an area characterized by evidence of an ethnic, religious or social group with distinctive traits, beliefs and social forms."

For the purposes of this Inventory, a cultural resource is defined as "evidence of American Indian use in the Columbia South Shore from the pre-contact era." Cultural resources can include native species (plants and animals), inanimate materials, land forms, archaeological sites, ancestral grounds, and other components of the physical environment associated with the American Indian's traditional use of the region.

In the 1800s, Lewis and Clark recorded two Indian village sites on the south bank of the Columbia River in the vicinity of the Columbia South Shore. Over time, physical evidence has frequently been discovered throughout the area confirming the presence of a past Native American population. Evidence can also include oral histories of the area.

Cultural resources can be easily buried, disturbed, or destroyed by natural causes or through human activity. Low-lying areas have flooded frequently over time, sometimes destroying historic buildings and landscapes naturally. The exact location of remaining areas of significance (including ancestral burial grounds and village sites) are not published to protect them from disturbance and/or looting.

2.8 Recreation and Open Space

Although the Columbia South Shore area is known mostly as an industrial area, it provides numerous opportunities for recreation and open space. In addition to the four golf courses, the area is home to a scenic pedestrian and bike trail that runs along the Columbia River. The area is also home to Whitaker Ponds, which is a reclaimed landfill that has been restored. The area is now home to the Columbia Slough Watershed Council, which offers the site for educational and recreational opportunities. Figure 2-7 shows the existing open space, parks, trails, and Columbia Slough access points.

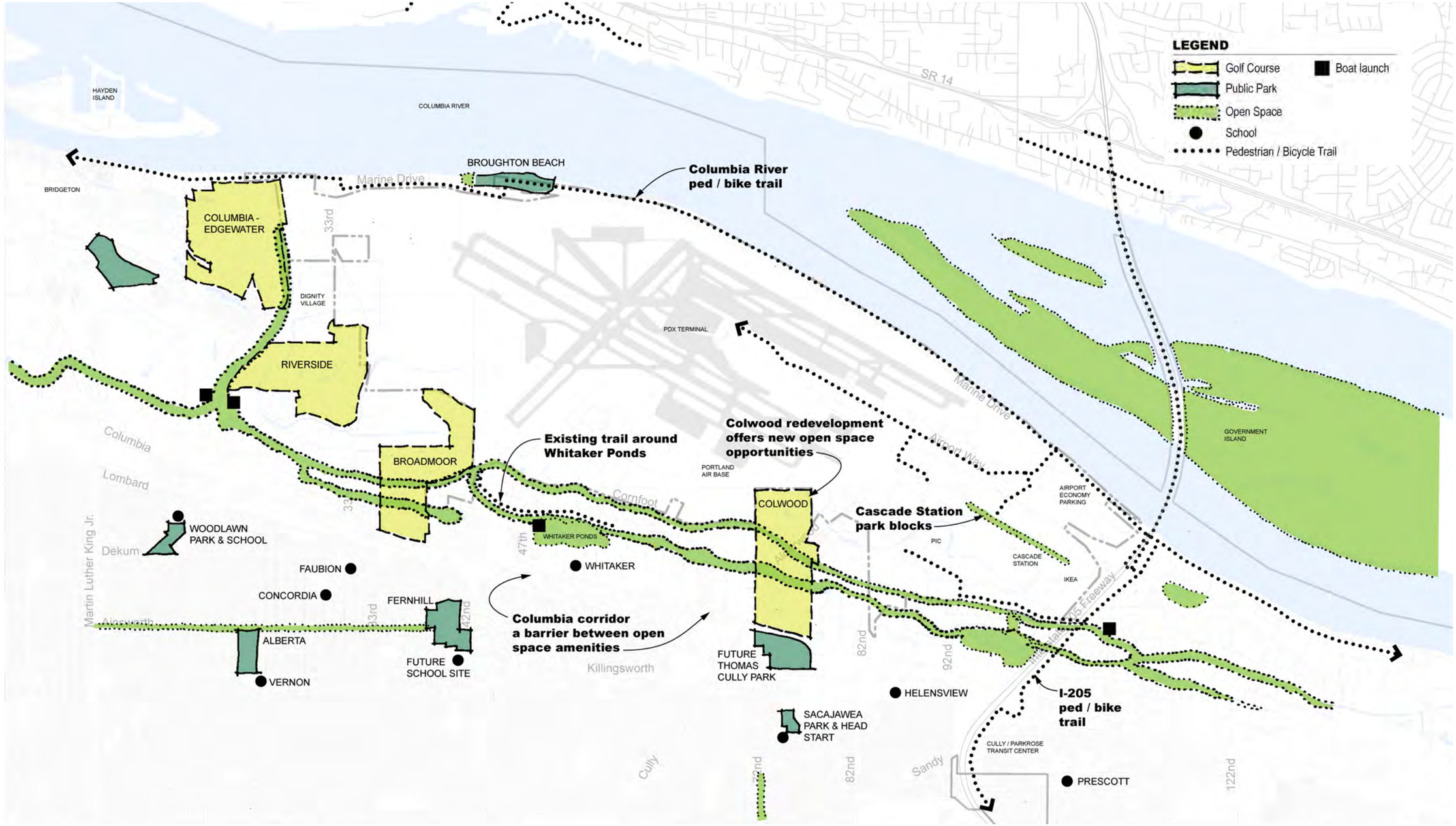

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Figure 2-7

Recreation / Open Space

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Portland International Airport

Source: City of Portland, Bureau of Planning

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3. NATURAL RESOURCES STUDY AREAS

The natural resources study areas include primary and secondary areas. The **primary natural resources study area**, illustrated on Figure 3-1, includes Port-owned property and the boundaries proposed as part of the decentralized option in the 2000 Airport Master Plan.

The Port has conducted an extensive inventory of the properties within the primary study area as part of the Strategic Environmental Evaluation, which was a follow-on study from the 2000 Airport Master Plan. The City of Portland has also conducted a preliminary Natural Resources Inventory (NRI) that encompasses the entire City. This information is subject to revision based on public review prior to adoption through a formal public process. Thus, figures related to the natural resources inventory have been identified as "draft." The City has incorporated the Port's inventory into the NRI for the primary study area. A summary of the City's NRI is presented in this section.

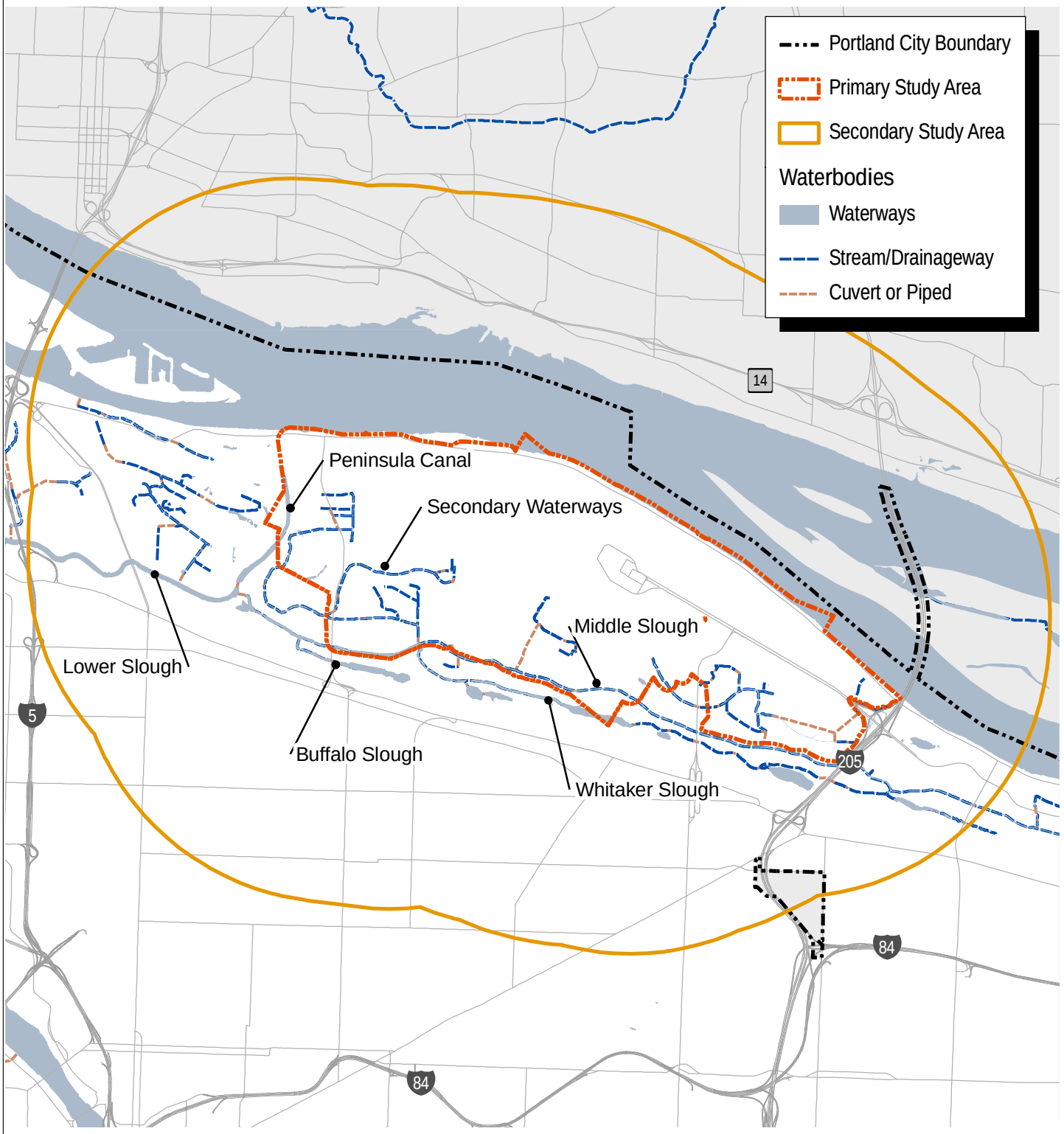
The **secondary natural resources study area**, also illustrated on Figure 3-1, is 10,000 feet beyond the primary natural resources study area. Wildlife management issues are particularly important in this area.

Water and air quality will also be analyzed as part of this Master Plan. The water quality study area includes all drainage basins within Port-owned property and the main channel of the Middle and Lower Columbia Slough. The primary study area for air quality coincides with that for natural resources. Off-site air quality impacts will be evaluated as part of the emissions inventory by using the average trip distances to and from the Airport for the various vehicle types (estimated by Metro in its 2040 transportation model).

3.1 Natural Resources Setting

Regionally situated in the Lower Columbia River Basin, the Columbia Slough meanders through a 32,700-acre watershed, which is part of a regional ecosystem that includes the Willamette River and Tualatin Mountains (Forest Park), Sauvie Island, the Columbia River, the Ridgefield and Shilapoo Wildlife Areas, Vancouver Lake, and the Sandy River. The watershed once contained a system of side channels, lakes, and wetlands that covered the floodplain of the Columbia River between the mouths of the Willamette and Sandy rivers. High water, known as freshets, seasonally inundated the floodplain, cutting new channels and depositing sediment.

Over the years, the watershed and waterway have been altered significantly to accommodate agricultural and industrial development. Beginning in 1918, levees were built to keep Columbia River flows out of the watershed and provide flood protection. Wetlands and side channels were drained and filled to allow for development. The



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Scale: 1" = 5,000'

Figure 3-1

Natural Resources Study Areas

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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waterway was channelized, and dozens of streams were filled or diverted to underground pipes. This activity resulted in an extensive loss of habitat, reduction of flood storage capacity, and reduced ability to filter sediments and pollutants from surface water.

Today, the Columbia Slough is a 19-mile main channel that begins at Fairview Lake and meanders west to Kelley Point Park, where it empties into the Willamette River. The Columbia Slough is shown on Figure 3-2. The watershed also contains approximately 30 miles of secondary waterways and other remaining surface water features, such as Fairview Creek, Fairview Lake, Wilkes Creek, and Smith and Bybee Lakes, one of the nation's largest urban freshwater wetlands.

The Columbia Slough watershed within the City of Portland consists of approximately 27,200 acres. Portland International Airport is located near the center of the Columbia Slough watershed, in a portion that has piped surface water, dikes and levees, and a system of pumps that provide hydrologic management and flood control. The Columbia Slough waterway near the Airport consists of a main channel, called the Middle Slough, and southern channels called Whitaker Slough and Buffalo Slough. Secondary waterways near the Airport are piped or pumped to the Middle Slough. East of the Airport, the Upper Slough and side channels drain to the Middle Slough, and the Middle Slough, in turn, drains to the Lower Slough. The Lower Slough is connected to the Willamette River and is influenced by daily tides, which are visible in the Lower Slough and often cause flow reversals in the Rivergate area.

Even with these alterations and development, numerous significant natural resources remain at and around the Airport. The Columbia River, Columbia Slough and remaining side channels, wetlands, hardwood bottomland forests, and upland wildlife habitat areas are all found near the Airport. Furthermore, there are many local and regional trails, including portions of the 40-mile Loop Trail located in the watershed. The main channel of the Columbia Slough waterway is open to canoeing and can be accessed by numerous docks and landings.

Table 3-1 lists the area occupied by natural resources within the primary and secondary study area boundaries. Figure 3-3 illustrates the vegetation features of the natural resources. These vegetation features provide important ecologic functions that benefit environmental quality, fish, wildlife, and humans.

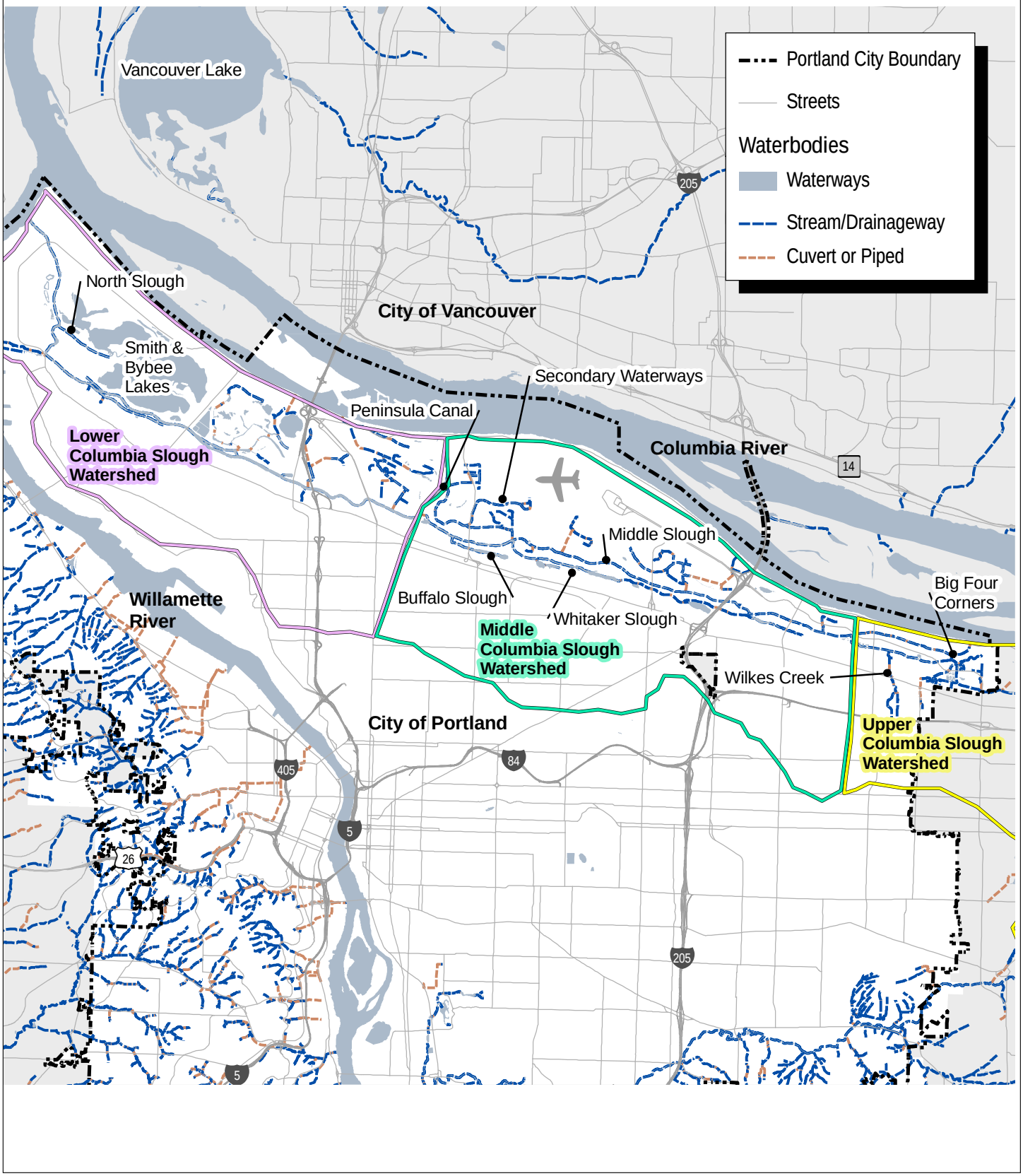

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Figure 3-2

Columbia Slough Watershed & Waterways

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Source: City of Portland, Bureau of Planning

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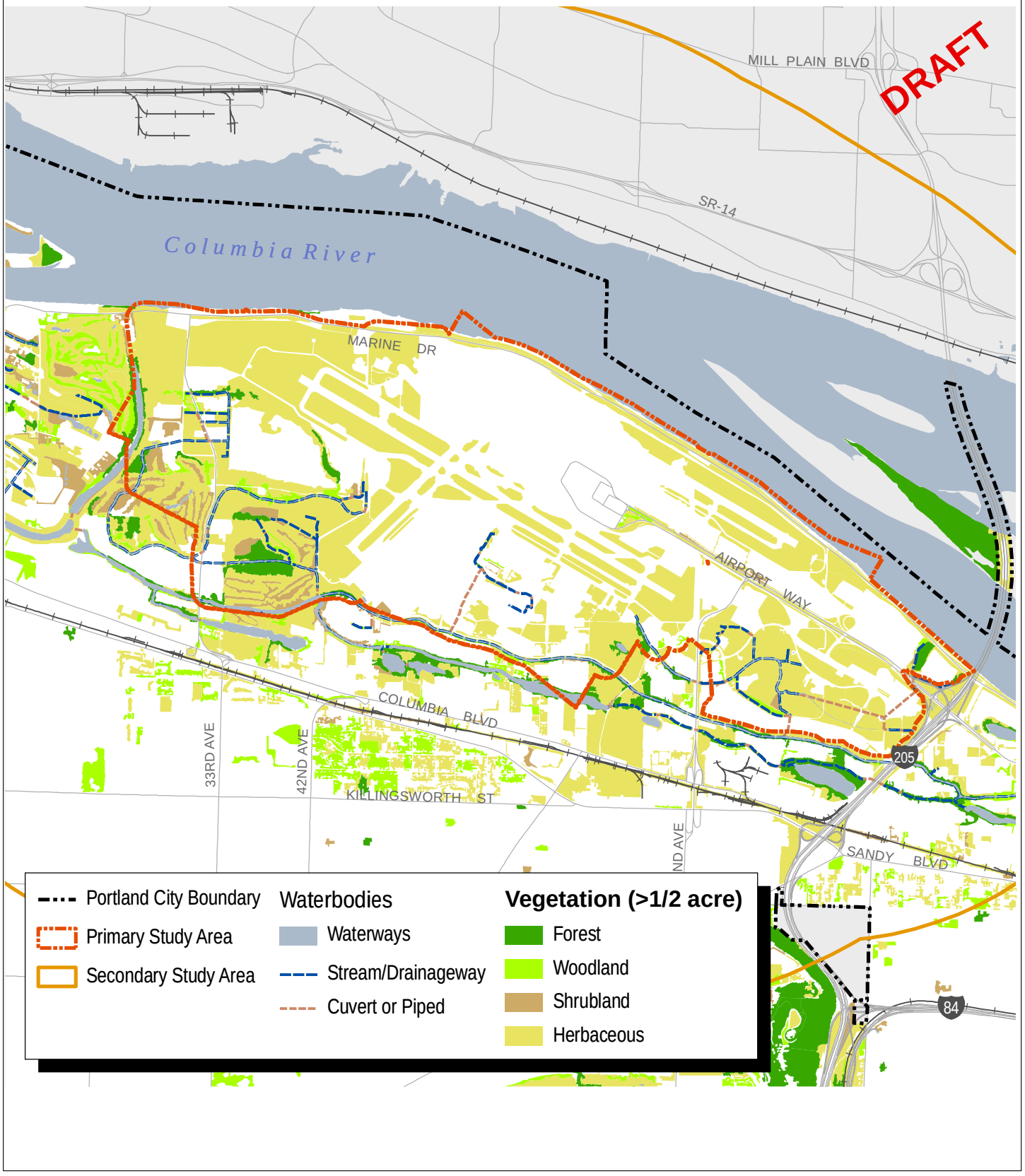

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Figure 3-3

Natural Resources - Vegetation Features

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Source: City of Portland, Bureau of Planning

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Table 3-1

NATURAL RESOURCES FEATURES

	Primary Study Area (3,926 Acres)	Secondary Study Area (21,590 Acres)
Stream (miles)	13	51
Open Channel (miles)	11	30
Columbia River (miles/acres)	NA	17/4,096
Piped Segments (miles)	2	4
Wetlands (acres)	115	446
Flood Area (acres) *(a)*	422	1,944
Vegetated (acres)	293	614
Non-vegetated (acres)	129	1,330
Vegetated (>= 0.5 acre) (acres) *(b)(c)*	1,773	3,927
Forest (acres)	80	401
Woodland (acres)	54	545
Shrubland (acres)	88	288
Herbaceous (acres)	1,551	2,687

NA = Not Applicable

(a) The flood area includes the 100-year floodplain, determined by the Federal Emergency Management Agency (FEMA), plus the 1996 flood inundation area.

(b) The vegetation classifications are applied in accordance with the National Vegetation Classification System specifications developed by The Nature Conservancy. The data within the primary study area and within 300 feet of all open water bodies in Portland are draft and are currently being updated based on 2006 aerial photography.

(c) Currently, vegetation data are available only for Portland. Vegetation data for Vancouver, Washington will be added when they become available.

Source: City of Portland, Bureau of Planning.

3.2 Riparian Corridors

Riparian corridors are generally considered to be those areas bordering rivers, streams, lakes, and wetlands. Riparian corridors include the transition zones between the aquatic and upland areas, where vegetation continues to provide streams with structure, shade, microclimate, nutrients, and other organic materials, and habitat for fish and wildlife. For the purposes of this inventory, riparian corridors are considered to include river and stream channels, adjacent riparian vegetation, and off-channel areas, including wetlands, side channels, and floodplains. Riparian corridors provide important ecologic functions, such as:

- Microclimate and shade
- Bank stabilization and control of sediments, nutrients, and pollutants

- Stream flow moderation and flood storage
- Large wood and channel dynamics
- Organic inputs, food web, and nutrient cycling

Wildlife habitat/corridors Figure 3-4 shows natural resources features that provide riparian corridor functions. It is important to note that the figures include only those vegetated areas 0.5-acre or greater in size. Also, because vegetation data are not available for the city of Vancouver, Washington, riparian corridor functions were only mapped for the city of Portland.

3.2.1 Wildlife Habitat

Even with the extensive development that has occurred in the natural resources study areas over the last 150 years, the remaining habitat areas support a rich diversity of wildlife found nowhere else within the city of Portland. Most of the native species that were historically found in the Columbia Slough watershed are still found there. However, most of these species are much less abundant. In addition, several introduced species have become so abundant that they dominate plant and animal communities. Although impacts have occurred, valuable habitat areas and wildlife populations remain in the study areas, such as large wetland expanses.

The natural resources provide important functions for wildlife habitat, including food, shelter/cover, and roosting and nesting opportunities for a wide variety of wildlife species. The wildlife habitat is illustrated on Figure 3-5. While some remnant areas of relatively high quality wildlife habitat still exist in the Columbia Slough watershed, most habitat in the primary and secondary areas is highly disturbed, and dominated by non-native species, such as reed canary grass and Himalayan blackberry.

The following habitat conditions and fish and wildlife are currently found in the study areas:

- Native vegetation, such as willow, black cottonwood, Oregon ash, Douglas hawthorn, Oregon white oak, sedges, and rushes, are scattered throughout the watershed. Populations of wapato and Columbia sedge are less common, found only in a few places (Lev et al. 1994).

- More than 150 species of birds roost, feed, nest, and/or migrate through the Columbia Slough watershed in an average year.

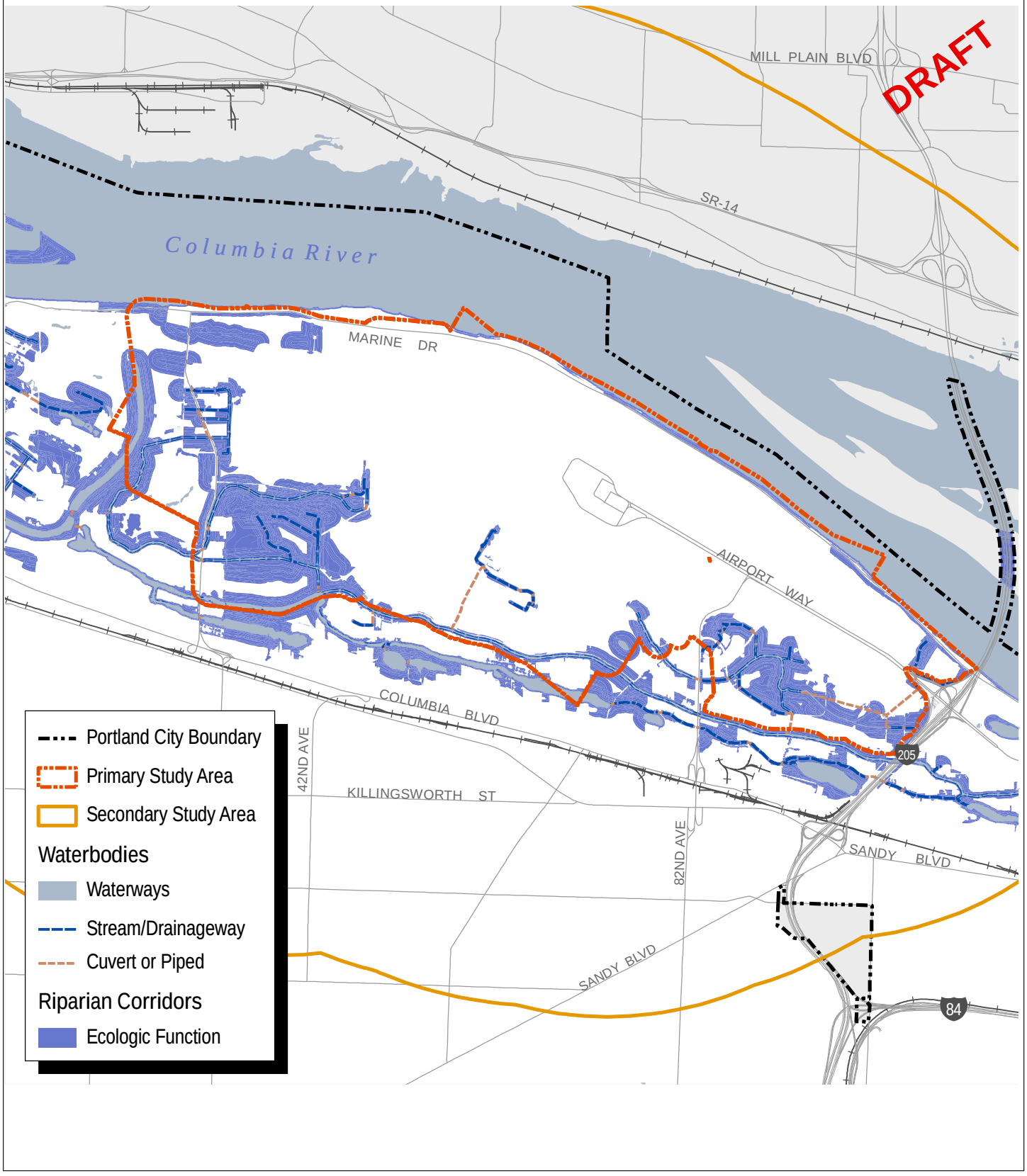

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Figure 3-4

Natural Resources - Riparian Corridor Functions

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Portland International Airport

Source: City of Portland, Bureau of Planning

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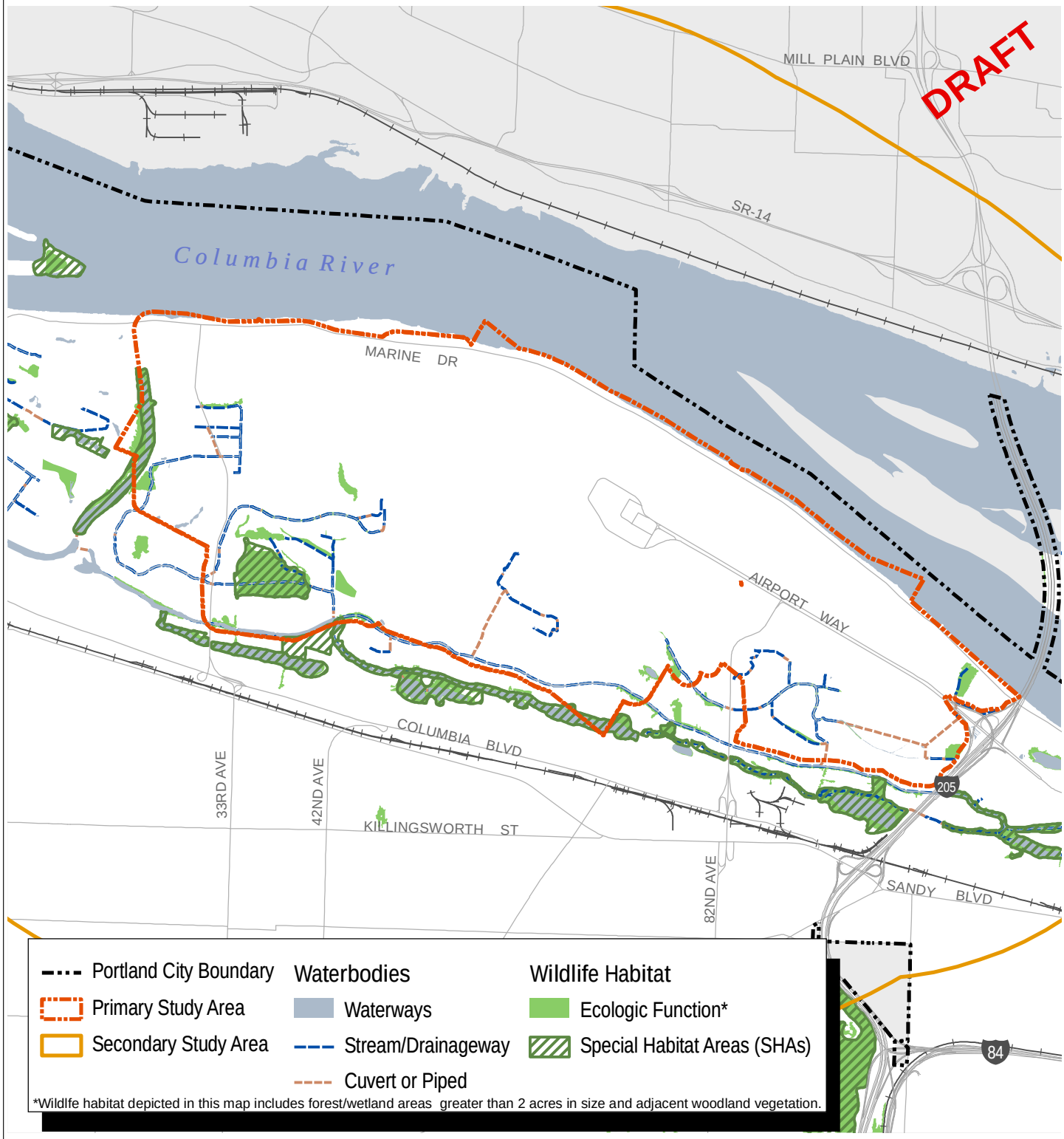

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Figure 3-5

Natural Resources - Wildlife Habitat

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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- The watershed and waterway serve as a travel corridor along the Lower Columbia River, Pacific Flyway, and other migratory bird pathways. The watershed and Columbia Slough waterway provide a vital corridor for wildlife movement between the Columbia River Gorge, Sandy River Delta, and Blue Lake to the east, to the Smith and Bybee Wetlands, Forest Park, Sauvie Island, Vancouver Lake, and Ridgefield National Wildlife Refuge to the west.

- More than 25 species of ducks, geese, swans, and raptors winter in the region, and neotropical migrant shorebirds and songbirds stop over in spring and fall. Many neotropical migrant songbirds and migrant waterfowl remain in the area throughout the summer to nest in the watershed. The watershed hosts a number of State of Oregon and federally listed species during the breeding season.

- The waterway, secondary waterways, and ponds are home to American beaver, muskrat, northern river otter, several amphibian species, painted and western pond turtles, and 12 native fish species, including seasonal use of the Lower Slough by anadromous salmonid species.

- Mammals such as coyote, black-tailed deer, and non-native red fox live in the upland habitats.

- As urbanization has occurred, non-native species have proliferated, adapting to the urban environment and out-competing native species. Some of the noxious wildlife species in the watershed include the house sparrow, European starling, rock pigeon, nutria, common carp, bluegill, and bullfrog. Some noxious weed species in the watershed include the Himalayan blackberry, English ivy, reed canary grass, purple loosestrife, and Japanese knotweed.

The vegetated riparian area adjacent to the Columbia Slough waterway is generally narrow and fragmented; however, native black cottonwood and Oregon ash still exist in remnant patches. Some riparian areas are devoid of trees, in part, because maintenance of primary levees requires removal of all trees and shrubs. The fragmentation of the riparian vegetation, combined with numerous road crossings, significantly restricts safe travel for wildlife along the Columbia Slough.

3.2.2 Water Quality

Good water quality is important for the health of human, fish, and wildlife communities. People use Portland's waterways, illustrated on Figure 3-6, including the Columbia Slough, for canoeing, fishing, and other recreational activities. The Columbia Slough has experienced severe water quality problems and contaminated sediments, resulting, in large part, from past agricultural and industrial wastes, as well as development patterns that have reduced vegetation and increased impervious surfaces. Conditions

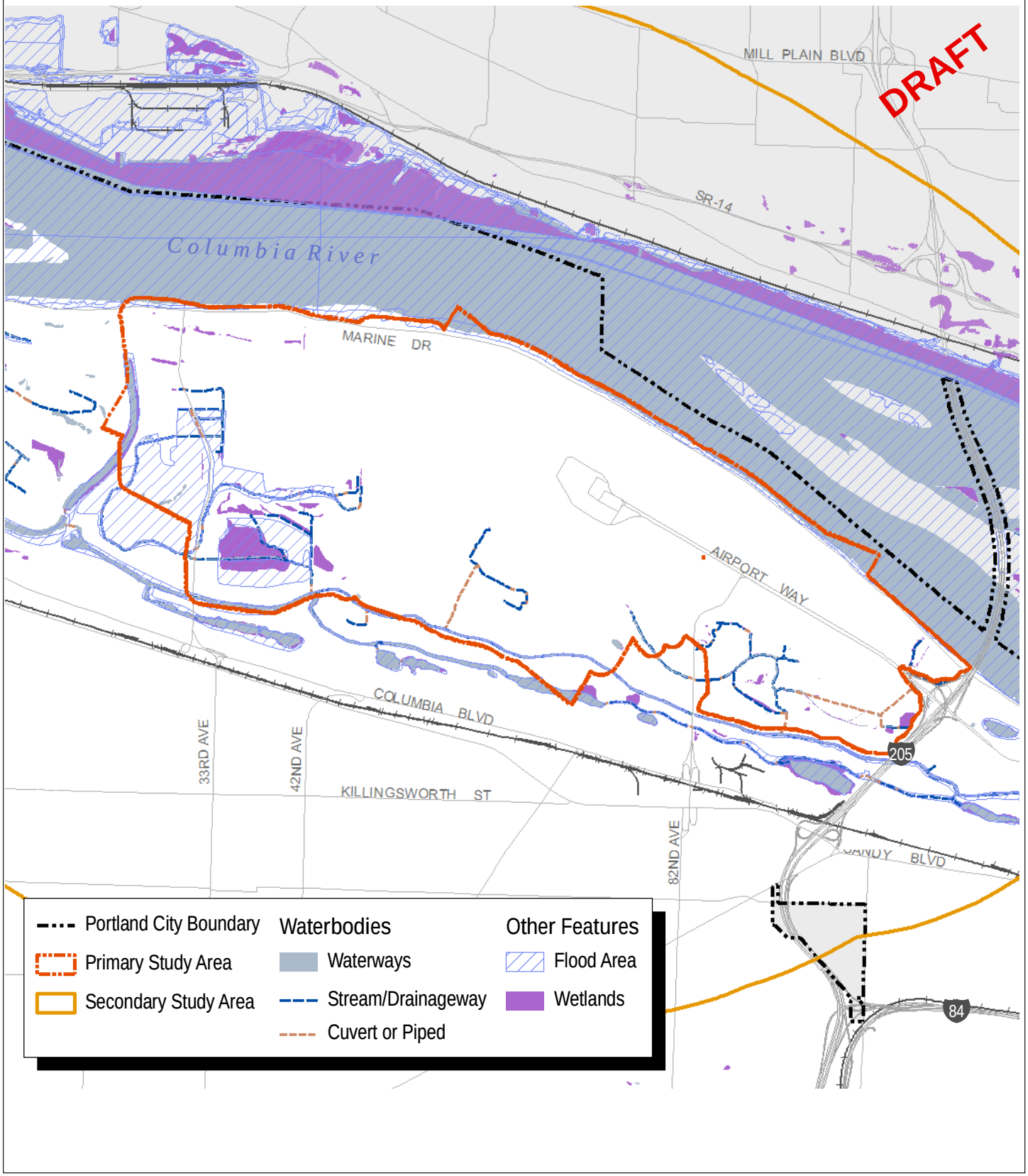

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Figure 3-6

Natural Resources - Water Related Features

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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are improving and measures have been taken to reduce pollution and improve the quality of natural resources. Industrial discharges have been regulated and combined sewer overflows have been controlled. Stormwater management to reduce pollutant load from surface water is a primary objective for the City. Many more people are beginning to view the Slough as an urban amenity.

The Oregon Department of Environmental Quality (DEQ) placed the Columbia Slough on the State's 303(d) list in 1994/1996 (DEQ 1999). The 303(d) list identifies water bodies that are "water quality limited" because they do not meet certain water quality standards related to the following parameters:

- Temperature
- Dissolved oxygen
- Eutrophication
- Nutrients, pH, and chlorophyll-a (algae)
- Total suspended solids
- Bacteria
- Toxics in the sediment (DDT/DDE, dieldrin, dioxins, PCBs, and lead)

The hydrology of the Slough is a major factor in determining what happens to pollutants that enter the waterway. The entire Slough system is a low-gradient waterway, dropping only a foot or two over its 19-mile length. The Upper and Middle sloughs (from Fairview Lake to NE 18th Avenue) are managed by a series of pumps and levees. All water entering the Upper and Middle Slough must be pumped into the Lower Slough. The Lower Slough is tidally influenced, meaning that water from the Columbia and Willamette rivers backs up into the Lower Slough twice per day. The tidal influence is so strong that it can reverse the flow of the Lower Slough near its confluence with the Willamette River. The result is that pollutants entering the Upper or Middle slough eventually end up in the Lower Slough, where they can remain for days to weeks, depending on the tides. Sediments transported into the Lower Slough can remain for decades.

3.2.3 Natural Resource Enhancement Opportunities

Figure 3-7 shows the areas around the Airport that provide ecological functions at some level and wetland mitigation sites. There are many opportunities to restore and enhance the natural resources around the Airport. Figure 3-8 depicts enhancement opportunity areas. Current activities to improve watershed health induce planting trees and vegetation along the slough, wetland mitigation, and culvert removal in Whitaker Slough to improve flow.

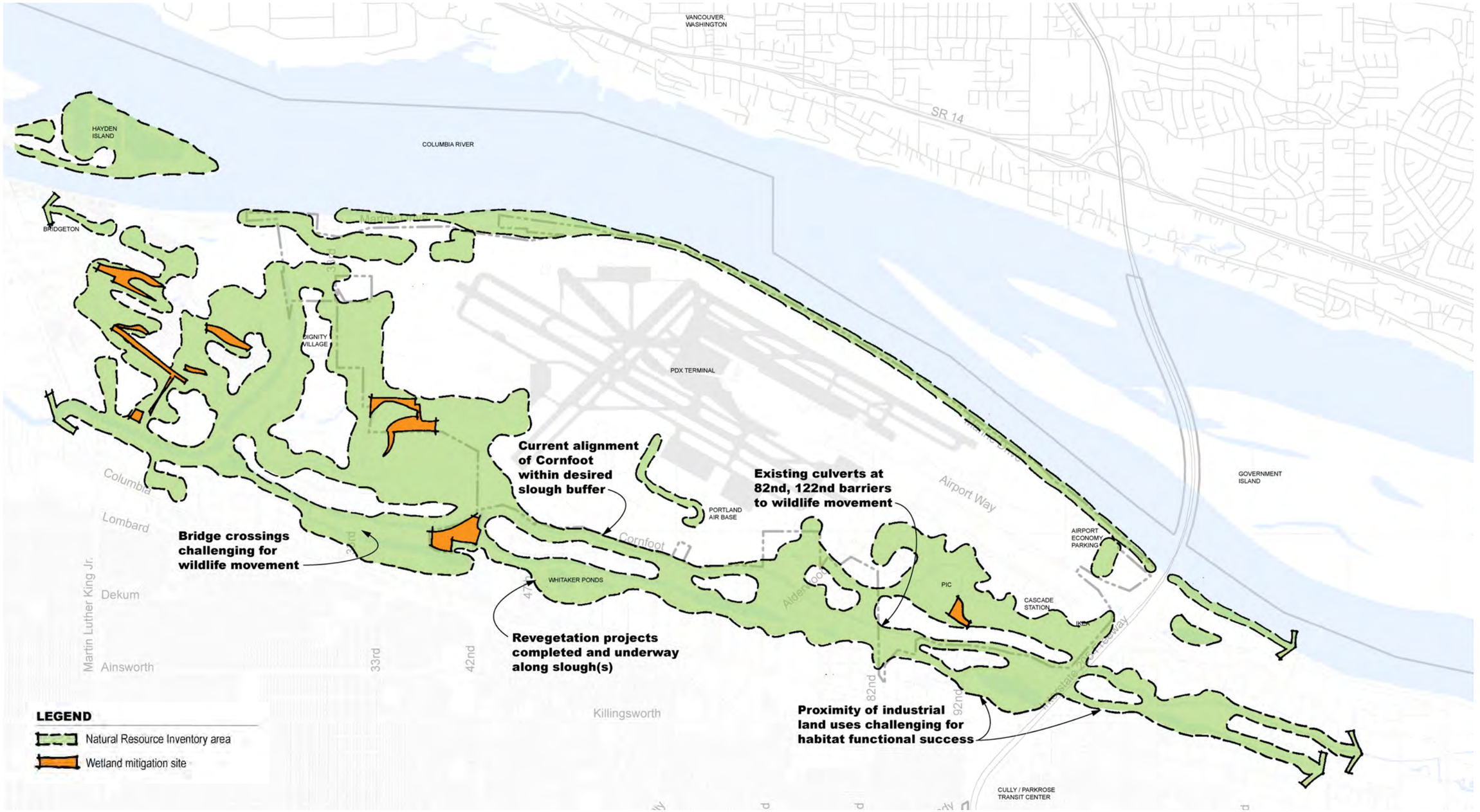

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Figure 3-7

Natural Resources - Inventory

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Portland International Airport

Source: City of Portland, Bureau of Planning

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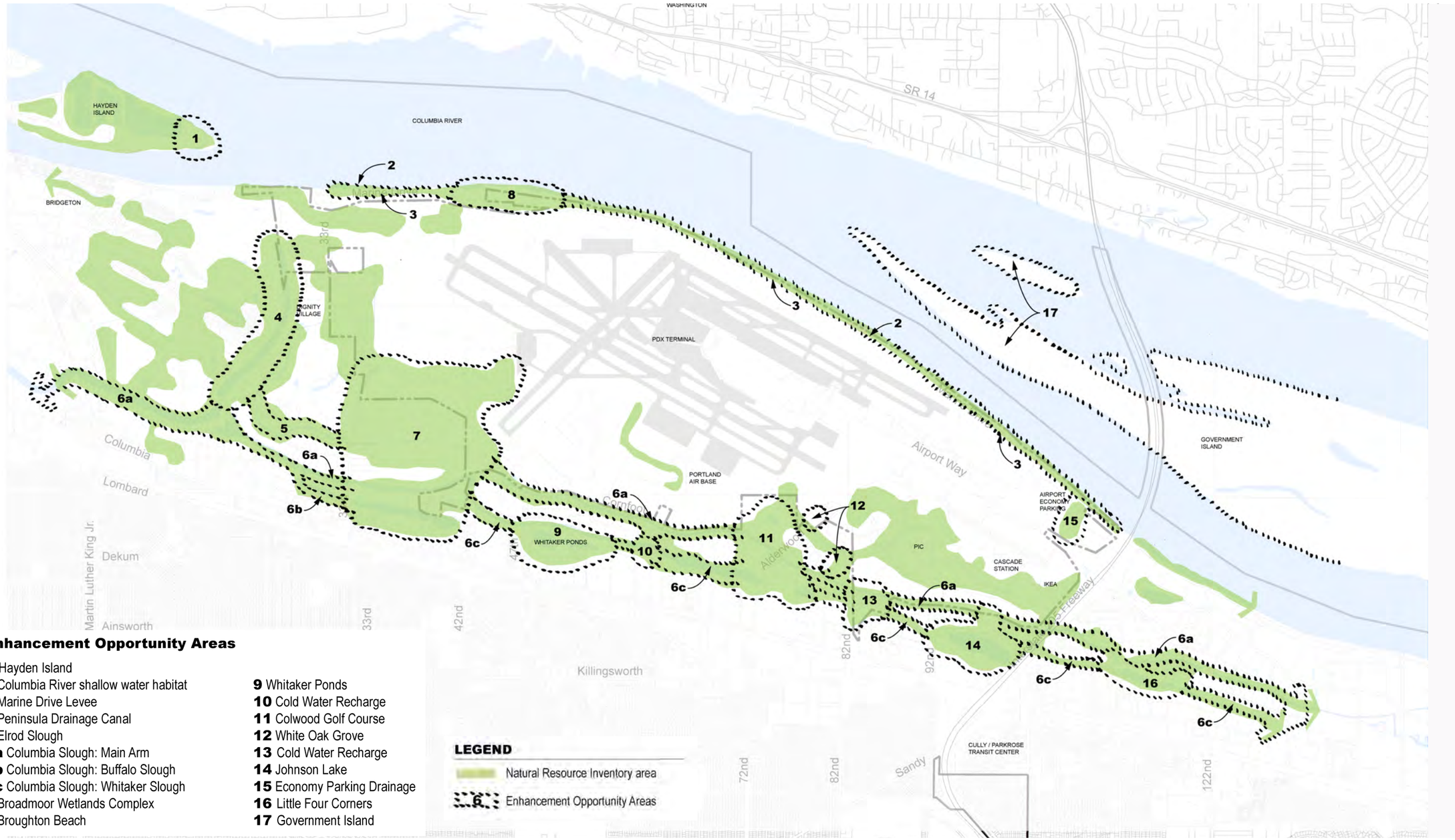

Enhancement Opportunity Areas

1 Hayden Island
2 Columbia River shallow water habitat
3 Marine Drive Levee
4 Peninsula Drainage Canal
5 Elrod Slough
6a Columbia Slough: Main Arm
6b Columbia Slough: Buffalo Slough
6c Columbia Slough: Whitaker Slough
7 Broadmoor Wetlands Complex
8 Broughton Beach
9 Whitaker Ponds
10 Cold Water Recharge
11 Colwood Golf Course
12 White Oak Grove
13 Cold Water Recharge
14 Johnson Lake
15 Economy Parking Drainage
16 Little Four Corners
17 Government Island

AIRPORT FUTURES
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Figure 3-8

Natural Resources - Enhancement Opportunity Areas

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

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4. REGIONAL TRANSPORTATION STUDY AREAS

Portland International Airport is a major intermodal transportation facility serving much of the State of Oregon and southwest Washington. A number of major transportation facilities serve the Airport site, including I-205; light rail transit; major arterials, such as Airport Way, 82nd Avenue, and Columbia Boulevard; and portions of the regional 40-mile Loop Trail.

The Airport is centrally located within the Columbia Corridor, which has historically been, and continues to be, an important regional industrial district. The corridor has direct access to two north-south interstate highways, the national Class 1 railroad system, the national inland waterway network, and the regional light rail transit system. Because of these investments in major transportation facilities, the corridor is home to many thousands of family-wage jobs (including jobs at the Airport) and plays a vital role in the regional and bi-state economy.

The regional transportation study areas include primary and secondary areas.

The **primary regional transportation study area** boundaries are the same as the boundaries of the primary land use study area, illustrated on Figure 2-1. The primary study area is bordered to the north by the Columbia River, to the east by 122nd Avenue, to the west by the Peninsula Slough, and to the south by Lombard Street/Killingsworth Street/Sandy Boulevard (Portland Highway).

Determination of the primary area was based on the transportation impact analyses completed as part of the Conditional Use Master Plan Permit of 2003 and the Cascade Station/Portland International Center Environmental Assessment in 2006. This area includes intersections that are directly affected by trips to and from the Airport and may require future mitigation.

Within the primary study area, facilities are available to service multiple modes of transportation, some with common corridors and others with exclusive-use corridors. Consistent with the City's Transportation System Plan, Table 4-1 summarizes the modal function for selected streets in the primary study area.

The **secondary regional transportation study area** includes the area in which potential impacts are anticipated. This area is bounded by the Columbia River to the north, 148th Avenue to the east, Martin Luther King Boulevard to the west, and Killingsworth Street/Cully Boulevard/Prescott Street/Sandy Boulevard to the south.

Table 4-1

PRIMARY REGIONAL TRANSPORTATION STUDY AREA STREET CLASSIFICATIONS

Roadway	Traffic	Transit	Pedestrian	Bicycle	Truck
NE Airport Way	Major City Traffic Street	Community Transit Street	Local Service Walkway	City Bikeway	Priority Truck Street
NE Alderwood Drive	Local Service Street	Local Service Street	Local Service Walkway	Local Service Bikeway	Local Service Truck Street
NE Alderwood Road	Neighborhood Collector Street	Community Transit Street	City Walkway	City Bikeway	Priority Truck Street
NE Buffalo Street	Local Service Street	Local Service Street	Local Service Walkway	Local Service Bikeway	Freight District Street
NE Cascades Parkway	Neighborhood Collector Street	Local Service Street	City Walkway	City Bikeway	Freight District Street
NE Columbia Boulevard	Major City Traffic Street	Community Transit Street	City Walkway	Local Service Bikeway	Priority Truck Street
NE Cornfoot Road	Neighborhood Collector Street	Community Transit Street	Off-Street Path	City Bikeway	Priority Truck Street
NE Cully Boulevard	Neighborhood Collector Street	Transit Access Street	City Walkway	City Bikeway	Major Truck Street
NE Elrod Road	Local Service Street	Local Service Street	Local Service Walkway	Local Service Bikeway	Freight District Street
NE Holman Street	Neighborhood Collector Street	Community Transit Street	City Walkway	Local Service Bikeway	Freight District Street
NE Marine Drive	Neighborhood Collector Street	Local Service Street	Off-Street Path	City Bikeway	Freight District Street
NE Marx Street	Neighborhood Collector Street	Local Service Street	Local Service Walkway	Local Service Bikeway	Freight District Street
NE Mt. Hood Avenue	District Collector Street	Local Service Street	City Walkway	City Bikeway	Freight District Street

Table 4-1 *(continued)*
PRIMARY REGIONAL TRANSPORTATION STUDY AREA STREET CLASSIFICATIONS

Roadway	Traffic	Transit	Pedestrian	Bicycle	Truck
NE Mt. St. Helens Avenue	Neighborhood Collector Street	Local Service Street	City Walkway	City Bikeway	Freight District Street
NE Sunderland Avenue	Local Service Street	Community Transit Street	Local Service Walkway	Local Service Bikeway	Freight District Street
NE 33rd Drive	Neighborhood Collector Street	Community Transit Street	City Walkway	City Bikeway	Freight District Street
NE 42nd Avenue	Local Service Street	Local Service Street	Local Service Walkway	Local Service Bikeway	Freight District Street
NE 47th Avenue	Neighborhood Collector Street	Community Transit Street	City Walkway	City Bikeway	Priority Truck Street
NE 82nd Avenue	Major City Traffic Street	Major City Transit Street	City Walkway	City Bikeway	Priority Truck Street
NE 92nd Drive	Local Service Street	Local Service Street	City Walkway	Local Service Bikeway	Freight District Street
NE 105th Avenue	Neighborhood Collector Street	Community Transit Street	City Walkway	Local Service Bikeway	Freight District Street
NE 122nd Avenue	District Collector Street	Community Transit Street	City Walkway	City Bikeway	Priority Truck Street
I-205	Regional Traffic-Way	Regional Transit-Way	Off-Street Path	Off-Street Path	Regional Truckway

Source: City of Portland, *Transportation System Plan*.

4.1 Automobile-oriented Travel

Automobile-oriented travel, whether for passenger or freight movement, is the most common mode of transportation in the area and is anticipated to be the primary mode of transportation in the future. Two interstate highways provide major regional accessibility to Portland International Airport. I-205 and I-84 are critical links in passenger and cargo movements. Additionally, I-5 and U.S. Highway 26, State Route 14, and I-405 provide connectivity to the connector streets and major arterials throughout the region. Within the City of Portland, NE Columbia Boulevard, NE Lombard Street, NE Sandy Boulevard, NE Marine Drive, NE Killingsworth Street, NE Airport Way, NE Cully Boulevard, NE 82nd Avenue, and NE 122nd Avenue are main arterial links for users of the Airport.

Other significant collector streets carry less traffic, but provide for additional traffic circulation throughout the study area. In the southeast area of the Airport, these collector streets include NE Alderwood Road, NE Cascades Parkway, NE 105th Avenue, and NE Holman Street. In this area both Alderwood Road and Cascades Parkway are built to full City standards, including pedestrian facilities and sidewalks. Both Holman Street and 105th Avenue were generally constructed to accommodate motor vehicles and have little or no bicycle or pedestrian facilities.

South of the Airport, the collector system includes NE Cornfoot Drive, NE 47th Avenue, and NE Alderwood Road. In general, these collector streets are constructed as two-lane roadways without curbs, sidewalks, or provisions for pedestrian or bicycle facilities. These streets serve a composite of immediately adjacent industrial, commercial, and residential land uses. NE Columbia Boulevard provides the major east/west linkage between Rivergate Industrial Park (west) and I-205 (east). West of the Airport, the area is served by NE 33rd Avenue, which connects the major arterials on the south side of the Airport (Columbia Boulevard and Lombard Street) with Marine Drive to the north.

4.2 Roadway Performance

Three major factors contribute to frequent congestion in the study area during morning and evening travel times. The Airport itself contributes a substantial amount of traffic in the area. In addition, development of retail, industrial, and office uses along the Airport Way corridor (both east and west of I-205) contributes to congestion. Finally, regional commuting from Clark County residents accessing and exiting I-205 is a significant factor.

Currently, both I-205 and I-84 experience congestion. Ramp metering was implemented to reduce congestion on these interstates; however, it has resulted in increasing queuing on the interstate on-ramps and congestion on the supporting City streets. The volume of traffic, weaving movements between lanes and to/from ramps, and the interchange spacing on these freeways have increased the frequency of traffic incidents. The time needed to recover from an individual traffic incident has also

increased, resulting in increased travel time, especially during commute periods for Clark County residents.

As the regional daily peak travel periods increase, passenger and cargo access to the Airport will be increasingly affected.

4.3 Existing Traffic Conditions

Traditionally, the City anticipates two daily periods of congestion: the morning peak, which occurs between 6:30 a.m. and 8:30 a.m., and the evening peak, which occurs between 4:30 p.m. and 6:30 p.m. During these peaks within the primary study area, congestion may occur on I-205, NE Columbia Boulevard, and NE Airport Way in the vicinity of I-205 (p.m. peak).

Generally, the numbers of weekday passenger trips to and from the Airport peak between 11 a.m. and 2 p.m. One significant exception is between 5 a.m. and 6 a.m., when a large number of departing passengers arrive prior to the general morning period of congestion. The nearly daily congestion on the I-5 and I-205 bridges is the result of:

- Regional employment and residential imbalance
- Time zone differences between PDX and the central and eastern United States (results in early morning departures by eastbound travelers)
- Limited alternative travel routes between Vancouver, Washington and Portland
- Limited alternative travel modes between Vancouver and Portland

The Columbia Corridor has a significant concentration of Portland's industrial jobs. A high proportion of employees in the area commute daily to/from Clark County, Washington. The normal daytime shift ends at 3 p.m. and the volumes of traffic on both interstate bridges increase. Toward the end of this evening commute, the regular City commute begins.

Please see Section 5.3 of this document for a more complete presentation of existing ground transportation conditions.

4.4 Intersections

Because the intersections of streets are often the location of bottlenecks within the transportation system, significant intersections along the study area roadways were selected for operational analysis and evaluation. These include the 25 intersections shown in Table 4-2.

Table 4-2

INTERSECTIIONS SELECTED FOR EVALUATION

I-205/NE Airport Way Southbound (SB) off	I-205/NE Airport Way NB on
I-205/NE Killingsworth Street SB	I-205/NE Killingsworth Street NB on
NE Airport Way/NE 82nd Avenue	NE Airport Way/NE Mt. Hood Avenue Eastbound (EB)
NE Airport Way/NE Holman Street	NE Airport Way/NE 122nd Avenue
NE Alderwood Road/NE Cascades Parkway	NE Alderwood Road/NE 82nd Avenue
NE Alderwood Road/NE Cornfoot Road	NE Alderwood Road/NE Holman
NE Columbia Boulevard/NE Alderwood Road	NE Columbia Boulevard/47th Avenue
NE Columbia Boulevard/NE 82nd Avenue SB	NE Columbia Boulevard/NE 82nd Avenue NB
NE Columbia Boulevard/NE Columbia Parkway	NE Killingsworth Street/NE 82nd Avenue
NE Killingsworth Street/NE 82nd Avenue Northbound (NB)	NE Killingsworth Street/NE Columbia
NE Killingsworth Street/NE Columbia Boulevard/ 89th Avenue	NE Sandy Boulevard/NE 102nd Avenue
NE Sandy Boulevard/NE 105th Avenue	NE Sandy Boulevard/NE 112th Avenue
NE Sandy Boulevard/NE 121st Place	

4.5 Transit

The region's light rail (LRT) system (MAX) connects the Airport with the City center. Within the primary regional transportation study area, MAX stops at the Parkrose/Summer Transit Center, Cascade Station, Mt. Hood Station, and the Airport Terminal. This transit service is provided daily, between 5 a.m. and midnight with trains operating every 15 minutes.

Approximately 6% of Airport passengers use public transit to and from the Airport terminal. It is unknown what percentage of PDX employees use public transit, but it is known that approximately 20% of all riders that use the Airport MAX station are Airport employees.

Bus service is available throughout the study area via five bus routes. Scheduled bus service operates on NE Columbia Boulevard, NE Sandy Boulevard, NE Lombard Street, NE Killingsworth Street, NE Airport Way, NE Cully Boulevard, NE 82nd Avenue, and NE 122nd Avenue. There is no direct transit service from Clark County to the Airport. C-Tran provides regional peak hour service to the Parkrose/Center Transit Center,

where connections can be made to the light rail system. Key gaps in the system related to transit accessibility exist at:

- NE 82nd Avenue (south of NE Alderwood Road) - Route 86; no sidewalks or bike lanes are available.
- NE Alderwood Road (west of NE 82nd Avenue) - Route 86: limited sidewalk is available at the north end, and no bike lanes are available.
- NE 105th Avenue/NE Holman Street - Route 87: limited segments of sidewalk are available and shoulder widths vary, but are generally narrow.

4.6 Bicycle and Pedestrian Transport

Facilities provided for walking and biking within the study area include sidewalks, bike lanes, and multi-use paths.

The City's Bikeway network serves Portland International Airport with bike lanes on NE 33rd Avenue, NE Lombard Street, NE Alderwood Road, NE Cascades Parkway, and NE 82nd Avenue (within Port of Portland property). East of the multi-use trail constructed along I-205, bike lanes have been constructed on NE Airport Way and NE 122nd Avenue. Two major multi-use paths have also been constructed at the Airport, one that connects to the passenger terminal and another that connects to the Marine Drive Trail. The Airport also has bike boulevards on low-volume service roadways with connections to the region's multi-use trail, the 40-mile Loop Trail system.

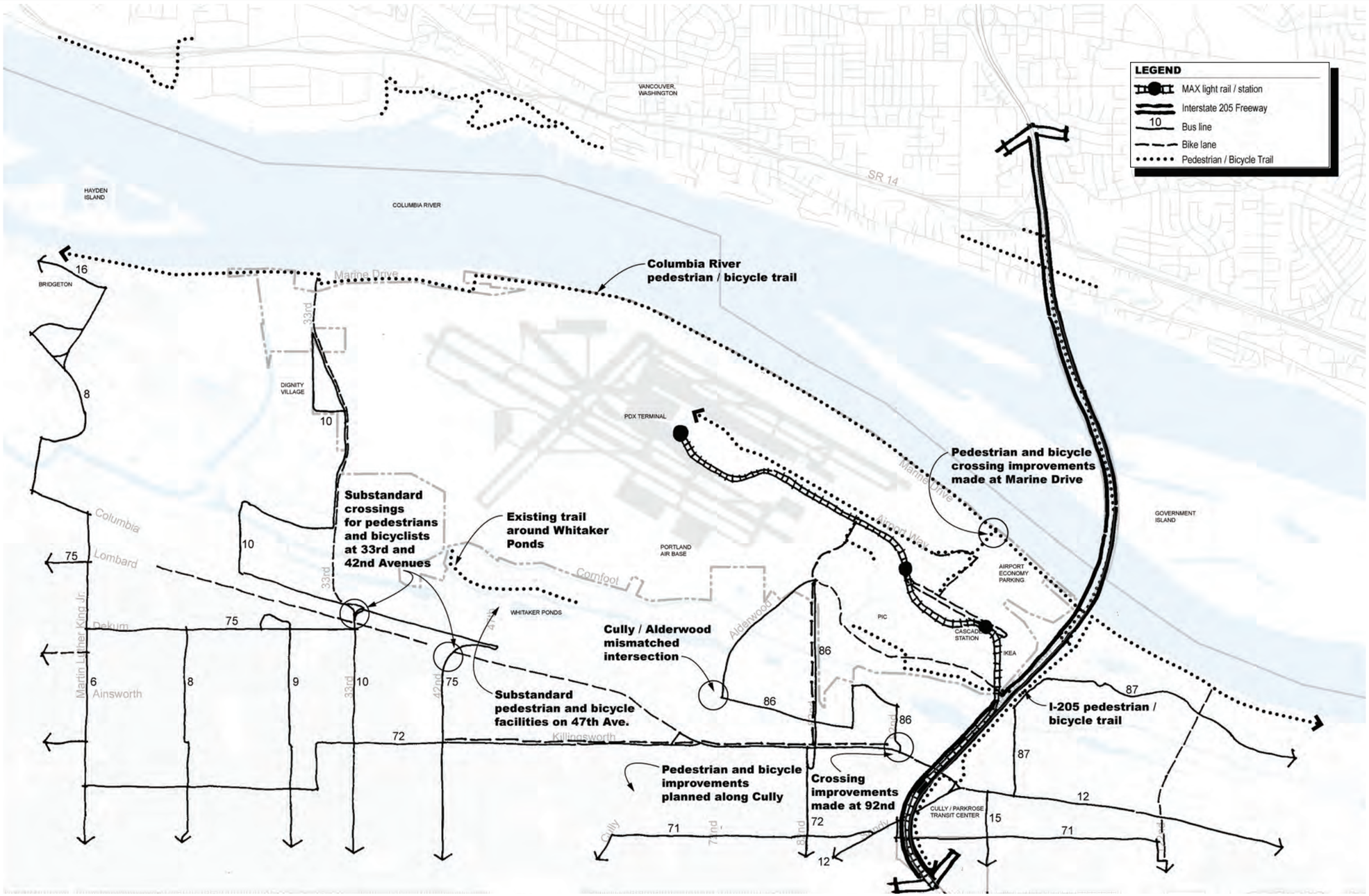
Pedestrian sidewalks have been constructed throughout the Portland International Center (NE Cascades Parkway and NE Alderwood Road) and as part of the Airport terminal. Additionally, sidewalks have been constructed on NE 82nd Avenue, on the service road north of NE Airport Way, and on NE Airport Way east of I-205. Due to the expressway design of Airport Way (high speed, limited access, free flow interchanges), the PDX Bicycle and Pedestrian Plan calls for placing bike and pedestrian facilities on parallel routes.

Gaps in the existing system include:

- NE 82nd Avenue (south of NE Alderwood Road): no sidewalks or bike lanes are available.
- NE Alderwood Road (west of NE 82nd Avenue): limited sidewalks are available at the north end; no bike lanes are available.
- NE 105th Avenue/NE Holman Street: limited segments of sidewalk are available and shoulder widths vary, but are generally narrow.
- NE Airport Way (NE Holman Street to I-205): no sidewalks are available on the north side.

For this inventory, the "bike lane" category included shoulders that were specifically designed for bicycle use through pavement markings, as well as other paved shoulders at least 5-feet in width that could be used for bicycle travel. However, shoulders on high-speed, limited access roadways were not assumed to be suitable for bicycle use.

The transportation facilities in and around the Airport are shown on Figure 4-1.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Figure 4-1

Regional Transportation System

Master Plan Update
Portland International Airport

Source: City of Portland, Bureau of Planning

September 2008

5. AIRPORT MASTER PLAN STUDY AREA

The Airport Master Plan study area, shown on Figure 5-1, is defined to include all Port-owned property associated with PDX, as well as any additional property related to the centralized and decentralized alternatives presented in the 2000 Master Plan, as follows:

- Port-owned properties associated with PDX
- Areas within a 300-foot buffer from the secured Airport perimeter fence
- Areas within the runway protection zones (RPZs, trapezoidal areas off the ends of the runways that are mandated to be free of obstructions and land uses incompatible with aircraft operations).

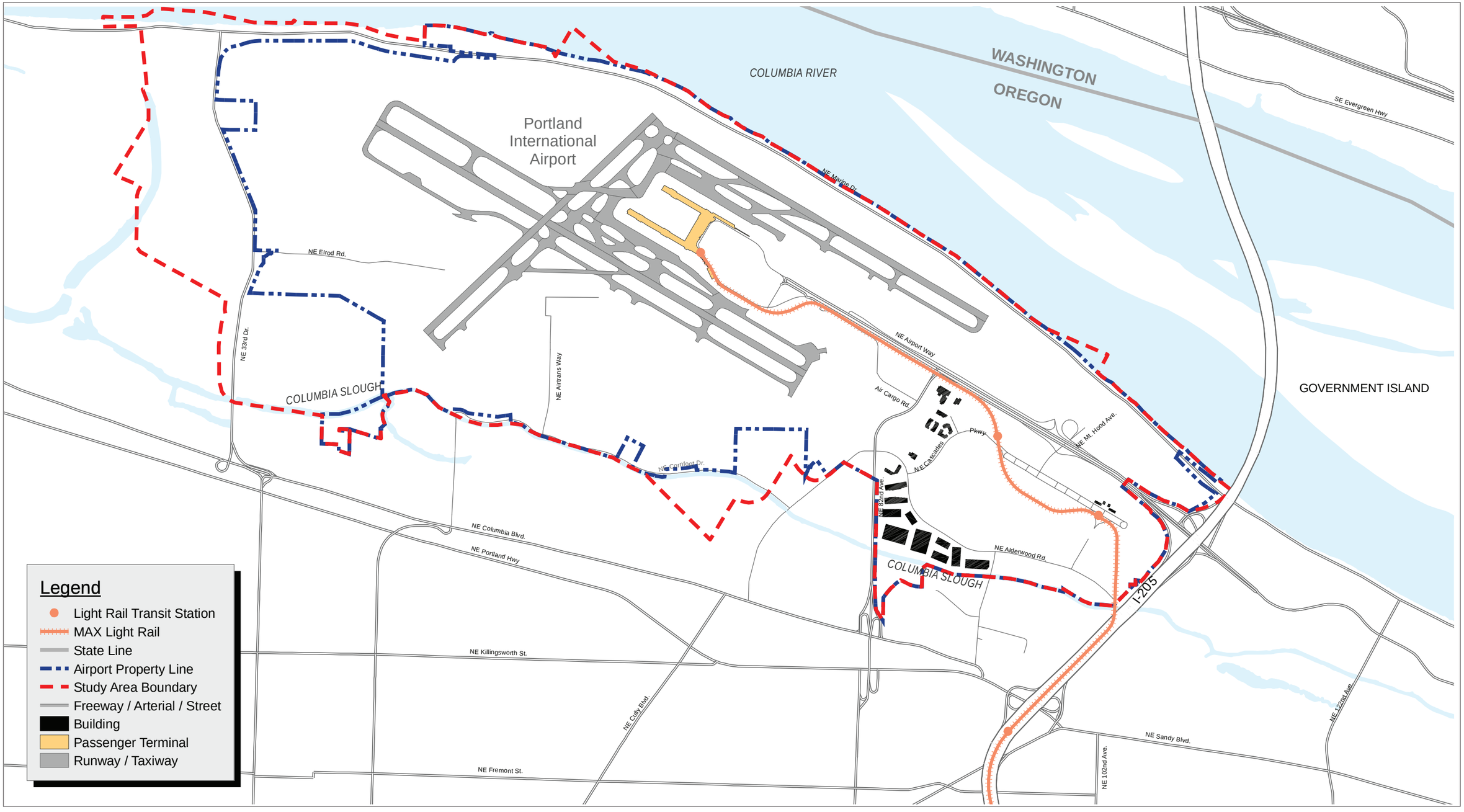
Consistent with the Master Plan focus on land uses, the Airport Master Plan study area is divided into 11 on-Airport (land within the Airport's property boundary) land use categories, as shown on Figure 5-2 and listed below.

- Airfield
- Passenger terminal
- Ground transportation/parking
- Air cargo
- General aviation
- Military
- Airport/airline support
- Commercial/industrial
- Strategic reserve
- Natural resources
- Mitigation site

The facilities within each of these land use categories are shown on Figures 5-3 and 5-4. The land use categories, facilities, and the Airport's airspace are described in the following sections.

5.1 Airfield

The airfield facilities and conditions that support, or affect, aircraft operations at the Airport, including the runways, runway use configurations, taxiways, aircraft ramps and parking, pavement use and management, surveillance equipment and navigational aids, wind coverage and weather, airspace, and noise management procedures, are described below. Existing airfield facilities are shown on Figures 5-3 and 5-4.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 2,100'
Scale: 1" = 2,100'

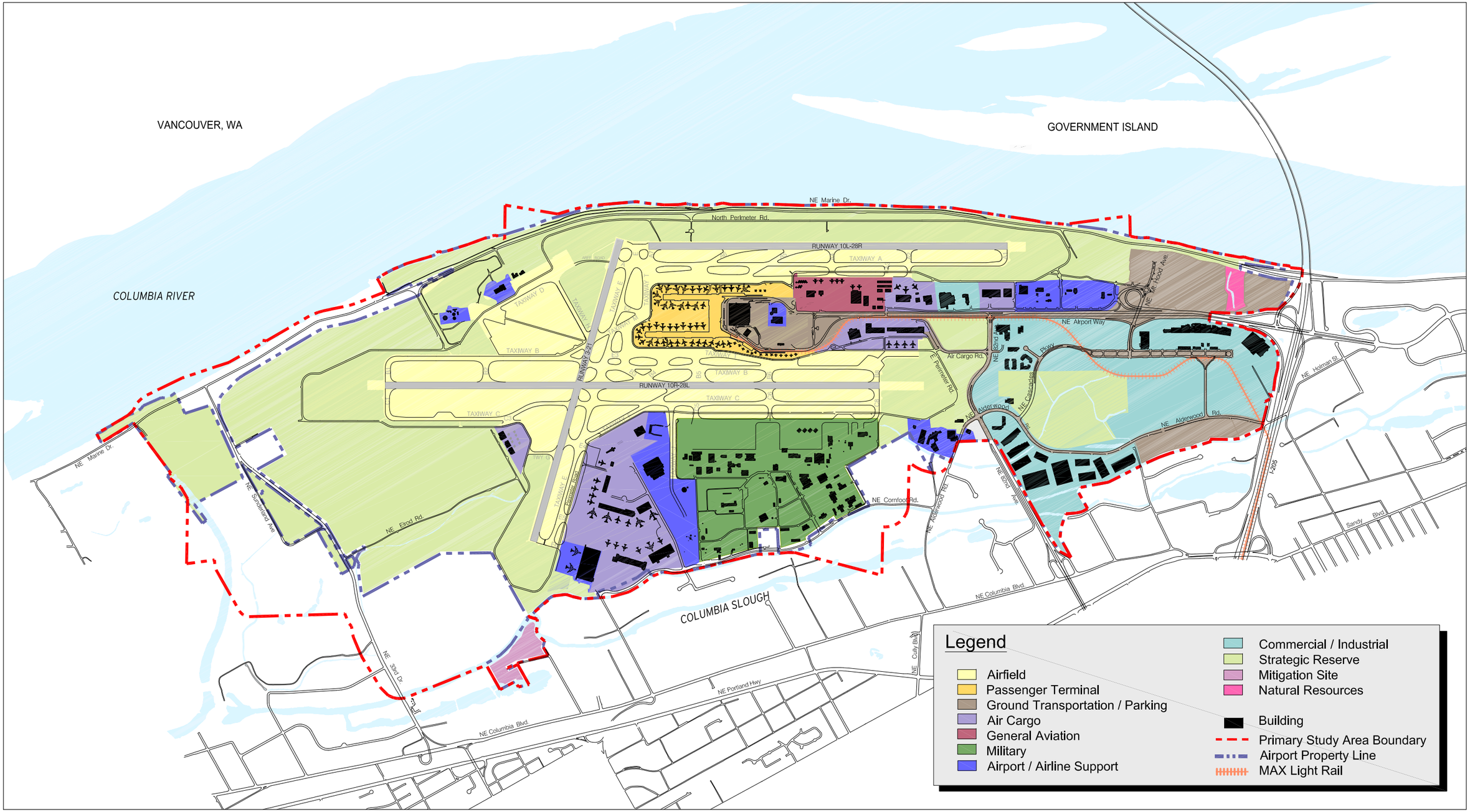
Figure 5-1

Airport Master Plan Study Area

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008



AIRPORT FUTURES
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0' 2,100'
Scale: 1" = 2,100'

Figure 5-2

Airport Land Uses

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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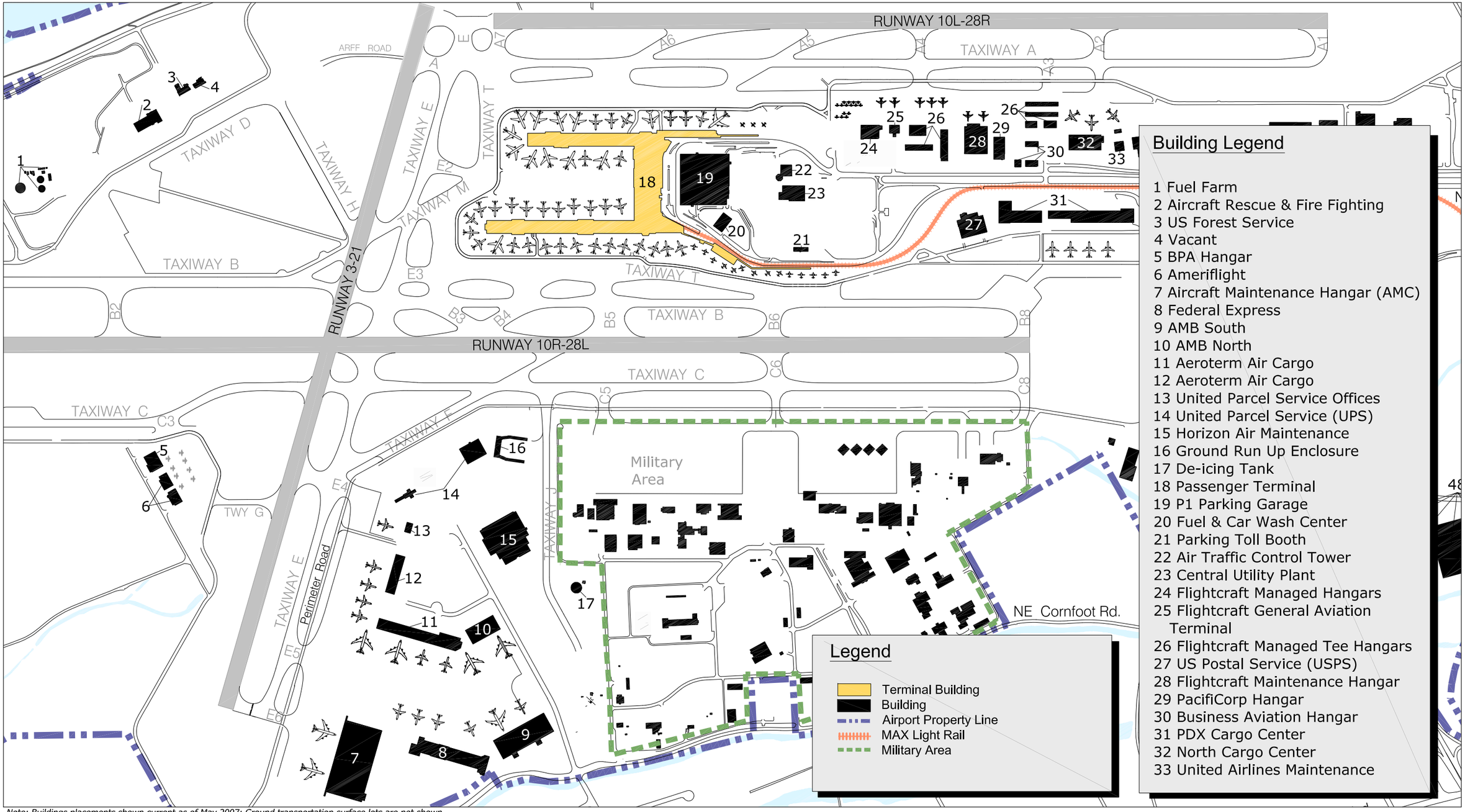


Note: Buildings placements shown current as of May 2007; Ground transportation surface lots are not shown

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

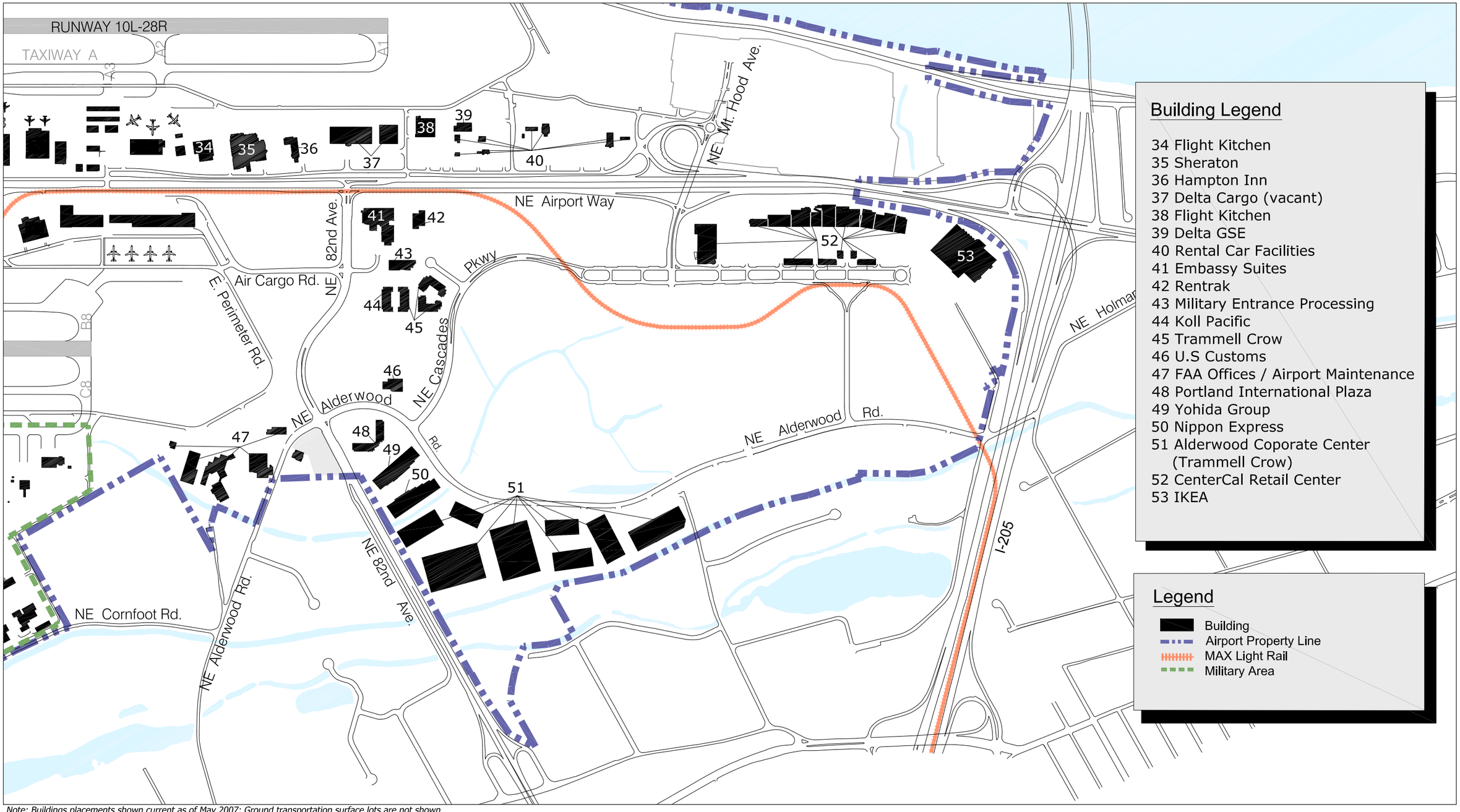
Source: Port of Portland Staff

Figure 5-3

Airport Facilities - West

Master Plan Update
Portland International Airport

September 2008



Note: Buildings placements shown current as of May 2007; Ground transportation surface lots are not shown

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 900'
Scale: 1" = 900'

Figure 5-4

Airport Facilities - East

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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5.1.1 Runways

The length, width, and pavement strength of a runway together determine the type of aircraft that the runway can serve. Runways are designed to FAA criteria relating to the physical dimensions and strength of runway pavement, lighting and navigational aids, and safety clearances. The safety clearances for runways, both on the ground and in the air, are primary influencing factors in the configuration of an airport.

Portland International Airport has two parallel runways and one crosswind runway capable of accommodating air carrier aircraft operations. The two parallel runways, Runways 10R-28L and 10L-28R, are oriented southeast-northwest and are 11,000 feet and 8,000 feet long, respectively. The parallel runways are separated by 3,100 feet, and are located north and south, respectively, of the passenger terminal. All heavily loaded widebody aircraft use the south runway (10R-28L). The crosswind runway, Runway 3-21, is oriented northeast-southwest, and is 7,000 feet long. The crosswind runway is located west of the passenger terminal, and intersects the south runway. The crosswind runway primarily serves general aviation and turboprop aircraft when crosswinds dictate or when requested for pilot convenience. All three runways are 150 feet wide. The two parallel runways meet Airplane Design Group (ADG) V standards. Runway 3-21 meets ADG III standards. Each runway is equipped with various navigational aids and lighting. See Section 5.1.6 for additional information on surveillance equipment and navigational aids.

The south runway is scheduled to be rehabilitated in 2011. To provide consistent airfield capability, the north runway is planned to be extended on both ends from its current length of 8,000 feet to 9,827 feet prior to south runway rehabilitation. Specifically, the north runway will be lengthened to accommodate larger and heavier aircraft, which currently use the south runway. These aircraft require more runway length on departures so as not to incur substantial payload penalties or the potential loss of service.

5.1.2 Runway Use Configurations

Runways are typically aligned with prevailing local wind conditions because aircraft runway performance is optimized when aircraft land and take off into the wind. Strong winds blowing perpendicular to the direction of aircraft travel during take-off and landing ("crosswinds") are not desirable. Episodes of very strong crosswinds can result in a runway being unusable for take-off and landing.

Runway use configuration refers to the combination of runways in use at any given time. Runway use configurations change throughout the day based on wind, weather, noise abatement procedures, and the volume of aircraft operations. Currently, three runway use configurations predominate at the Airport - east flow, west flow, and crosswind flow. During east flow, aircraft move in an easterly direction, arriving and departing on

Runways 10L and 10R, with occasional use of Runways 3 and 21 by light aircraft. For noise abatement purposes, east flow is the preferred configuration when winds are calm. During west flow, aircraft move in a westerly direction, arriving and departing on Runways 28L and 28R, with occasional use of Runways 3 and 21 by light aircraft. During crosswind flow, aircraft are limited to arriving and departing on Runway 3-21.

The most recent wind data collected at the Airport were taken from the National Oceanic and Atmospheric Administration, National Climatic Data Center's Surface Airways Observations (TD-3280) data set for the 10-year period from January 1, 1995, to December 31, 2004. The results were applied in determining the runway use configurations shown on Figure 5-5. The wind coverage during east flow is 63.53%; during west flow, 32.24%; and during crosswind Flow, 4.23%.

Air traffic controllers from the Portland Airport Traffic Control Tower (ATCT) indicated that the following runway use criteria are in place for aircraft operations at the Airport:

- East flow is the preferred calm wind runway use configuration.
- The Airport transitions to crosswind flow when the crosswind component approaches or exceeds 15 knots. Gusting crosswinds and reported turbulence can result in controllers switching to crosswind flow at lower crosswind speeds.

The pilots of small, light propeller aircraft originating at or destined for the south cargo area frequently request clearance to land on Runway 3. They also request departure on Runway 21 from the Taxiway C intersection, provided that winds permit such operations.

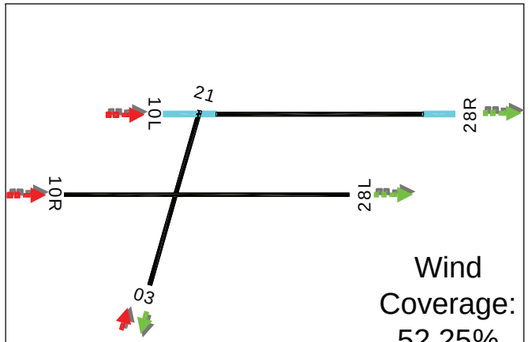
5.1.3 Taxiways

The Airport's taxiway system allows aircraft to move about the Airport between the runways and aircraft parking positions at the terminal, cargo areas, and general aviation areas. The taxiway system is illustrated on Figure 5-2 and summarized below. The taxiway system is well developed to serve the current airfield configuration and operations. It consists of three basic taxiway types: parallel, exit, and general taxiways, as defined below.

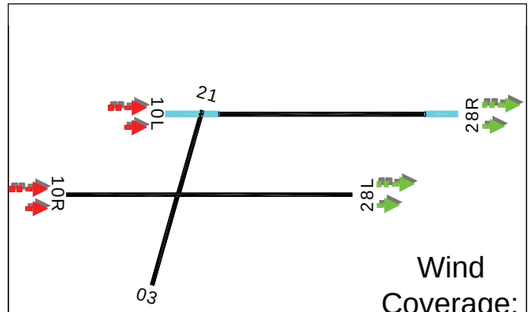
- Parallel taxiways are aligned next to runways and allow aircraft to move along the length of a runway without impeding runway operations.
- Exit taxiways are aligned between the parallel taxiways and allow aircraft to exit the runway upon landing or enter the runway to take off. The exit taxiways are summarized in Table 5-1.
- General taxiways connect the parallel taxiways to the aircraft parking areas at the terminal, cargo areas, and general aviation areas.

EAST FLOW

Wind Coverage: 63.53%



Wind Coverage: 52.25%



Wind Coverage: 11.27%

Runway 03-21 inactive due to crosswind component exceeding 15 knots

NOTES:

(1) Wind coverage was estimated using NOAA Surface Airways Hourly and Airways Solar Radiation (TD-3280) data for the period January 1, 1995 through December 31, 2004.

(2) Wind coverage was estimated using the following assumptions:

-Small prop and turboprop aircraft (aircraft with takeoff weights of less than 41,000 pounds) would cease using a particular runway orientation when the crosswind component exceeds 15 knots.

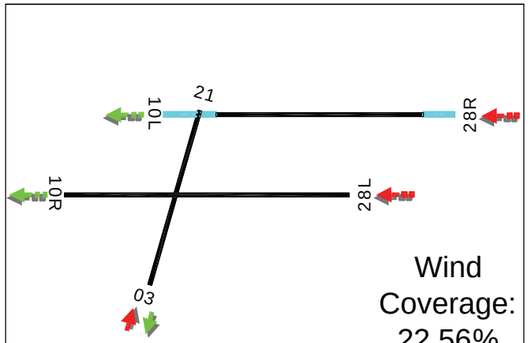
-Jet aircraft and large prop and turboprop aircraft would cease using a particular runway orientation when the crosswind component associated with the runway exceeds 20 knots.

-Runway configurations would shift when tailwind components exceed 3 knots.

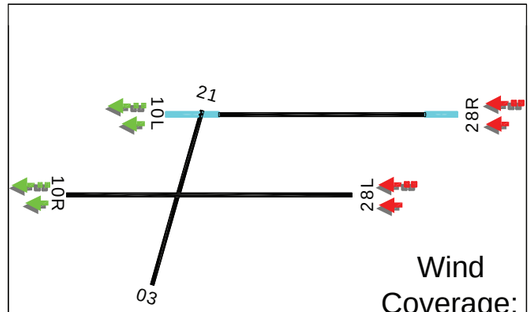
(3) Flow configurations were prioritized based on discussions with Portland TRACON and ATCT staff, existing noise abatement procedures, and wind patterns.

WEST FLOW

Wind Coverage: 32.24%



Wind Coverage: 22.56%



Wind Coverage: 9.68%

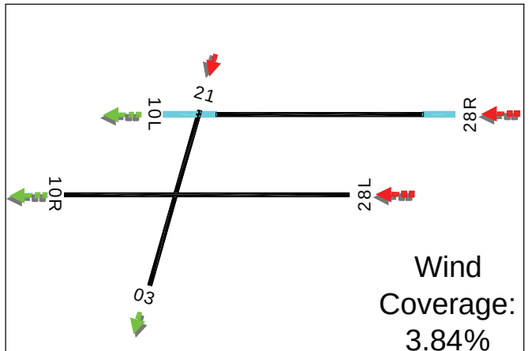
Runway 03-21 inactive due to crosswind component exceeding 15 knots

CROSSWIND FLOW

Wind Coverage: 4.23%

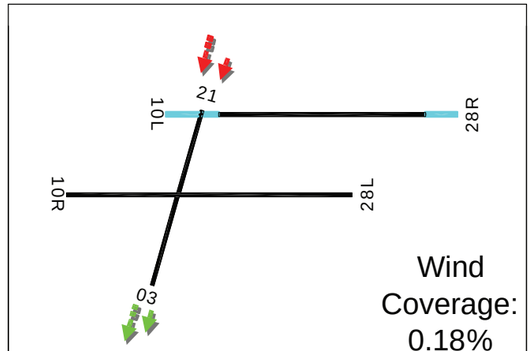
LEGEND

- Proposed runway extension
- Departures, small prop and turboprop aircraft
- Departures, jet aircraft and large prop and turboprop aircraft
- Arrivals, small prop and turboprop aircraft
- Arrivals, jet aircraft and large prop and turboprop aircraft



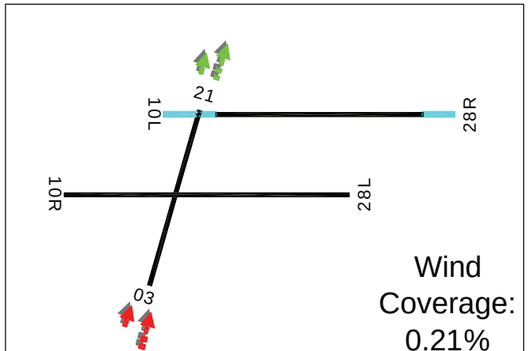
Wind Coverage: 3.84%

Continued jet use of Runways 28L and 28R due to parallel runway crosswind component of less than 20 knots



Wind Coverage: 0.18%

Parallel runways inactive due to crosswind component exceeding 20 knots



Wind Coverage: 0.21%

Parallel runways inactive due to crosswind component exceeding 20 knots

AIRPORT FUTURES
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Figure 5-5

Runway Use Configurations

Master Plan Update
Portland International Airport

Source: Jacobs Consultancy, Runway 10L-28R Extension Feasibility Study Portland International Airport , December 2005

September 2008

Table 5-1

EXIT TAXIWAY SUMMARY

Exit Taxiway	Location	Width (feet)	Exit Type
A1	East end of Runway 10L-28R	115	90-degree
A2	2,190 feet from Runway 28R threshold	90	90-degree
A4	3,900 feet from Runway 28R threshold	75	90-degree
A5	4,650 feet from Runway 28R threshold	90	30-degree
A6	6,000 feet from Runway 28R threshold	90	30-degree
A7	7,910 feet from Runway 28R threshold	110	90-degree
B1/C1	10,940 feet from Runway 28L threshold	110/90	90-degree
B2	8,760 feet from Runway 28L threshold	75	90-degree
B3	5,440 feet from Runway 28L threshold	130	30-degree
B4	5,120 feet from Runway 28L threshold	130	30-degree
B5	4,080 feet from Runway 28L threshold	290	90-degree
B6/C6	2,430 feet from Runway 28L threshold	125/70	90-degree
B8/C8	East end of Runway 10R-28L	90	90-degree
--	North end of Runway 3-21	130	90-degree
E4	4,650 feet from Runway 21 threshold	90	90-degree
E6	6,960 feet from Runway 21 threshold	90	90-degree

Source: Federal Aviation Administration, *2007 PDX Airport Master Record.*

Taxiway A is a full-length parallel taxiway for Runway 10L-28R on the north side of the airfield. The taxiway extends along the south side of the runway, and is connected to the runway by several exit taxiways. In addition to serving aircraft arriving and departing on Runway 10L-28R, Taxiway A also provides access to aviation uses in the northeast area of the Airport, including a fixed base operator (FBO), several independent aircraft hangars, and air cargo facilities. Taxiway A is 75 feet wide, and the centerline is 400 feet from the runway centerline consistent with ADG V standards.

Taxiway B is located on the north side of south Runway 10R-28L, and is one of two parallel taxiways serving that runway. The runway centerline to taxiway centerline separation is 600 feet for the segment of the taxiway west of Runway 3-21, and in this location, the taxiway is 100 feet wide. East of Runway 3-21, the separation narrows to 400 feet and the taxiway is 75 feet wide.

Taxiway C, the second parallel taxiway serving Runway 10R-28L, is 75 feet wide and located on the south side of the south runway. The runway centerline to taxiway centerline separation is 750 feet for a segment of the taxiway west of Runway 3-21.

This separation provides clearance of the Runway 10R glideslope antenna (see Section 5.1.6). The separation narrows to 400 feet immediately west of Runway 3-21, as well as immediately east of Runway 3-21.

Taxiway D is located along the edge of the northwest ramp.

Taxiway E is the parallel taxiway to Runway 3-21. The taxiway is 75 feet wide and located on the east side of the runway. The runway centerline to taxiway centerline separation is 400 feet.

Taxiway G provides access from the southwest ramp to Runway 3-21.

Taxiway H provides access from the northwest ramp to Runway 3-21.

Taxiway J provides access to areas near NE AirTrans Way, including the ground run-up enclosure (GRE) and the Horizon Air Maintenance Facility.

Taxiway M connects Taxiway B to the terminal area apron.

Taxiway T is an apron-edge taxiway around the perimeter of the terminal area apron ramp. Portions of this taxiway are used by all aircraft destined for or departing from the passenger terminal. The perimeter taxiway system allows Taxiway T to be used for aircraft to maneuver into or out of terminal gates while transiting aircraft can bypass the terminal via parallel Taxiways A, B, and E.

Taxiway T on the south side of the terminal ends just east of the terminal facilities. The 2000 Airport Master Plan identified the realignment of Taxiway T to run parallel to Taxiway B for the full length of Taxiway B as a long-term future improvement. The realignment of Taxiway T is to coincide with a long-term future eastward extension of Concourse B. The 2000 Airport Master Plan also recommended a new crossfield taxiway to provide a north-south airfield connection east of the terminal facilities. Currently, all traffic moving between the north and south sides of the airfield must use Taxiway T and/or Taxiway E west of the terminal. This situation can result in congestion and aircraft delays, which will become more pronounced as activity at the Airport increases.

5.1.4 Aircraft Ramps and Parking

Aircraft Ramps

Ramps, or apron areas, are paved portions of the airfield where non-military aircraft stop for loading or unloading of passengers and/or cargo, maintenance, and short- and long- term storage. Ramp areas may also be used to store aircraft servicing equipment and vehicles. Ramp areas are nonmovement areas, meaning that they do not have to be free of obstructions at all times and design criteria and safety area specifications are

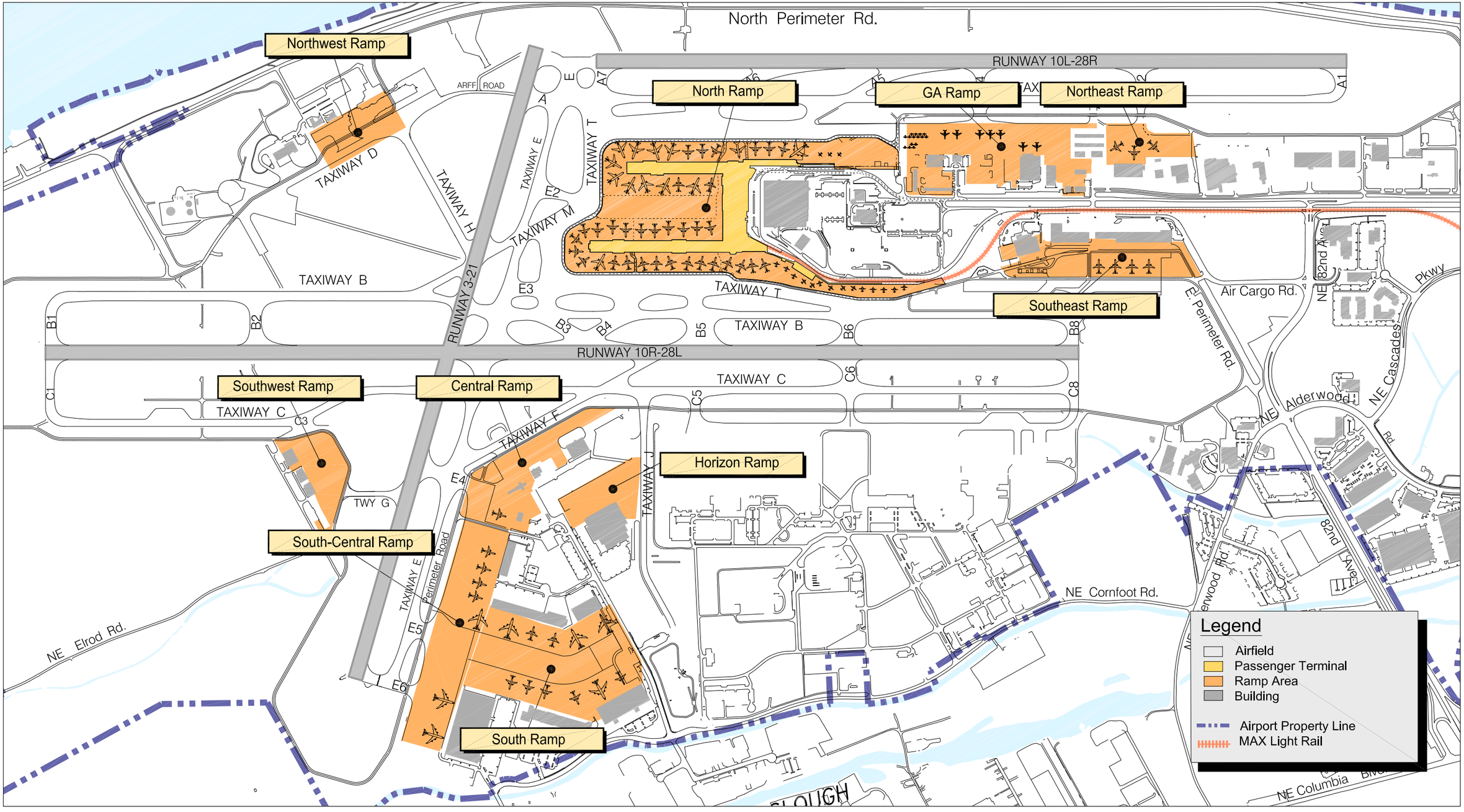
limited. For the purposes of this Inventory, ramp refers to non-military ramps. All ramp areas are illustrated on Figure 5-6.

The north ramp encompasses the entire airside perimeter of the passenger terminal and concourses and provides 68 marked aircraft parking positions, 67 of which are used for the loading and unloading of passengers, and 1 of which is used only for overnight aircraft parking. Of the 67 marked positions used for loading and unloading passengers, 46 are served by loading bridges, which allow passengers and employees to walk between the terminal and the aircraft in an enclosed, elevated corridor. The 46 parking positions served by loading bridges accommodate a variety of aircraft types. All of these parking positions accommodate narrowbody, single-aisle aircraft, such as the B-737, A320, and MD-80, and approximately 29 of the 46 positions can be used for B-757 aircraft, the largest of the narrowbody aircraft. Twelve parking positions can be used for widebody, dual-aisle aircraft, which include the B-767. One position is capable of handling ADG V aircraft, such as the A340, B-777, and B-747. The loading bridges at six parking positions (D10 through D15) are connected to the Federal Inspection Services facilities and are referred to as international gates.

The remaining 21 marked aircraft parking positions used for loading and unloading passengers are ground loaded (i.e., they do not have loading bridges). The ground-loaded parking positions are used only by regional aircraft, consisting of turboprops and small jets (approximately 70 seats and smaller). All larger commercial passenger aircraft use loading bridge gates. Figure 5-7 illustrates the aircraft types with the largest wingspans that can be accommodated at each parking position (i.e., gate).

Other ramp areas include the GA Ramp, Northeast Ramp, Southeast Ramp, Northwest Ramp, Southwest Ramp, Central Ramp, South-Central Ramp, South Ramp and Horizon Air Ramp. The GA Ramp is the general aviation ramp, located north of NE Airport Way and east of the passenger terminal building. The Northeast Ramp, Southeast Ramp, Southwest Ramp, Central Ramp, South-Central Ramp, and South Ramp are the cargo ramps. These ramps may also be used for aircraft maintenance. The Northwest Ramp is located northwest of the passenger terminal building and is used for aircraft maintenance.

Cargo ramps are discussed in Section 5.4.2. Cargo ramps are generally also used for airport/airline support, maintenance, and storage purposes. General aviation ramps are discussed in Section 5.5.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

Figure 5-6

Ramp Areas

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

J:\43791-PDX-MP\CADD\Exhibits_080714\ Apt_Apron_Spaces_v6_081908.dwg Sep 22, 2008 - 3:39pm

Legend:

B 747-400

B 757-300

DH 8 400

B 757-200

DH 8 100

B 767-400

B 737-700

B 767-300

Gate	Lease Charter
A1	Horizon
A2	Horizon
A3	Horizon
A4	Horizon
A5	Horizon
A6	Horizon
A7	Horizon
A8	Horizon
A9	Horizon
A10	Horizon / Big Sky
A11	Horizon
A12	Horizon / Big Sky
A13	Horizon
A14	Horizon

Gate	Lease Charter
B1	Horizon
B2	Alaska
B3	Alaska

Gate	Lease Charter
C1	Alaska
C2	Alaska
C3	Alaska
C4	Alaska
C5	Alaska
C6	Port
C7	Alaska
C8	Frontier
C9	American
C10	Alaska
C11	American
C12	Port
C13	Southwest
C14	Southwest
C15	Southwest
C16	Southwest
C17	Port
C18	Port
C19	Port
C20	Port
C21	Port
C22	Port
C23	Port

Gate	Lease Charter
D1	Continental
D2	Port
D3	US Airways
D4	Vacant
D5	Delta
D6	Northwest
D7	Delta
D8	Northwest
D9	Delta
D10	Lufthansa
D11	Port
D12	Port
D13	Port
D14	Port
D15	Northwest

Gate	Lease Charter
E1	United
E2	United
E3	United
E4	United
E5	Port
E6	Skywest
E7	Skywest
E8	Skywest
E9	Skywest
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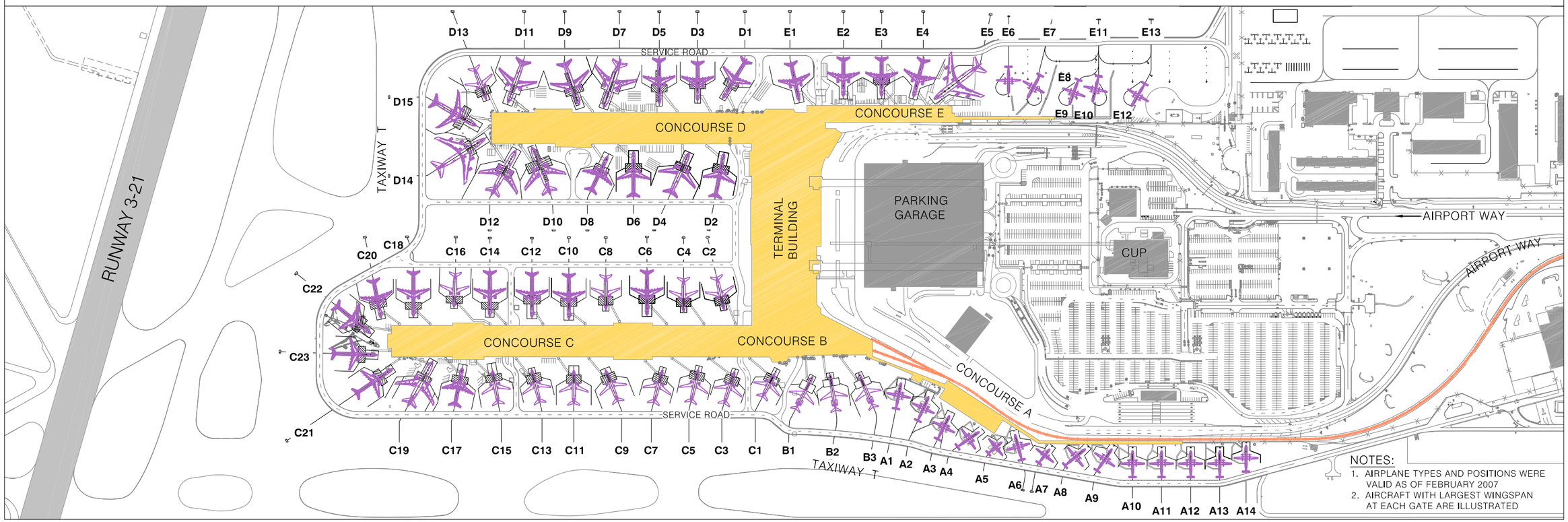
E12	Skywest
E13	Skywest



NOTES:
1. AIRPLANE TYPES AND POSITIONS WERE VALID AS OF FEBRUARY 2007
2. AIRCRAFT WITH LARGEST WINGSPAN AT EACH GATE ARE ILLUSTRATED

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Figure 5-7

Gate Locations and Aircraft Parking

Master Plan Update
Portland International Airport

September 2008

Remain Overnight Aircraft Parking

Overnight aircraft parking, which occurs after the last flight of the day has been unloaded, is known as remain overnight (RON) parking. Because of the time zone differential across the country, a large number of national flights terminate on the West Coast. Ideally, RON parking is provided at the terminal gates, where aircraft can be efficiently prepared, boarded, and released for the first flight of the day. However, demand for RON parking at many airports exceeds the number of available aircraft parking positions at the terminal. When this occurs, surplus ramp areas must be used to park aircraft overnight.

Demand for RON parking at PDX typically exceeds the available terminal gate positions. The Northeast Ramp serves as the main supplemental RON parking location. The Southeast Ramp is also used for supplemental RON parking from time to time as necessitated by demand.

5.1.5 Pavement Use and Management

The Port of Portland operates an extensive Pavement Management Program to manage the continuous improvement and maintenance of approximately 800 acres of pavement at the Airport. This program includes monitoring pavement conditions, forecasting and scheduling pavement projects to optimize life cycles, and minimizing maintenance costs. The Pavement Management Program incorporates a combination of historical construction and performance data, visual surveys, and computer analyses to provide pavement condition information and identify pavement maintenance needs. The FAA mandates that all airports receiving federal funds implement an airfield pavement management program.

Projects to address maintenance needs are prioritized by location and use, as well as by the potential for foreign object debris on pavements used by aircraft. Foreign object debris, in the form of loose rocks or pieces of pavement, can be produced when pavements deteriorate or are damaged. Such debris can be sucked into a jet engine, causing significant damage to the aircraft. The focus on maintaining sound pavements, particularly in aircraft operating areas, is based in substantial part on preventing foreign object debris. Pavement management projects may consist of reconstruction, rehabilitation, partial rehabilitation, slurry seal, and fog seal applications. Other maintenance activities include vegetation control, sweeping, patching, crack sealing, and pavement marking.

Visual surveys of the pavement condition at the Airport are conducted on a regular basis, in accordance with FAA requirements. Pavements are rated using a standard Pavement Condition Index (PCI) with a scale of 0 to 100 (failed to excellent). The most recent survey, conducted in 2005, indicated that approximately 60% of pavement surfaces were rated 86-100 (excellent), 21% were rated 71-85 (very good), 9% were

rated 56-70 (good), 5% were rated 41-55 (fair), 4.5% were rated 26-40 (poor), and 0.5% were rated 0-25 (very poor to failed). The surfaces that were rated very poor to failed are generally not in use. For those pavement areas regarded as major airside assets, consisting of runways, taxiways, and terminal area ramp, conditions observed during the 2005 survey are summarized below.

The Runway 10R-28L pavement had an overall PCI rating of 83. As a result of the projected natural deterioration of the pavement and the need to reconstruct several joints in the underlying runway foundation materials, the runway pavement is scheduled for rehabilitation in 2011. As noted previously, Runway 10R-28L has two parallel taxiways, Taxiways B and C. The west and east sections of Taxiway B were reconstructed in 2004 and 2005, respectively, and had a PCI rating of 100; the remaining section of the taxiway, in the vicinity of exit Taxiway B5, is scheduled for rehabilitation in 2008. Taxiway C was last rehabilitated in 2002 and 2003 and had an average PCI rating of 99.

The Runway 10L-28R pavement was last rehabilitated in 1994, and had an average 2005 PCI rating of 88. The runway is scheduled for rehabilitation in 2009 and 2010. Taxiway A, which is the parallel taxiway for Runway 10L-28R, was last rehabilitated in 2000 and had a PCI rating of 93.

The Runway 3-21 pavement was rehabilitated in various sections between 1998 and 2001. The 2005 average PCI rating was 94. The runway is scheduled for rehabilitation in 2012. Taxiway E, which is the parallel taxiway for Runway 3-21, was last rehabilitated between 1998 and 2003, and had a 2005 average PCI rating of 95. Portions of the taxiway are projected to need rehabilitation in 2013.

All runway pavements at the Airport are constructed of asphalt concrete. The majority of taxiway pavements are also asphalt concrete, with the exception of portions of Taxiway B and Taxiway T pavements that have been reconstructed with Portland cement concrete.

5.1.6 Surveillance Equipment and Navigational Aids

The Airport is equipped with a variety of electronic surveillance equipment and navigational aids that facilitate safe and efficient aircraft operations in most weather conditions. The surveillance equipment is used to monitor the locations of aircraft in the air and aircraft and other vehicles on the ground, and to provide information to air traffic controllers. Airport navigational aids generally provide information to assist pilots with course or descent guidance during landings and take-offs. The key surveillance equipment and navigational aids at the Airport are summarized along with their applicable instrument approaches in Table 5-2 and described in the following paragraphs.

Table 5-2
INSTRUMENT APPROACHES AND NAVIGATIONAL AIDS

Navigational aid	Location	Approach Procedure	Minima *(a)*
ILS	On-Airport	ILS-Runway 10L	293/RVR 2,400
ILS	On-Airport	ILS-Runway 10R	224/RVR 1,800
ILS	On-Airport	ILS-Runway 10R CAT II	124/RVR 1,200
ILS	On-Airport	ILS-Runway 10R CAT III	/RVR 600
ILS	On-Airport	ILS-Runway 28R	280/RVR 4,000
ILS	On-Airport	ILS-Runway 28L	306/RVR 2,400
Localizer	On-Airport	LOC/DME Runway 21	680/RVR 1.75 miles
Portland VOR/DME	On-Airport	VOR/DME Runway 21	680/RVR 1.75 miles
Portland VOR/DME	On-Airport	VOR Runway 28R	600/RVR 5,000
Battle Ground VORTAC	9.6 nm North	Circling	880/RVR 2.5 miles
NA *(b)*		RNAV (GPS) Runway 28L	340/RVR 2,400
NA *(b)*		RNAV (GPS) Runway 28R	720/RVR 4,000
NA *(b)*		RNAV (GPS) Runway 10L	330/RVR 2,400
NA *(b)*		RNAV (GPS) Runway 10R	390/RVR 4,000
NA *(b)*		RNAV (RNP) Runway 28L	/RVR 2,400
NA *(b)*		RNAV (RNP) Runway 28R	/RVR 2,400

DME = Distance measuring equipment
GPS = Global positioning system
ILS = Instrument landing system
LOC = Localizer
NA = Not applicable
nm = Nautical miles
RNAV = Area navigation
RNP = Required navigational precision
RVR = Runway visual range
VOR = Very high frequency omnidirectional range
VORTAC = VOR plus military tactical air navigation (TACAN) facility

(a) Approach minima are stated in terms of cloud ceiling (in feet above the ground) and horizontal visibility (expressed as RVR in feet, unless noted otherwise)
(b) This procedure uses satellite navigation technology, Special Aircraft and Aircrew Authorization Required (SAAAR).

Source: Port of Portland.

Airport Surveillance Radar

Airport surveillance radar (ASR) provides short-range coverage of airborne aircraft and is used by air traffic controllers in the FAA's Terminal Radar Approach Control (TRACON) facility to sequence, separate, and provide navigational guidance to aircraft in the terminal area environment (i.e., within an approximately 34.5-statute mile radius of the Airport). The ASR at the Airport is an ASR-9, located in the southwest quadrant of the Airport.

Airport Surface Detection Equipment

The Airport is equipped with Airport Surface Detection Equipment (ASDE) radar, which is designed specifically to detect all principal features on the surface of the Airport, including aircraft and ground vehicles. Data collected by the ASDE are routed to air traffic controllers in the ATCT. The data are used to augment visual observations of aircraft and vehicles by controllers in the ATCT during periods of good visibility, and is a primary means of controlling ground traffic on the runway/taxiway system during periods of low visibility. The system at the Airport is an ASDE-3. The ASDE antenna is located on top of the ATCT.

The ASDE is enhanced with an Airport Movement Area Safety System (AMASS), which adds safety logic to the ASDE radar display. AMASS identifies the arriving aircraft, and provides an audible and visible alarm to controllers in time for corrective action to be taken when the system predicts the potential for a runway incursion.

Very High Frequency Omnidirectional Range Collocated with Distance Measuring Equipment

The Airport is equipped with very high frequency omnidirectional range (VOR) collocated with distance measuring equipment (DME), located in the northwest quadrant of the Airport, and categorized as a low-altitude service. The VOR/DME signal provides en route navigational guidance (the VOR and DME provide bearing and distance, respectively, relative to the facility) to pilots. It is usable for a distance of 46 statute miles between altitudes of 1,000 feet to 18,000 feet above mean sea level (MSL). The PDX VOR/DME also serves as a secondary instrument approach aid for aircraft arriving on Runways 21 and 28R. The VOR/DME is owned and maintained by the Port. It is anticipated that the cost of maintenance, scarcity of parts, and the advent of global positioning systems (GPS) will eventually render this equipment obsolete.

Another facility serving the Airport is the Battle Ground VORTAC. A VORTAC is a navigation facility providing bearing information from a VOR and bearing and distance from a tactical air navigation (TACAN) facility. The VORTAC is located 11 statute miles north of the Airport in Clark County, Washington.

Tactical Air Navigation

TACAN is an ultra-high frequency (UHF) navigational aid that provides suitably equipped military aircraft with a continuous indication of bearing and distance to the TACAN station. TACAN was developed by the military and requires TACAN airborne equipment. The PDX TACAN antenna is located approximately 595 feet west of the centerline of Runway 3-21 and 400 feet south of the centerline of Taxiway C.

Instrument Landing System

An instrument landing system (ILS) provides electronic guidance to aircraft approaching a runway. All ILSs consist of a localizer antenna, located at the far end of the runway relative to an approaching aircraft, which provides horizontal guidance. Precision ILSs also provide vertical guidance using a glideslope antenna located adjacent to the runway near the touchdown zone, approximately 1,000 feet beyond the approach end of the runway. Although the ILS is intended for use during poor visibility conditions, at major commercial airports such as PDX, almost all commercial aircraft use the ILS when available. An ILS consists of electronic equipment on the ground that produces precise signals collected by equipment on board suitably equipped aircraft. As stated above, the major components of an ILS consist of a localizer transmitter, which provides electronic horizontal guidance, and a glideslope transmitter, which provides electronic vertical guidance. Each approach end of each runway requires its own ILS to provide guidance for approaching aircraft. The Airport currently has an ILS on both ends of each parallel runway. The approaches to these runways using the ILS are termed "precision instrument" approaches because the systems generate both horizontal and vertical electronic guidance.

ILS approaches are categorized based on decision height and the horizontal visibility at the runway. Decision height is defined as the minimum height at which a decision must be made during a precision instrument approach to either continue the approach or execute a missed approach. Horizontal visibility is referred to as runway visual range (RVR), which determines what the horizontal limit of visibility is at the airport surface. The different categories of ILS approaches are:

- Category I (CAT I) – Provides for precision approaches to a decision height down to 200 feet and an RVR down to 1,800 feet.
- Category II (CAT II) – Provides for precision approaches to a decision height down to 100 feet and an RVR down to 1,200 feet.
- Category IIIA (CAT IIIA) – Provides for precision approaches without a decision height (down to the ground) and an RVR down to 600 feet.
- Category IIIB (CAT IIIB) – Provides for precision approaches without a decision height and an RVR down to 150 feet.
- Category IIIC (CAT IIIC) – Provides for precision approaches without a decision height and without an RVR. Landings are permitted in weather conditions with no ceiling or visibility, such as during periods of heavy fog (referred to as 0/0 conditions).

Runways 10L, 28L, and 28R are all equipped for ILS CAT 1 approaches. The ILS equipment on Runway 10R is more precise than the equipment on the other runways, and allows for ILS CAT II and IIIA approaches in addition to ILS CAT I. The CAT IIIA approach permits landings on Runway 10R when visibility is as low as 600 feet RVR and 0 feet decision height. Use of the CAT II and CAT III capabilities requires special equipment on the aircraft, special training of flight crews, and FAA certification of both aircraft and flight crew.

Runway 21 is equipped with a localizer and a collocated low-power DME. This navigational aid is the basis for a nonprecision straight-in approach to the runway. The localizer antenna is located approximately 1,000 feet from the endpoint of Runway 3.

Outer, Middle, and Inner Markers

Outer, middle, and inner markers (OM, MM, and IM, respectively) are electronic beacons. The markers are components of the ILS, and provide an aircraft with its location on the final approach course as it passes over the marker. Outer and middle markers are typically provided for CAT I ILS approaches, and an inner marker is added for ILS CAT II and ILS CAT III approaches.

Transmissometers

Transmissometers are the component of an ILS that measure the distance of visibility along the runway or provide RVR data, as mentioned previously. For each ILS, transmissometers are located near the pertinent runway. For ILS CAT I approaches, two transmissometers are required – at touchdown and rollout. For ILS CAT III approaches, an additional transmissometer is required at the runway midpoint. At the Airport, the parallel runways are equipped with touchdown, midpoint, and rollout transmissometers.

Nondirectional Radio Beacon

A nondirectional radio beacon (NDB) is collocated with the outer marker of the ILS for Runway 28R, approximately 5.5 nautical miles east of the Airport. When used in conjunction with the ILS, NDBs are referred to as outer compass locators. The NDB provides directional guidance to pilots and also serves as a secondary instrument approach aid to Runway 28R.

Visual Approach Slope Indicator

A visual approach slope indicator (VASI) provides visual vertical glidepath information to aircraft on landing approaches. Runway 28L is equipped with a four-box VASI set at a standard 3- degree glidepath angle.

Precision Approach Path Indicator

A precision approach path indicator (PAPI) is another system that provides visual vertical glidepath information to aircraft on landing approaches. Runways 10L, 10R, 28R, 3, and 21 are equipped with four-light PAPIs. The PAPIs on Runways 10L, 10R, 28R, and 3 are set at a standard 3-degree glidepath angle. The PAPI on Runway 21 is set at a steeper, nonstandard angle of 3.6 degrees.

Airfield Lighting

Airfield lighting helps delineate the Airport operational surfaces at nighttime and during periods of low visibility. Edge lights and centerline lights delineate runways and taxiways. Approach lighting systems assist pilots on landing approaches. Additionally, Surface Movement Guidance and Control System (SMGCS) lighting systems, discussed further below) guide aircraft on the airfield in conditions of low visibility. Airfield lighting systems at the Airport are summarized below.

Runway and Taxiway Lighting

The parallel runways (Runways 10L-28R and 10R-28L) are equipped with high intensity runway lights (HIRL). Both runways are also equipped with centerline lighting. In addition, Runway 10R has touchdown zone (TDZ) lighting, which is a requirement for ILS CAT II/III operation. The crosswind runway, Runway 3-21, is equipped with medium intensity runway lights (MIRL).

Runway end identifier lights (REIL) are synchronized flashing lights, typically one on each side of a runway threshold, which provide rapid and positive identification of a runway end to approaching pilots.

All taxiways are provided with standard edge lights. The taxiways parallel to the runways (Taxiways A, B, and E) are also equipped with centerline lights.

Runway Approach Lighting

The Airport is equipped with a variety of approach lighting systems and visual aids to assist pilots in locating the runway at night or during periods of reduced visibility.

A high-intensity approach lighting system with sequenced flashing lights (ALSF) is a 2,400-foot-long approach lighting system. The outer 1,400 feet of this system have sequenced flashing lights. Runway 10R is equipped with an ALSF-2, which is a requirement for ILS CAT II/III operations. The ALSF-2 lighting systems have additional light bars on each side of the approach light lane for the innermost 1,000 feet compared to a standard ALSF.

A medium-intensity approach lighting system with runway alignment indicator lights (MALSR) is provided on Runways 10L, 28L, and 28R. This system is a 1,400-foot-long lighting system with runway alignment indicator lights (RAIL) extending an additional 1,000 feet.

Rotating Beacon

This visual aid indicates the location of an airport. The beacons are located either on or close to an airport and alternating white and green beams indicate the airport's location. The beacon for the Airport is located south of the threshold of Runway 28L and meets current FAA specifications.

Surface Movement Guidance and Control System

The Airport is equipped with an SMGCS, which provides guidance and visual clearance verification to taxiing aircraft during periods of reduced visibility (typically when the RVR is less than 1,200 feet). As discussed earlier in the definitions of ILS categories, this RVR represents Category III conditions. The SMGCS consists primarily of taxiway centerline lights, stop bar lights, and a set of flashing runway guard lights commonly known as WIG WAG lights. The stop bar lights function similarly to traffic lights and control the flow of aircraft onto the runways. Stop bar lights are located at each runway hold position. The taxiway centerline lights are used during periods when RVR is less than 1,200 feet and when operations are conducted only on Runway 10R. Low visibility taxiway centerline lighting is provided on Taxiways B and C. When the RVR is less than 600 feet (which represents Category IIIB conditions), Taxiway C centerline lights are turned off and Taxiway B lights remain on to provide the low visibility taxiing route to be used for aircraft movement under reduced visibility conditions. When the Runway 10R RVR is between 1,200 feet and 600 feet, aircraft arriving on Runway 10R typically use exit Taxiways B5, B6, and B8. When the Runway 10R RVR is less than 600 feet, all arriving aircraft will exit Runway 10R at Taxiway B8.

5.1.7 Wind Coverage and Weather Summary

As discussed previously in Section 5.1.2, the prevailing wind direction determines the orientation of runways and, therefore, aircraft arrival and departure flows. On an annual basis, aircraft operations on the Airport's primary runways (Runways 10R-28L and 10L-28R) are nearly equally divided between east flow (aircraft landing and departing to the east) and west flow (aircraft landing and departing to the west). Historically, east flow conditions have prevailed at the Airport 63.53% of the time. Typically, west flow conditions predominate in the summer and east flow conditions predominate in the winter.

The primary measures of weather conditions at an airport are cloud ceiling height and horizontal visibility. The categories of weather conditions that determine whether visual flight rules (VFR) or instrument flight rules (IFR) are to be used are summarized below.

- VFR1 – Ceiling (the height of clouds, smog, etc., above the ground) is at least 3,500 feet, and visibility is at least 10 miles. At the Airport, these conditions prevail 73.1% of the time. During VFR1 conditions, dual approach streams are possible. In weather conditions below VFR1, FAA Air Traffic Control (ATC) will enforce full IFR radar separation between aircraft.

- VFR2 – Ceiling is less than 3,500 feet, but at least 2,000 feet or visibility is less than 10 miles, but at least 5 miles. These conditions occur at the Airport 14.0% of the time.

- IFR1 – Ceiling is less than 2,000 feet, but at least 200 feet or visibility is less than 5 miles, but at least 0.5 mile. These conditions occur at the Airport approximately 11.2% of the time and are considered CAT I ILS conditions.

- IFR2 – Ceiling is between 100 and 200 feet, and visibility is between 0.25 mile and 0.5 mile. These conditions occur at the Airport approximately 0.6% of the time and are considered to be CAT II ILS conditions. During these conditions, the Airport is limited to one arrival stream in east flow as Runway 10R is the only CAT II/III ILS runway.

- IFR3 – Ceiling is less than 100 feet and visibility is at least 0.125 mile. IFR3 conditions occur at the Airport approximately 1.1% of the time. These conditions include CAT III ILS conditions. During IFR3 conditions, the Airport is limited to one arrival stream on Runway 10R.

Other information pertinent to the planning and design of airport facilities is the airport reference temperature. This is the mean maximum daily temperature during the hottest month of the year. A reference temperature is established for an airport because air temperature affects aircraft take-off performance and helps determine runway length requirements. As indicated on the current Airport Layout Plan (ALP) for PDX, the reference temperature is 77.1°F.

5.1.8 Airspace

Airspace is defined as the area above and adjacent to the surface of the airfield. The national airspace structure, responsibility for air traffic control procedures, local air traffic control procedures, and FAR Part 77 imaginary surfaces are summarized below.

National Airspace Structure

U.S. airspace is under the jurisdiction of the FAA. The FAA established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS is the network of airspace within the United States and includes, but is not limited to, air navigation facilities, airports and landing areas, aeronautical charts, associated flight rules, and regulations. For additional information on the national airspace structure, refer to the FAA *Aeronautical Information Manual*. Airspace as classified by the FAA (in FAR Part 71, *Designation of Airspace*) is either controlled or uncontrolled. The Airport's airspace is actively controlled, meaning that aircraft operating within the Airport's airspace are under the positive control of the ATCT at PDX or the TRACON.

Responsibility for Air Traffic Control Procedures

The FAA controls air traffic at three primary levels, as discussed below:

- Air Route Traffic Control Center
- Terminal Radar Approach Control
- Airport Traffic Control Tower

Air Route Traffic Control Center

Air Route Traffic Control Centers (ARTCCs) control aircraft operating under IFR in controlled airspace and in en route phases of flight. In the continental United States, 20 ARTCCs control airspace. The ARTCC for the Airport is located in Seattle, with airspace jurisdiction from the Canadian border to northern California, eastward to Idaho, and portions of Montana. The Seattle ARTCC controls en route IFR traffic above 13,000 feet.

Terminal Radar Approach Control

TRACONs are found in metropolitan areas with heavier aircraft traffic volumes. TRACONs use radar to control the orderly flow of aircraft traffic arriving to and departing from the major air terminals and between major air terminals. This traffic includes all IFR flights in the TRACON jurisdiction area and those transitioning from the ARTCC controlled en route phase to the TRACON-controlled approach and departure phases. This traffic also includes VFR flights within the Portland Class C airspace. The Seattle ARTCC delegates the jurisdictional area for TRACON oversight at the Airport. The jurisdictional area encompasses 21 other airports, two of which—Troutdale Airport and Pearson Field—directly affect operations at the Airport. The TRACON primarily controls IFR traffic from the surface to 13,000 feet above MSL.

Airport Traffic Control Tower

The Airport Traffic Control Tower controls the initial level of aircraft departures and the final level of aircraft arrivals. Air traffic control at the Airport is handled through air/ground communications and visual signaling from the ATCT. Not all airports have control towers. Portland International Airport, Troutdale Airport, and Hillsboro Airport have ATCTs. Airports such as Pearson Field, Mulino Airport, and Scappoose Industrial Airpark do not have ATCTs and are classified as uncontrolled airports.

Local Air Traffic Control Procedures

FAR Part 91, *General Operating and Flight Rules*, sets forth the general operating and flight rules that pilots must follow. Local air traffic control flight procedures include VFR and IFR. General aviation and military aircraft fly under both VFR and IFR. However, commercial aircraft are required to fly under IFR.

Weather influences which flight rules should be followed, primarily with regard to visibility and cloud cover. FAR Part 91, Section 91.155 states the basic weather minimums for VFR operations. VFR requires a ceiling of at least 1,000 feet and visibility of at least 3 miles. If these weather minimums are not present, a pilot must fly under IFR or not at all.

Visual Flight Rule Procedures

Under VFR, a pilot must maintain visual separation from other aircraft. The aircraft is also not normally under the control of FAA ATC or military air traffic control if not flying within controlled airspace, such as the Airport's Class C airspace.

Pilots of commercial and general aviation aircraft operating under VFR with FAA-filed flight plans enter the Airport terminal area under the positive control of the Seattle ARTCC. The Seattle ARTCC then relays control to the TRACON at the Airport, which gives the information to the ATCT during the pilot's final approach. The assigned arrival procedure will vary depending on the operational conditions at the Airport, including traffic volumes and runway configuration.

Aircraft departing the Airport terminal area receive clearance and departure instructions from the ATCT. The departure procedure will vary depending on destination, runways in use, and volume of traffic.

Instrument Flight Rule Procedures

Under IFR, a pilot is under the jurisdiction of FAA ATC, which controls aircraft separations from other aircraft. The required separation is 1,000 feet vertically or 3 miles horizontally.

Aircraft operating under IFR approach the Airport terminal area under the positive control of the Seattle ARTCC. The Seattle ARTCC then transfers arriving IFR aircraft to TRACON control by clearing the aircraft to the Airport via a Standard Terminal Arrival Route (STAR). STARs are preplanned IFR arrival procedures published for pilot use. STARs use a combination of published VOR radials and intersections and assigned vectors, altitudes, and speeds to route aircraft into the arrival flow sequence. Aircraft are typically assigned an arrival route to the Airport based on their city of flight origin.

Two departure procedures are published for use at the Airport. These procedures have been designed to facilitate IFR clearances and transition from aircraft takeoff to the en route phase of flight. The departure procedures in use at the Airport are summarized in Table 5-3.

Table 5-3
DEPARTURE PROCEDURES

Name of Procedure	Instructions
Portland Five	Fly runway heading, or as assigned; expect vectors to join assigned route. Maintain assigned altitude; expect filed altitude/flight level 5 minutes after departure.
River-Six	Takeoff Runways 10L and 10R: Turn left, intercept and proceed via the PDX R-085*(a)* or as assigned; expect radar vectors to assigned route. Expect filed altitude/flight level 5 minutes after departure.
	Takeoff Runway 21: Turn right, fly heading 290 degrees or as assigned; expect radar vectors on course. Expect filed altitude/flight level 5 minutes after departure.
	Takeoff Runways 28L and 28R: Intercept and proceed via the PDX R-277 or as assigned; expect radar vectors to assigned route. Expect filed altitude/flight level 5 minutes after departure.

(a) PDX R-085 refers to the PDX VOR radial bearing 85 degrees.

Source: Port of Portland.

Instrument Approach Procedures

Instrument approach procedures ensure the safe landing/takeoff of aircraft when operating under IFR. These procedures are in effect from the beginning of an aircraft's initial approach to the airport to the point where a safe landing is accomplished. All procedures pertain to the aircraft approach surface. This approach surface is an imaginary inclined plane beginning 200 feet beyond the end of the runway pavement and extending up to 10 miles.

Instrument approach procedures are primarily determined by the precision of navigational aids in measuring approach conditions during aircraft arrivals, providing the necessary guidance for a safe landing. At the Airport, both precision (lateral/directional and vertical/descent profile information provided) and nonprecision instrument approaches (only lateral information provided) are used.

The 14 instrument approach procedures in use at the Airport vary according to available navigational aids. The approach procedures may also influence or be influenced by the type of runway used, approach surfaces, runway protection zones (RPZs), navigational aids, and aircraft type, but are most influenced by weather conditions.

Six precision instrument approach procedures are used for arrivals to Runways 10L, 28R, 10R, and 28L. The approach slope at these four runways is 50:1. The approach minimum at Runway 28R is 250 feet above touchdown at a visibility of 0.75 mile, considering the objects that penetrate obstacle clearance surfaces.

Eight nonprecision instrument approach procedures are used for arrivals to Runway 3-21. The nonprecision instrument approaches to Runway 21 are based on the localizer, a part of the ILS. These approach procedures are adequate for air carrier aircraft with a minimum visual approach of 1.75 miles for Aircraft Approach Category C and 2.0 miles for Aircraft Approach Category D. In addition to the nonprecision instrument approach procedures, a visual approach procedure is also used for Runway 3.

FAR Part 77 Imaginary Surfaces

Terrain and structural obstructions in the vicinity of the Airport may affect air navigation. FAR Part 77, *Objects Affecting Navigable Airspace,* establishes standards and notification requirements pertaining to terrain and structures that may affect navigable airspace. Objects penetrating the imaginary surfaces established under FAR Part 77 are defined as obstructions, although they may not be designated by the FAA as hazards to air navigation.

The general shapes, dimensions, and locations of the imaginary surfaces emanate from the runway centerline and are dimensioned according to the visibility minimums associated with the approach to the runway end and size of aircraft operating on the runway.

5.1.9 Noise Management Procedures

The Port of Portland Noise Management Office is charged with responding to community concerns and implementing strategies to minimize noise impacts from aircraft operations at the Airport. A ground run-up enclosure (GRE) for engine run-up maintenance tests and noise abatement approach procedures are used to minimize noise impacts.

Ground Run-up Enclosure

The noise produced by FAA-required aircraft engine run-up maintenance tests is of concern to the surrounding community, especially during nighttime hours. To reduce related sound levels, the Port of Portland conducts engine run-up tests inside a sound insulated ground run-up enclosure. The GRE at the Airport was built in 2001 adjacent to Taxiway J and is a three-sided enclosure measuring 55 feet high, 236 feet wide, and 291 feet deep. It is large enough to accommodate most aircraft. An evaluation of the GRE conducted in 2001 found that it was effective in reducing noise by 18 decibels (dB), or 75%. This reduction is consistent with results from evaluations at other airports.

Noise Abatement

Noise abatement procedures require pilots to follow recommended flight paths, which typically follow the Columbia River on both departures and arrivals. Other noise abatement procedures include dispersing flight tracks rather than using narrow approach corridors, keeping aircraft higher over residential areas, minimizing evening flights, and minimizing intersection departures from Runway 3.

The FAA, which controls and regulates airspace, must approve and implement all departure or arrival flight paths. The Port of Portland Noise Management Office works closely with the FAA, as well as residents, aircraft operators, and federal, State, and local governments, on matters related to deviations from established flight paths. The Port prepared a Cargo Feeder Study in 2005 to address noise generated from regional cargo feeder aircraft and other small aircraft weighing 12,500 pounds or less. The Port also commissioned an updated Noise Compatibility Study (FAR Part 150 study), which was approved by the FAA in 2007, to address aircraft noise impacts on the surrounding community. Many noise mitigation measures were recommended in the FAR Part 150 study. The Port is currently developing an implementation plan for the study recommendations.

5.2 Passenger Terminal

The passenger terminal configuration at Portland International Airport is unique among U.S. airports. Most comparable terminals serve similar passenger activity levels with multiple terminals and landside facilities. However, the passenger terminal at PDX consists of a single main terminal connected to five concourses: A, B, C, D, and E. The terminal layout is in the shape of the letter “H” and encompasses approximately 1.5 million square feet. This layout is classified by the FAA as a pier configuration. The pier configuration is one of four basic terminal concepts outlined in FAA Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*.

The pier configuration passenger terminal layout at PDX provides 68 aircraft gates, of which 46 are served by loading bridges and 22 require ground loading of passengers. The terminal area is located between parallel Runways 10L-28R and 10R-28L.

Crosswind Runway 3-21 is located immediately to the west of the passenger terminal facility. The location of the passenger terminal with respect to the runways is shown on Figure 5-2.

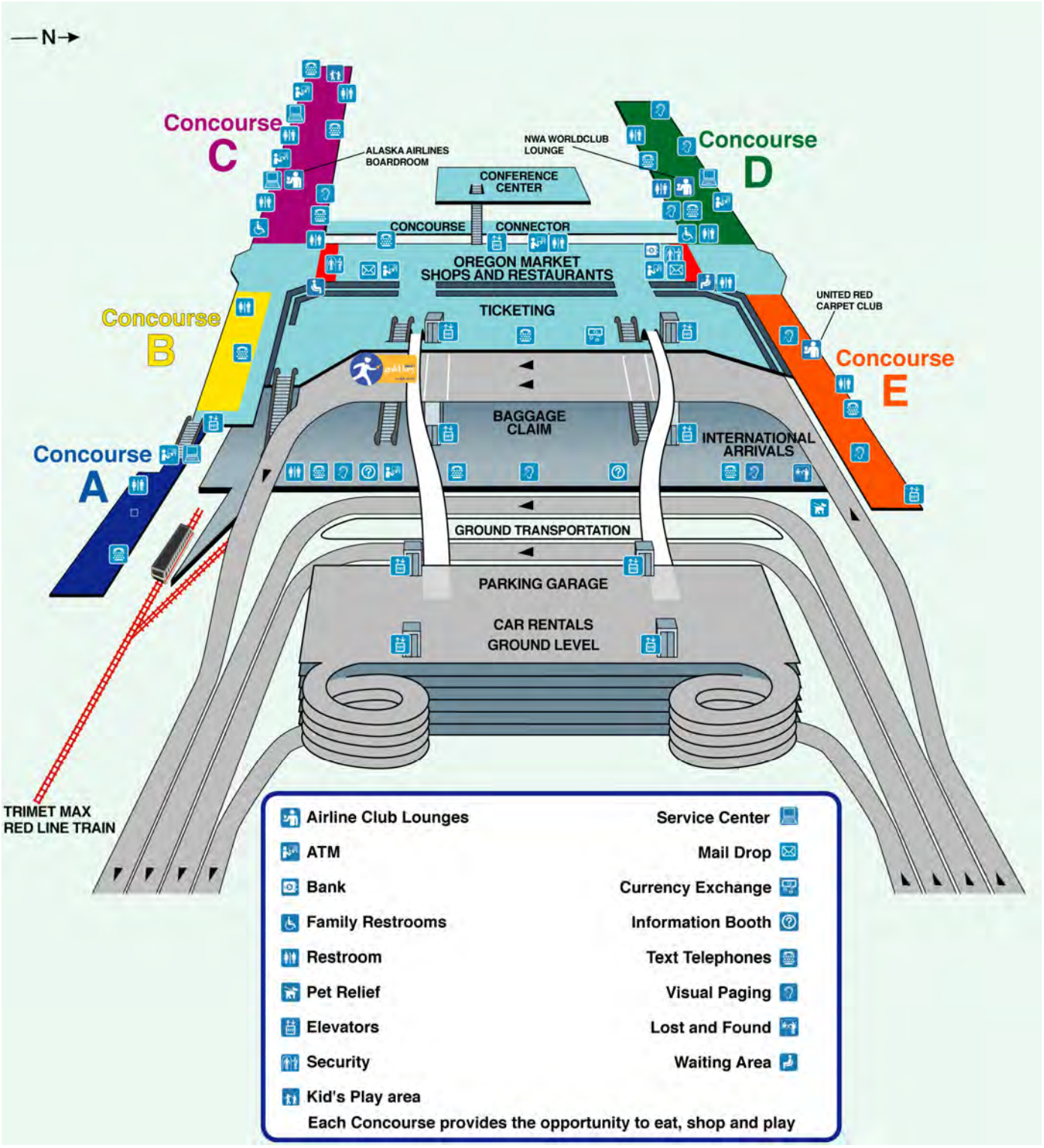
The passenger terminal is generally regarded as the most important facility at any developed airport. At PDX, where the terminal consists of the main terminal area (the middle portion of the "H" pier configuration) and concourses (the sides or legs of the "H" pier configuration), the main terminal area is the area accessible to the public prior to passenger security screening checkpoints. The concourses are beyond the security screening checkpoints.

Concourses A, B, and C are located on the south side of the main terminal and are accessible to passengers via the south-end Transportation Security Administration (TSA) security screening checkpoint. According to the *Terminal Access Study* for the Airport (Jacobs Consultancy, March 2005), Concourses A, B, and C accommodated 55% of total aircraft departures at the Airport in 2003. Concourses D and E are located on the north side of the main terminal and are accessible to passengers via the north-end TSA security screening checkpoint. The concourses are illustrated on Figures 5-8 through 5-11.

Concourse A is approximately 250 feet long and extends east from the south-end security checkpoint lobby. Passengers deplane and enplane on the first floor of Concourse A, which is accessed via a 320-foot post-security corridor from Concourse B. The first floor consists of holdrooms, airline operations areas, and seven commuter aircraft boarding gates, as shown on Figure 5-12. These gates are ground loaded (i.e., they do not have loading bridges) and serve 14 aircraft parking positions. The second floor of Concourse A provides airline office space, as shown on Figure 5-13. Horizon Air and Big Sky Airlines operate from Concourse A.

Concourse B is approximately 450 feet long and is adjacent to the south-end security checkpoint lobby, as shown on Figure 5-8. The deplaning level (first floor) of Concourse B provides Airport utilities and airline operations space, as shown on Figure 5-14. The enplaning level (second floor) primarily provides holdrooms for three airline gates, as well as restrooms and concession space, as shown on Figure 5-15. Alaska Airlines and Horizon Air operate from Concourse B.

Concourse C is approximately 1,440 feet long and extends west from the south-end security checkpoint lobby, as shown on Figure 5-8. The deplaning level (first floor) of Concourse C provides space for airline operations, concessionaire offices and storage, Airport utilities, and Port areas, as shown on Figure 5-16. The enplaning level (second floor) provides holdroom space for 23 aircraft gates located on both sides of the concourse, also referred to as a double-loaded concourse. The enplaning level also provides two concession nodes, two business service centers, and the Alaska Airlines



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

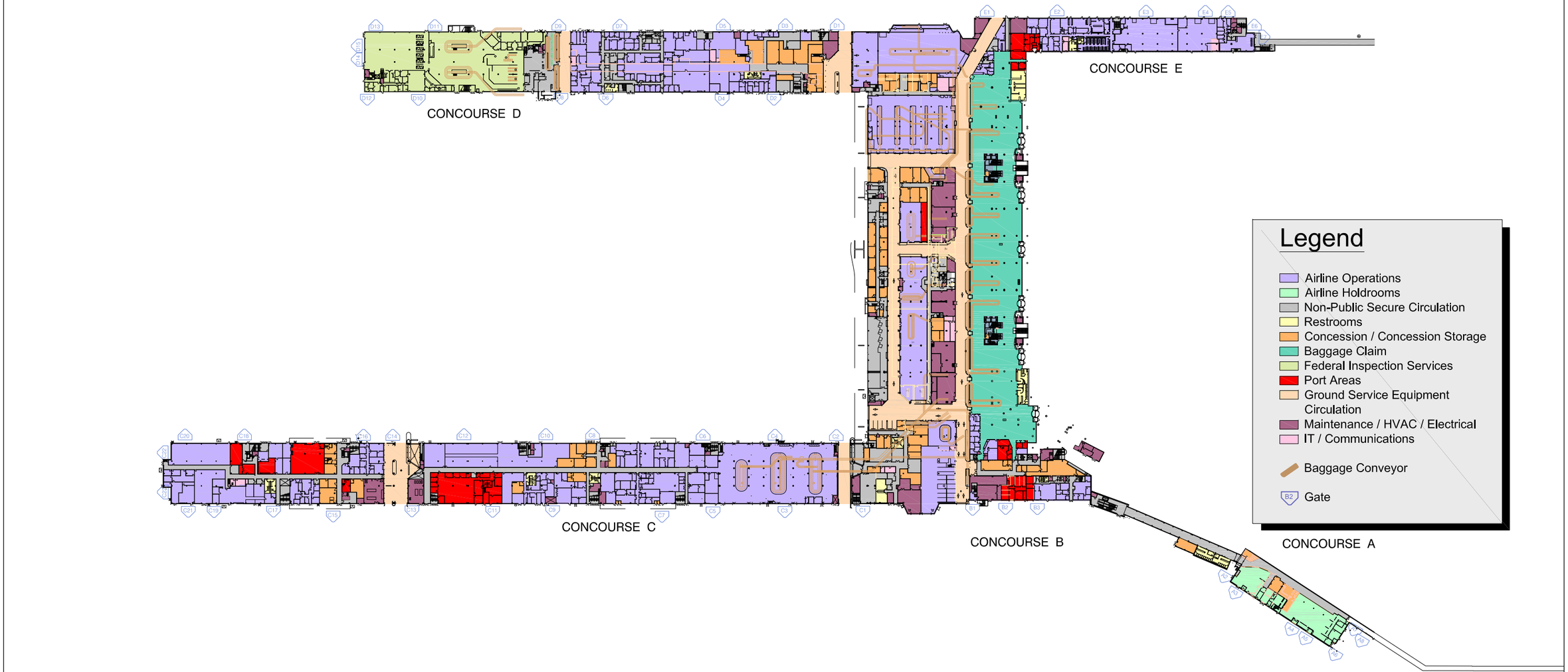
Figure 5-8

Terminal Map

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 200'
Scale: 1" = 200'

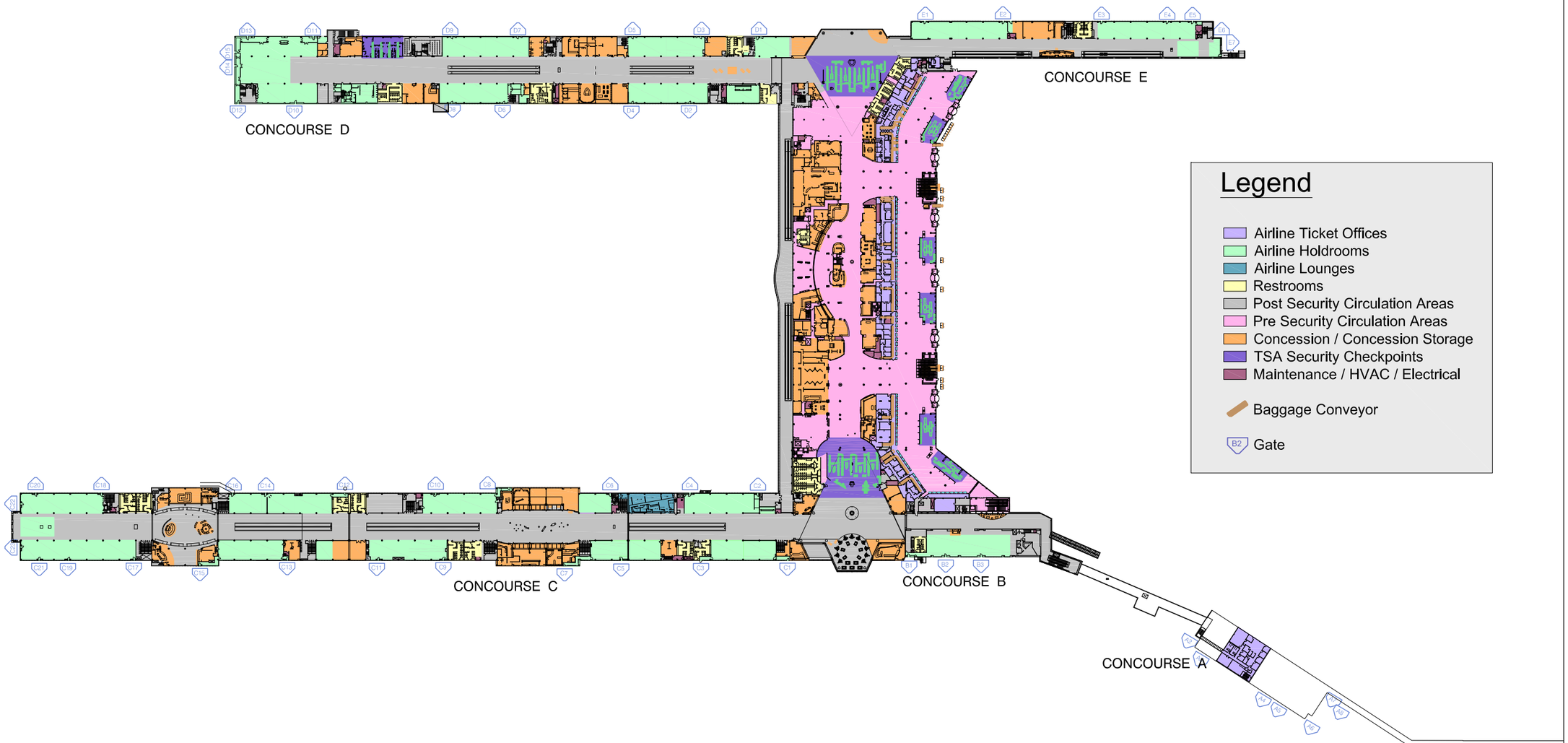
Figure 5-9

Terminal Functional Allocation - Deplaning Level

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

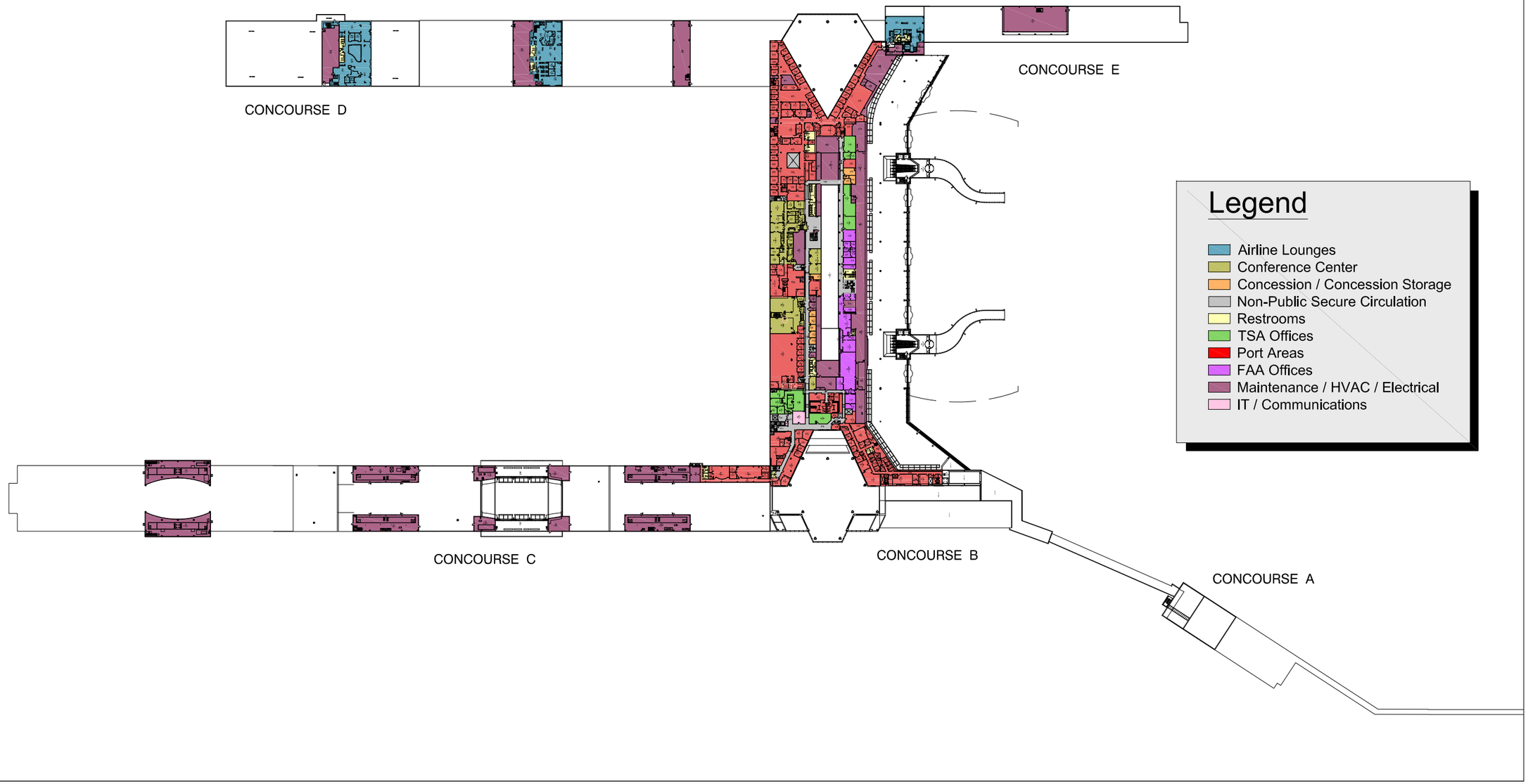
Figure 5-10

Terminal Functional Allocation - Enplaning Level

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 200'
Scale: 1" = 200'

Figure 5-11

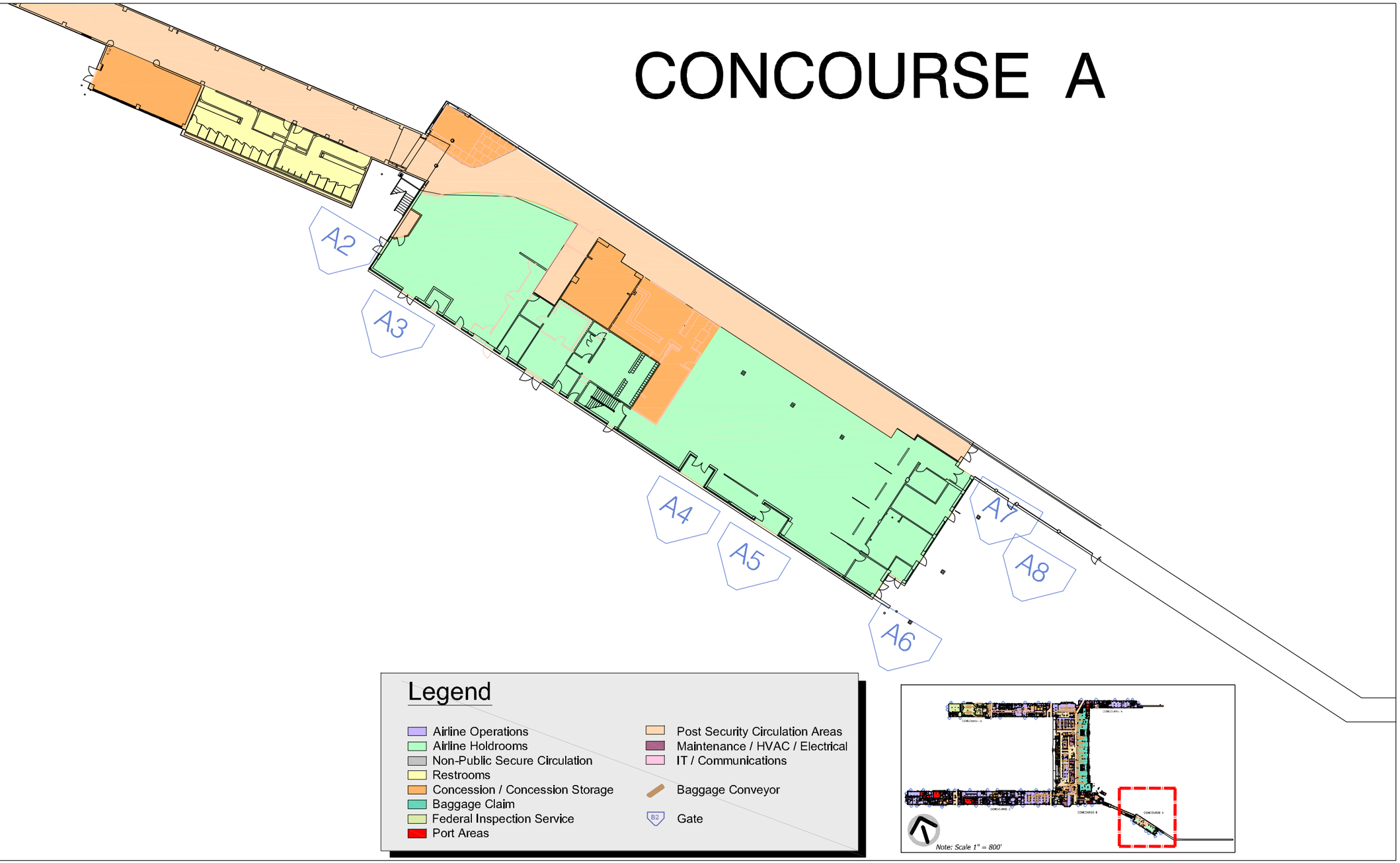
Terminal Functional Allocation - Mezzanine Level

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

CONCOURSE A



Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Federal Inspection Service
- Port Areas
- Post Security Circulation Areas
- Maintenance / HVAC / Electrical
- IT / Communications
- Baggage Conveyor
- B2 Gate

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 40'
Scale: 1" = 40'

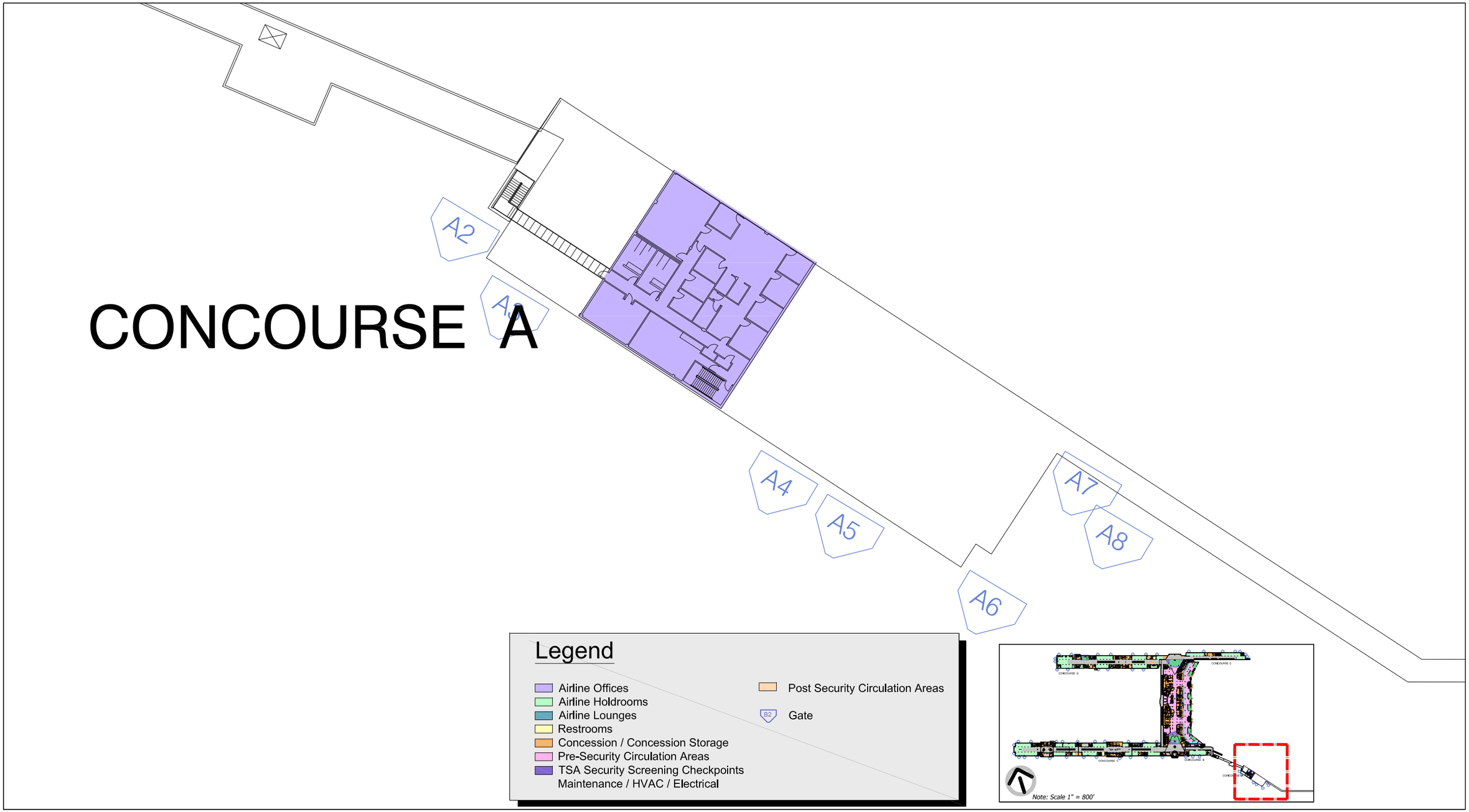
Figure 5-12

Concourse A: Deplaning and Enplaning Level (First Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 40'
Scale: 1" = 40'

Figure 5-13

Concourse A (Second Floor)

Master Plan Update
Portland International Airport

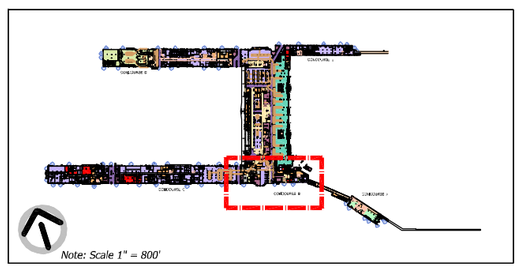
Source: Port of Portland Staff

September 2008

C4
C2
C3
C1
B1
B2
B3

Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Federal Inspection Services
- Port Areas
- Ground Service Equipment Circulation
- Post Security Circulation Areas
- Maintenance / HVAC / Electrical
- IT / Communications
- Baggage Conveyor
- B2 Gate



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 40'
Scale: 1" = 40'

Figure 5-14

Concourse B: Deplaning Level (First Floor)

Master Plan Update
Portland International Airport

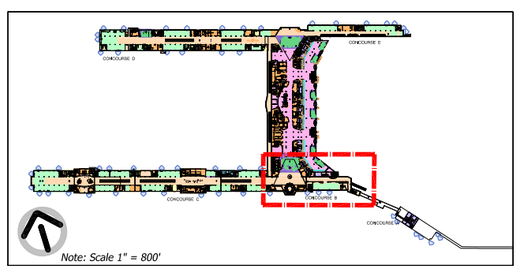
Source: Port of Portland Staff

September 2008

CONCOURSE B

Legend

- Airline Ticket Offices
- Airline Holdrooms
- Airline Lounges
- Restrooms
- Concession / Concession Storage
- Pre-Security Circulation Areas
- TSA Security Screening Checkpoints
- Maintenance / HVAC / Electrical
- Post Security Circulation Areas
- Gate (B2)



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 40'
Scale: 1" = 40'

Figure 5-15

Concourse B: Enplaning Level (Second Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 50'
Scale: 1" = 50'

Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Federal Inspection Services
- Port Areas
- Ground Service Equipment
- Circulation
- Maintenance / HVAC / Electrical
- IT / Communications
- Baggage Conveyor
- Gate

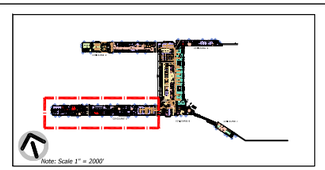


Figure 5-16

Concourse C: Deplaning Level (First Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

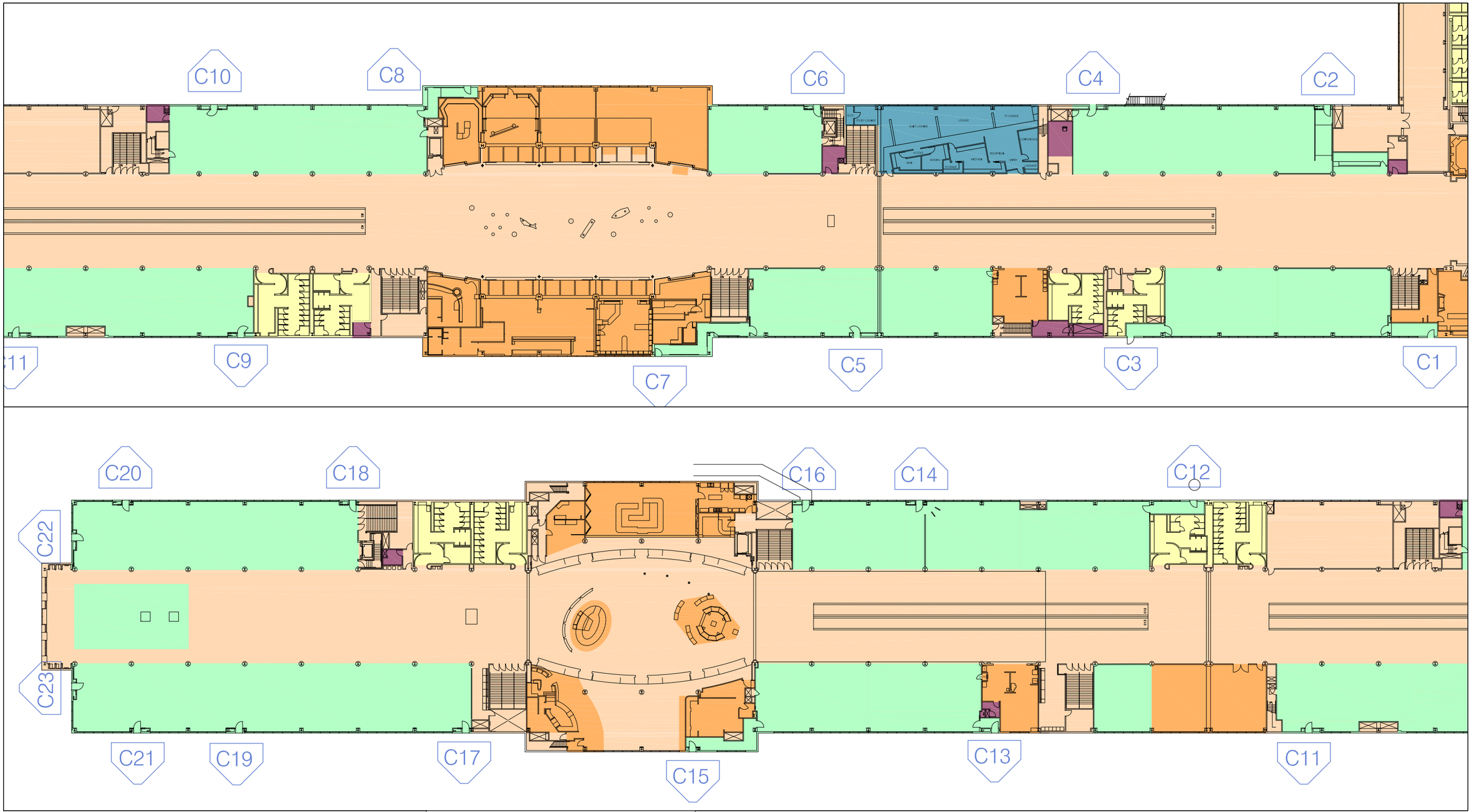
Board Room club lounge. The enplaning level of Concourse C is illustrated on Figure 5-17. A mezzanine level (third floor) houses Airport utilities along the length of the concourse, as illustrated on Figure 5-18. Alaska Airlines, American Airlines, Frontier Airlines, Southwest Airlines, and US Airways operate from Concourse C.

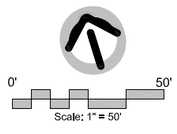
Concourse D is approximately 1,000 feet long and extends west from the north-end security checkpoint lobby as seen on Figure 5-8. The east side of the deplaning level (first floor) consists primarily of leased airline and unassigned airline operations space, and the west side of the deplaning level is primarily dedicated to Federal Inspection Services, as shown on Figure 5-19. The enplaning level (second floor) provides holdroom space for 15 gates, double loaded on both sides of the concourse. The rest of the enplaning level space provides concession areas, a business center, a currency exchange booth, and a TSA security checkpoint for international passengers entering the United States. The enplaning level is illustrated on Figure 5-20. A Northwest Airlines World Club lounge, along with a vacant lounge area, is located on the mezzanine level (third floor), as illustrated on Figure 5-21. Continental Airlines, Delta Air Lines, Hawaiian Airlines, Lufthansa German Airlines, Mexicana de Aviacion, and Northwest Airlines operate from Concourse D.

Concourse E is approximately 580 feet long and extends east from the north-end security checkpoint lobby, as shown on Figure 5-8. The deplaning level (first floor) consists primarily of leased airline and unassigned airline operations space. One holdroom on the deplaning level (at gate E7) serves regional airlines and requires ground loading of aircraft. The deplaning level of Concourse E is illustrated on Figure 5-19. The enplaning level (second floor) has six holdrooms. The remainder of the enplaning level provides concessions space and passenger circulation areas. The enplaning level of Concourse E is illustrated on Figure 5-20. The mezzanine level (third floor) accommodates the United Airlines' Red Carpet passenger lounge and Airport utilities. The mezzanine level is illustrated on Figure 5-21. Air Canada, JetBlue Airways, United Airlines, SkyWest Airlines, and United Express operate from Concourse E.

The functional areas and services provided in the passenger terminal at the Airport are described below.

As previously mentioned, the passenger terminal at PDX consists of three levels: deplaning, enplaning, and mezzanine. The deplaning level is referred to as the first floor of the passenger terminal for passengers or as the apron level for airline and Airport employees. Respectively, the enplaning and mezzanine levels are the second and third floors of the passenger terminal. The physical areas and services provided at PDX, as illustrated on Figure 5-8, are described below by level.





Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Airline Club Lounge
- Port Areas
- Post Security Circulation Areas
- Maintenance / HVAC / Electrical
- IT / Communications
- Baggage Conveyor
- Gate

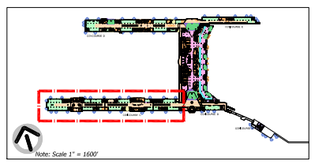


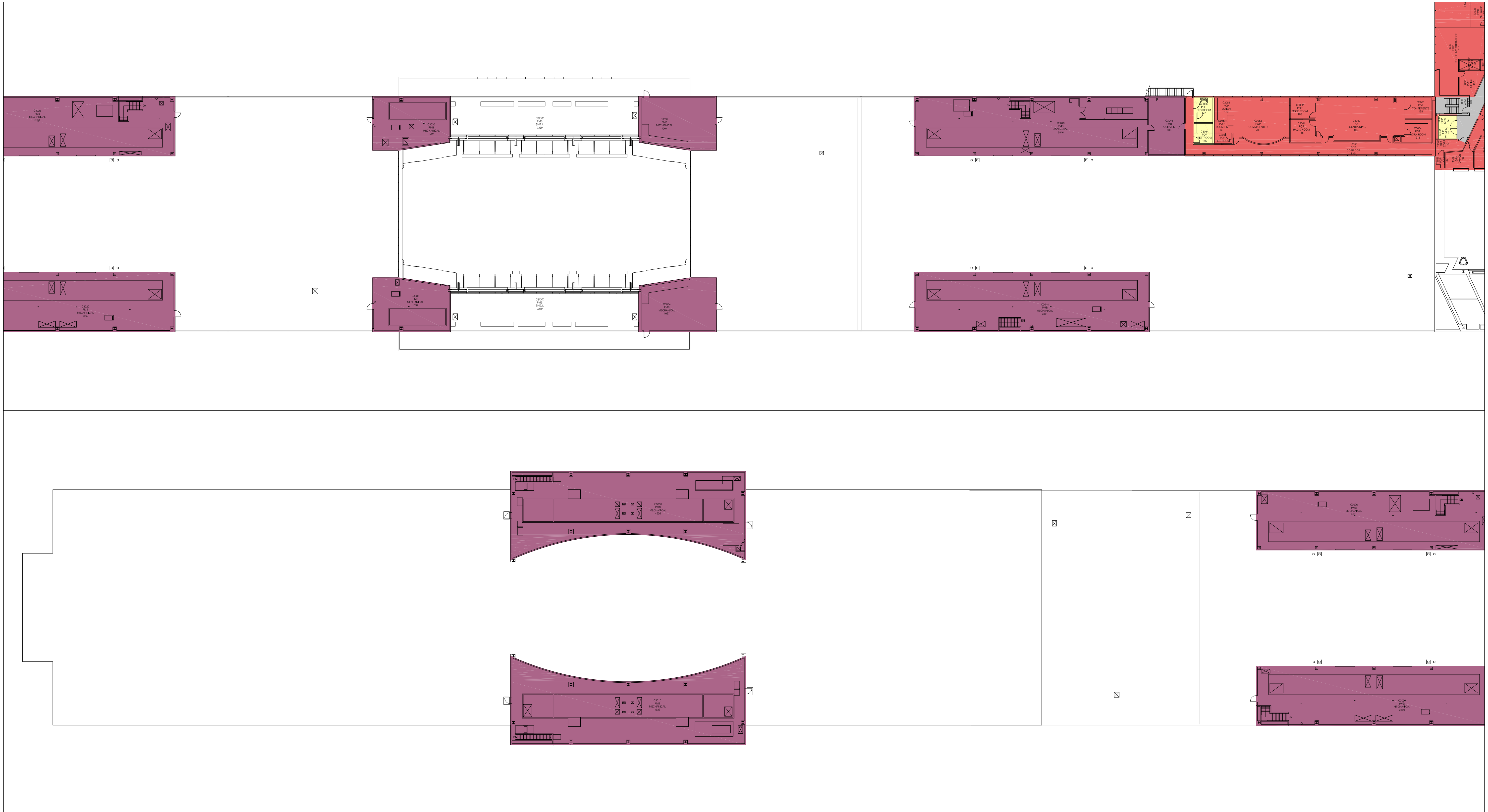
Figure 5-17

Concourse C: Enplaning Level (Second Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 50'
Scale: 1" = 50'

Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Federal Inspection Services
- Port Areas
- Ground Service Equipment Circulation
- Maintenance / HVAC / Electrical
- IT / Communications
- Baggage Conveyor
- Gate

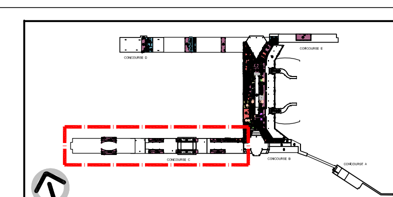


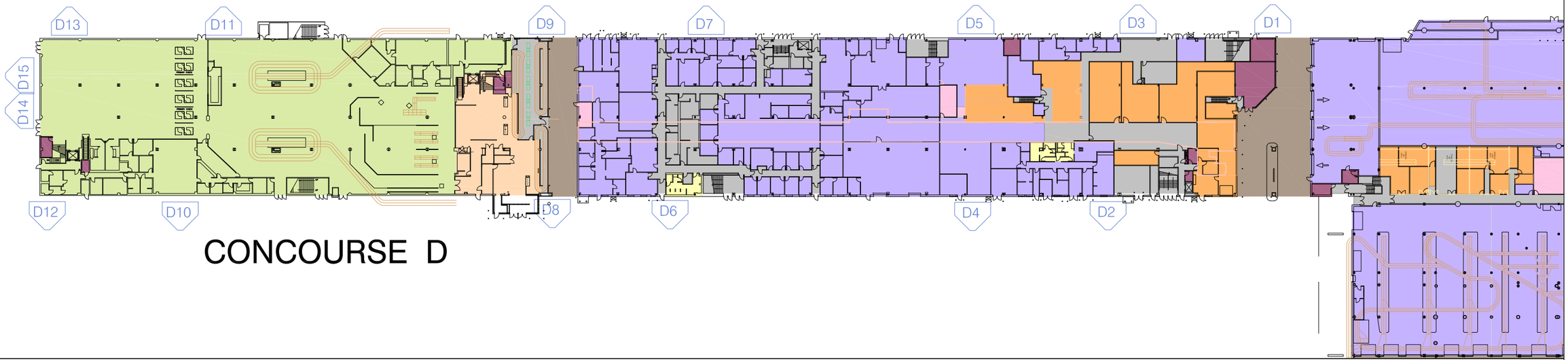
Figure 5-18

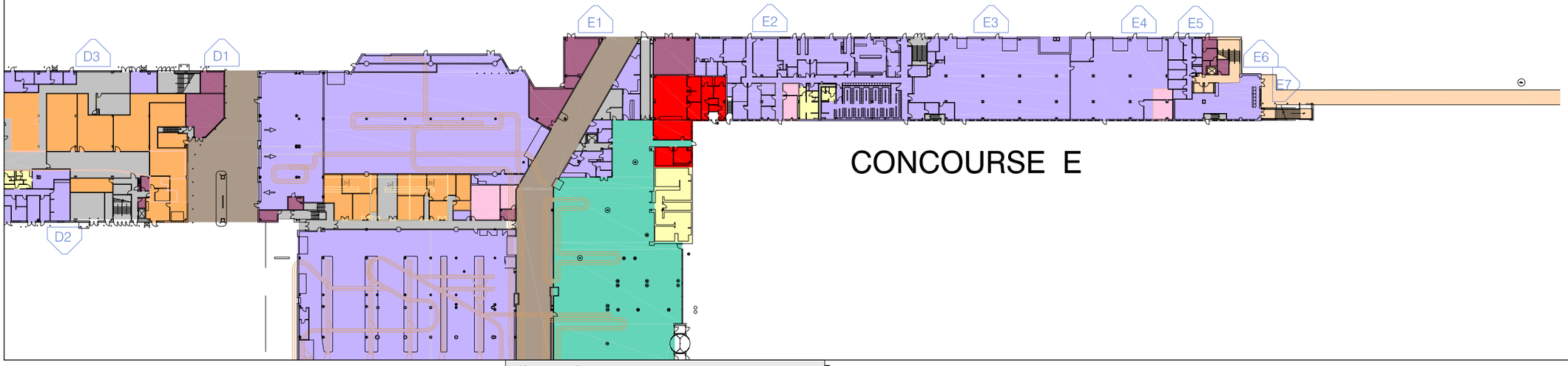
Concourse C: Mezzanine Level (Third Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008





AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 80'
Scale: 1"=80'

Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Federal Inspection Services
- Port Areas
- Post Security Circulation Areas
- Ground Service Equipment
- Circulation
- Maintenance / HVAC / Electrical
- IT / Communications
- Baggage Conveyor
- Gate

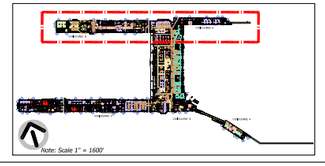


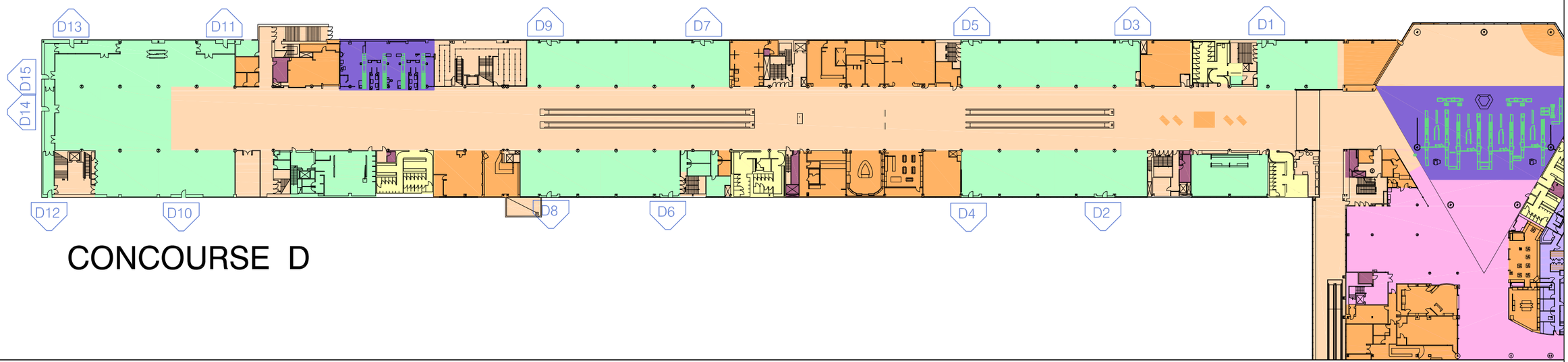
Figure 5-19

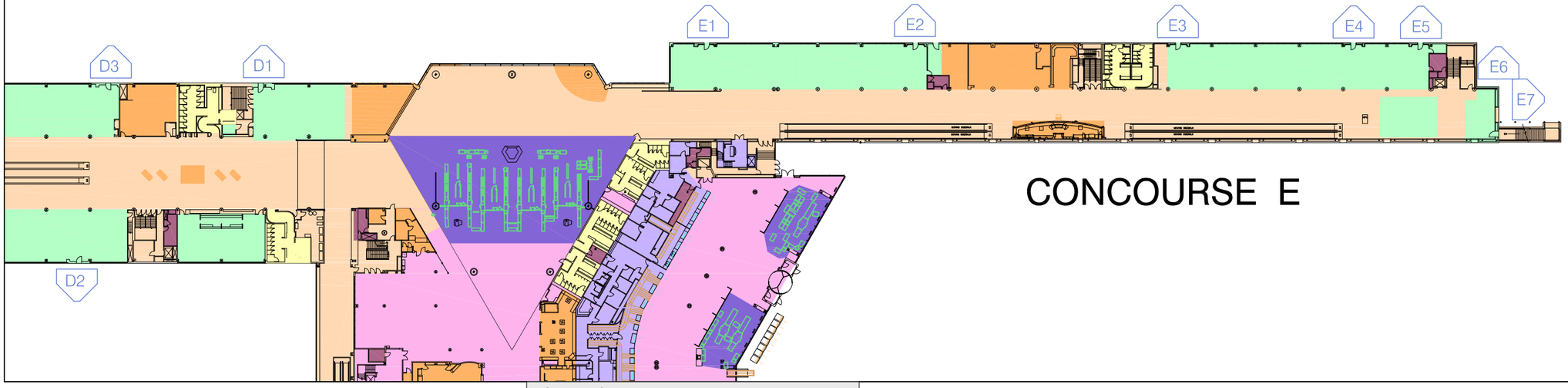
Concourses D and E: Deplaning Level (First Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008





AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 80'
Scale: 1" = 80'

Legend

- Airline Ticket Offices
- Airline Holdrooms
- Airline Lounges
- Restrooms
- Post Security Circulation Areas
- Pre Security Circulation Areas
- Concession / Concession Storage
- TSA Security Checkpoints
- Maintenance / HVAC / Electrical
- Baggage Conveyor
- Gate

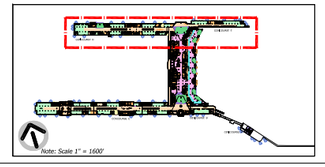


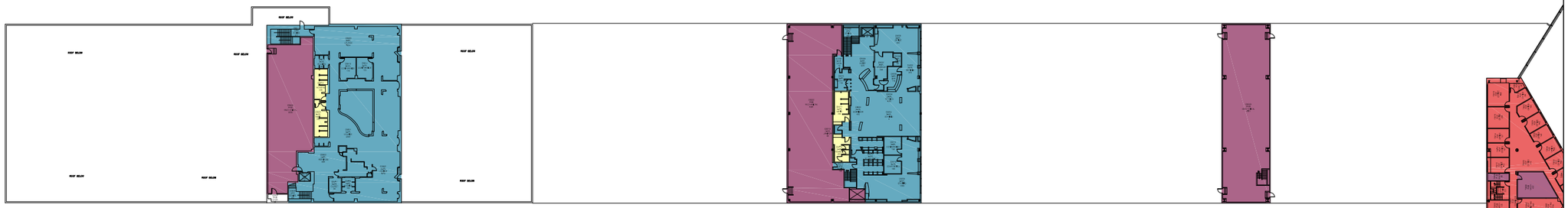
Figure 5-20

Concourses D and E: Enplaning Level (Second Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008



CONCOURSE D

CONCOURSE E

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 80'
Scale: 1" = 80'

Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Airline Club Lounges
- Port Areas
- Ground Service Equipment Circulation
- Maintenance / HVAC / Electrical
- IT / Communications
- Baggage Conveyor
- Gate

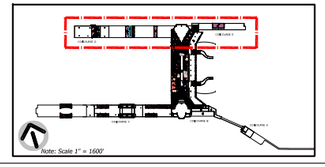


Figure 5-21

Concourses D and E: Mezzanine Level (Third Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

Currently, PDX is served by 17 scheduled airlines (see Table 5-4). These airlines provide nonstop service from the Airport to 44 domestic destinations and 6 international destinations: Vancouver, Amsterdam, Frankfurt, Guadalajara, Mexico City, and Tokyo. The Airport averages 280 daily scheduled domestic and international passenger aircraft departures during its summer peak travel season.

Table 5-4

AIRLINES SERVING PDX

Air Canada Jazz	Frontier Airlines	Northwest Airlines
Alaska Airlines	Hawaiian Airlines	Southwest Airlines
American Airlines	Horizon Air	United Airlines
Big Sky Airlines	JetBlue Airways	United Express
Continental Airlines	Lufthansa German Airlines	US Airways
Delta Air Lines	Mexicana de Aviacion	

Source: Port of Portland records, 2008.

5.2.1 Deplaning Level (First Floor)

The deplaning level is the first floor of the passenger terminal. Located on the deplaning level are baggage claim, inbound baggage areas, airline operations areas, outbound baggage areas, in-line explosives detection system (EDS) baggage screening areas, ground service equipment (GSE) circulation areas, some airline holdrooms, the Federal Inspection Services (FIS) area for international arrivals, non-public secure passenger circulation space, and other areas. The first floor of the main terminal area is illustrated on Figure 5-22. Some functions mentioned above are provided on the first floor of the concourses, but not on the first floor of the main terminal area.

Baggage Claim

With the exception of Concourse A, the only public area on the deplaning level (first floor) is the baggage claim area. Passengers arriving at PDX pick up their checked baggage at one of nine baggage claim units. Electronic baggage information display systems (BIDS) located throughout the area provide information for arriving passengers regarding the baggage claim unit to which their baggage will be delivered.

The baggage claim area is also the location where family members, friends, tour groups, and other visitors (collectively referred to as meeters and greeters) welcome arriving passengers. Accommodating meeters and greeters in the baggage claim area is a developing trend in the post-September 11 security environment. The Port has recognized this need by providing concession opportunities, restrooms, and seating

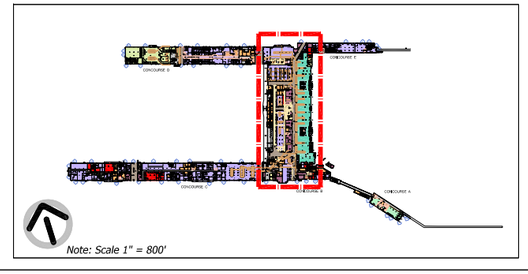
CONCOURSE B

CONCOURSE C

C3 C2 C1 B1 B2 B3 D3 D1 E1 E2

Legend

- Airline Operations
- Airline Holdrooms
- Non-Public Secure Circulation
- Restrooms
- Concession / Concession Storage
- Baggage Claim
- Federal Inspection Services
- Port Areas
- Ground Service Equipment
- Circulation
- Maintenance / HVAC / Electrical
- IT / Communications
- Pre-Security Circulation
- Baggage Conveyor
- B2 Gate



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 60'
Scale: 1" = 60'

Figure 5-22

Main Terminal Area: Deplaning Level (First Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

areas for arriving passengers and their meeters and greeters. Once passengers pick up their baggage and connect with their meeters and greeters, they typically exit the baggage claim area to access ground transportation connections or the parking facilities.

Inbound Baggage

The inbound baggage system is used by airline personnel to transfer passenger baggage from arriving aircraft to individual flat-flat plate baggage claim units. Baggage transfer occurs in the non-public area of the deplaning level. Once baggage is placed on the baggage claim units, it is transported via the moving conveyance system to passengers awaiting their baggage in the public baggage claim area.

Airline Operations

Airline operations areas include storage for aircraft support parts and equipment, GSE, workshop areas, airline employee break areas, and flight crew weather briefing and flight planning quarters. These areas at PDX are commonly leased exclusively by individual airlines and located in close proximity to individual airline gates and operations. Airline operations areas are considered exclusively a part of the non-public airport areas. They are specifically located in the main terminal area (Figure 5-22), Concourse B (Figure 5-14), Concourse C (Figure 5-16), and Concourses D and E (Figure 5-19).

Outbound Baggage

Much of the area designated for airline operations is used for the outbound baggage system used by airline personnel to organize, separate, and load passenger baggage for departing flights. This area is also commonly referred to as the baggage make-up or sortation area. Once baggage is electronically screened by the TSA, it travels on conveyor belt “racetracks” to sortation devices that resemble baggage claim units. Airline personnel then arrange the baggage by airline, flight number, and destination. Finally, tugs with baggage carts transport the baggage to departing aircraft. The outbound baggage system is illustrated as part of the baggage conveyor system throughout the main terminal area (Figure 5-22), Concourse B (Figure 5-14), Concourse C (Figure 5-16), and Concourses D and E (Figure 5-19).

Inline/Explosives Detection System Baggage Screening

The Port is implementing a 100% in-line explosives detection system matrix to comply with TSA requirements. The in-line baggage screening system is a continuous system used to transport baggage on conveyors from airline ticket counters underground to a new EDS inline matrix.

The term “matrix” is used to describe the complex travel path of the baggage once it leaves the ticketing/check-in area, as shown on Figure 5-23. This system is expected to be completed by the end of 2009 and will provide significant relief to congested ticket lobby areas where much of the screening equipment is currently located.

As bags are “re-routed” through the screening matrix, the current outbound baggage conveyance arrangement will be modified. Additional seismic bracing will also be required. This improvement will require relocation of the existing infrastructure, such as the TSA on-screen-resolution space, explosives trace detection (ETD) screening areas, break rooms, corridors, and tenant spaces.

An in-line baggage screening system provides a high level of service for passengers and airlines by automating the screening process. The system increases the reliability that checked baggage does not contain any forbidden objects, expedites the security screening process, reduces the amount of time passengers have to check baggage before aircraft departure times, reduces lobby congestion, reduces airline and TSA resources devoted to the baggage screening process, and complies with federal mandates.

Completion of the in-line baggage screening system will enable Airport management to meet future ticket lobby capacity growth needs by freeing up space in the ticket lobby for queuing and circulation.

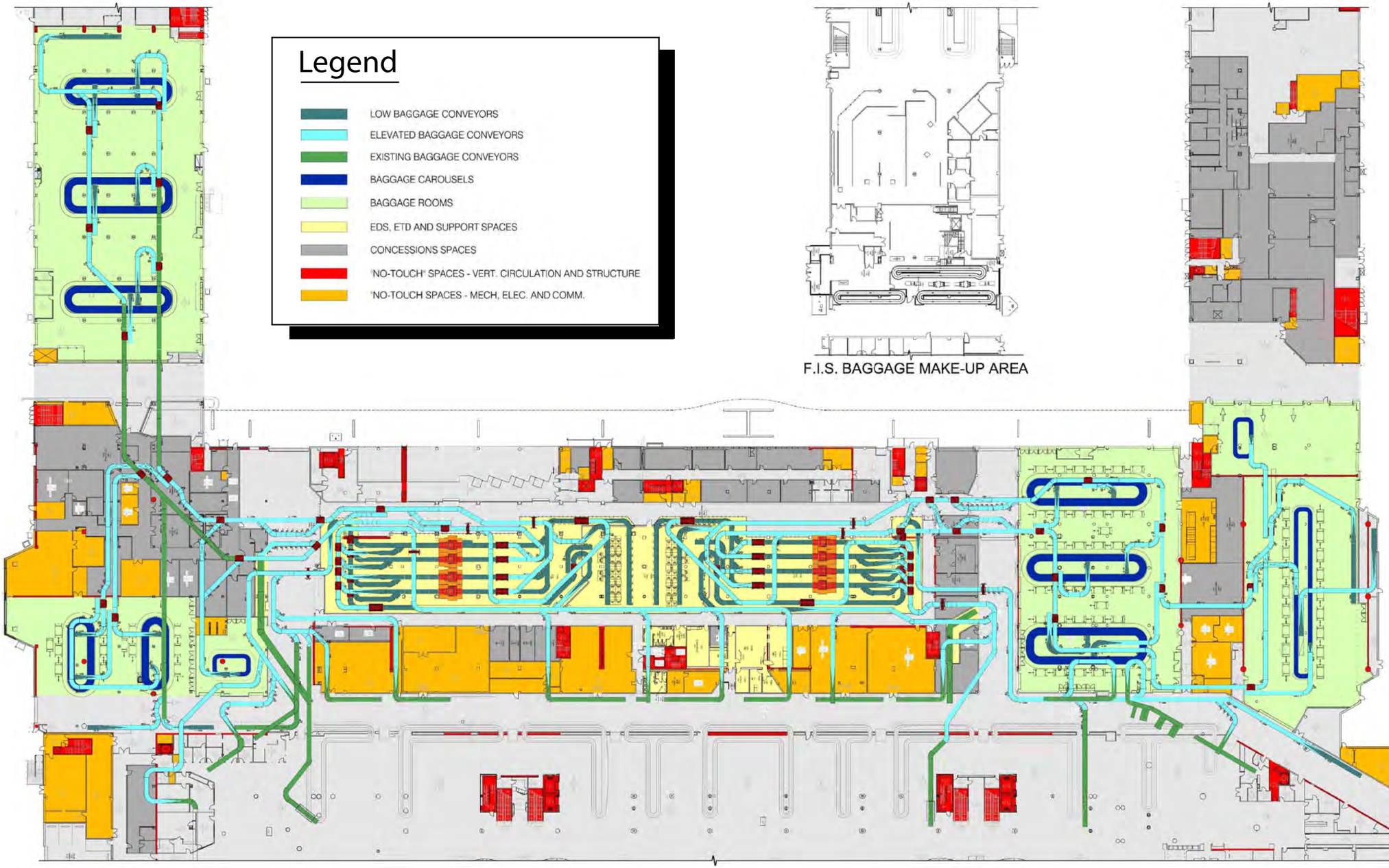
Ground Service Equipment Circulation

Ground service equipment circulation areas are considered the designated rights-of-way for tugs and baggage carts to maneuver between inbound baggage, outbound baggage, and aircraft parking apron areas. GSE equipment circulation areas are marked by striped service roads, which run along the backside of aircraft parking limit lines and throughout the terminal apron areas. These circulation areas are located throughout the main terminal area (Figure 5-22), Concourse B (Figure 5-14), Concourse C (Figure 5-16) and Concourses D and E (Figure 5-19).

Federal Inspection Services

Federal Inspection Services (FIS) for arriving international passengers are located at the west end of Concourse D (Figure 5-19). This area consists of immigration and passport control (primary inspection) services, as well as two baggage claim units.

After primary screening, passengers claim their baggage and proceed to customs and agricultural inspection areas (secondary inspection). After clearing primary and secondary screening procedures, passengers are then transported via shuttle to the International Arrivals Area, located at the north end of the baggage claim area.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Figure 5-23

In-Line Baggage Screening System (First Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

Non-Public Secure Circulation

Non-public secure circulation areas are the areas accessible only by Airport, airline, or other personnel under escort of a person with a Secure Identification Display Area badge. These areas include corridors, vertical circulation (i.e., stairs and elevators) and other areas that typically require a security clearance, as outlined by the Airport access control systems protocol. Non-public secure circulation areas are located throughout the main terminal area (Figure 5-22), Concourse B (Figure 5-14), Concourse C (Figure 5-16), and Concourses D and E (Figure 5-19).

Other Areas

Other areas on the deplaning level include restrooms, concession/concession storage, Port areas, maintenance/heating, ventilation, and air conditioning (HVAC)/electrical, information technology (IT) communications areas, and the loading dock. As they pertain to the deplaning level, concession/concession storage areas are non-public areas that provide storage locations for concessionaires, retailers, and other tenants that operate at PDX. Port areas are non-public areas that provide storage locations for terminal area support.

5.2.2 Enplaning Level (Second Floor)

With the exception of Concourse A, which is a single-level concourse, the enplaning level is the second floor of the passenger terminal (see the main terminal area shown on Figure 5-24**,** Concourse A shown on Figure 5-13, Concourse B shown on Figure 5-15, Concourse C shown on Figure 5-17, and Concourses D and E shown on Figure 5-20). The traveling public is most familiar with the functional areas located on the enplaning level. At PDX, the enplaning level consists of the airline ticketing lobby, the Oregon Market, the Oregon Market Food Court, two security screening checkpoints, and the majority of aircraft holdrooms and boarding gates. The enplaning level also provides airline ticket offices and the concourse connector. Outside at the enplaning level is the departures (upper) level roadway, which is covered by the signature canopy that is unique to PDX.

Pre-Security Circulation Areas

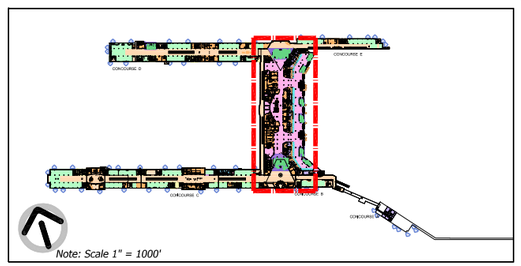
The pre-security circulation areas are located in the main terminal on the enplaning level. The ticket lobby, airline ticket offices, and concessions are located on this level.

C2

D1

Legend

- Airline Ticket Offices
- Airline Holdrooms
- Airline Lounges
- Restrooms
- Concession / Concession Storage
- Pre-Security Circulation Areas
- TSA Security Screening Checkpoints
- Maintenance / HVAC / Electrical
- Post Security Circulation Areas
- B2 Gate



AIRPORT FUTURES
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0' 60'
Scale: 1" = 60'

Figure 5-24

Main Terminal Area: Enplaning Level (Second Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

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Ticket Lobby and Passenger Check-In

Departing passengers check-in baggage and obtain their boarding passes in the ticket lobby. This area is located on the second floor of the main terminal area. Many of the traditional ticket lobby functions have changed in the post-September 11 aviation environment as a result of advancements in technology, an increase in security, and an economic condition in which airlines are attempting to reduce operating costs.

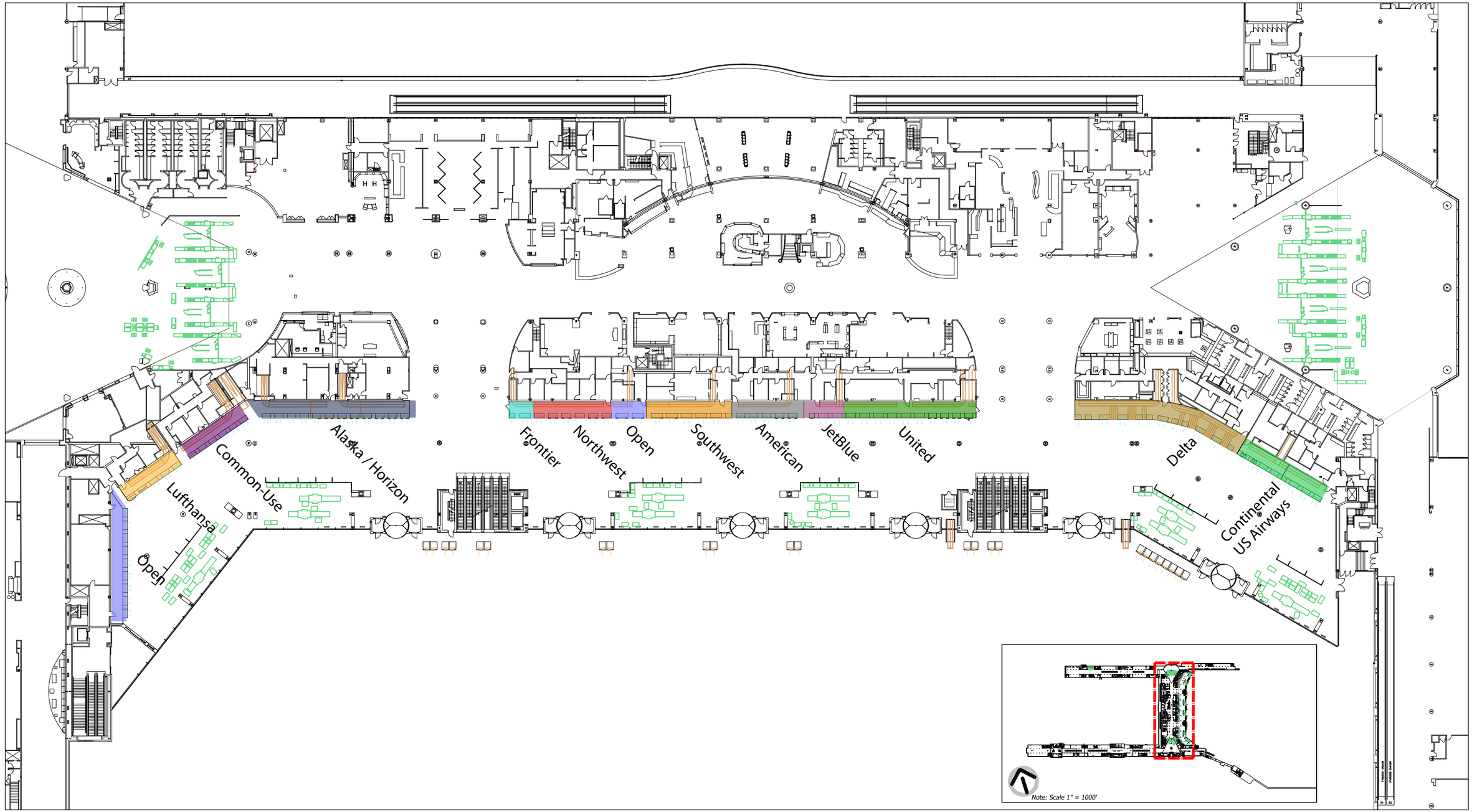
Passengers have many options for checking in for their flights at PDX. Travelers have access to electronic self-service kiosks that are free-standing or integrated into the ticket lobby queue. These integrated kiosks were created for those passengers needing assistance from a ticket agent. Although a portion of the ticket counter has been retrofitted to accommodate kiosks, the traditional linear ticket counter area is still available for those passengers who prefer to wait in line for a ticket agent. Each airline has a different check-in process and ticketing counter arrangement depending on its preferences. The airline ticket counter assignments in the ticket lobby are shown on Figure 5-25. An additional check-in option is to use the skycap service located at the curbfront. This service is provided to increase the capacity of the ticket lobby, but a fee is required for the services rendered.

The increase in security is highly visible to passengers as they enter the ticket lobby through one of six vestibules from the departures roadway curb. Ten EDS machines screen baggage at PDX. They are located along the front window wall in the ticket lobby and staffed by the TSA. Currently, after passengers check in with their airline, they must take their baggage to an additional location to be screened by TSA agents.

Common Use Terminal Equipment

Common use terminal equipment (CUTE) allows airlines to share terminal resources, such as boarding gates, check-in counters, and boarding pass readers. CUTE increases efficiency and reduces costs in administrative offices. In conjunction with the execution of a new Airport/Airline Agreement in 2005, the airlines requested an option for CUTE to be provided by the Port. This request was implemented, primarily for international carriers, at ticket counters and several Port-managed aircraft gates. There is a significant opportunity for CUTE to potentially delay the necessity for future ticket lobby and airline holdroom/gate expansion. CUTE also achieves operational efficiencies and reduces costs when it is necessary to close gates for temporary construction or other purposes. PDX currently has 16 CUTE ticket counter positions.

Four common-use holdrooms, including two international gates, are available at PDX. Airport development plans include having common use facilities available at all six of the international gates within the next 2 to 3 years.



AIRPORT FUTURES
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Figure 5-25

Ticket Lobby Airline Allocation (Second Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

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Airline Ticket Offices

Airline ticket offices (ATOs) traditionally include space to support day-to-day activities and transactions specific to airline operations. Currently, the airline ticket offices at PDX are located immediately behind the ticket counters, and public access to these areas is not available.

Concessions

PDX has a diverse and award winning concessions program. With nationally and regionally recognized concessionaires located throughout the main terminal and concourses, the concessions program continually generates increased gross sales and ranks high in customer satisfaction. The concessionaires at PDX are listed in Table 5-5. Although most concessionaires are located in pre-security circulation areas, concessions in post-security circulation areas are also discussed below.

The concessions program at PDX consists of four basic types of offerings. These include food and beverage, retail, news/gifts, and specialty type concessions. The majority of concessions are of the food and beverage variety. PDX has a total of 20 food and beverage concessionaires located at 29 locations. Gustav's Pub and Grill, Rose City Café & Wine Bar, and Stanford's are the Airport's full service restaurants and bars. The other food and beverage concessionaires range from quick service eateries to full-service bars. Although the hours of operation vary for the food and beverage concessions, most are open generally between the hours of 5:00 a.m. and 9:00 p.m.

Retail concessionaire typically sell a particular type of product, such as apparel, specialty or fine gifts, stationary, toys, or jewelry. Duty-free items are also sold. These concessionaires are generally open for business between 6:00 a.m. and 9:00 p.m. PDX currently has 10 retail concessionaires at 14 locations. Most of the retail concessionaires are located in the Oregon Market in the main terminal.

Other concessionaires specialize in news, books, and quick travel needs. At PDX, the three news/travel concessionaires are Hudson News, Your Northwest Travel Mart, and Powell's Bookstore. These concessionaires are located at 14 locations throughout the terminal and concourses and are open beyond the business hours for retail concessionaires.

Specialty concessionaires provide passenger services. PDX has two specialty concessionaires. RelaxStation is located in the Oregon Market and provides barbershop, hair, shoe shine, nail, and massage services. InMotion Pictures provides DVD player and movie rentals.

Table 5-5

CONCESSIONAIRES

Concessionaire Type	Location	Concessionaire Name	Concept
Food/Beverage			
	Oregon Market Food Court	Beaverton Bakery	Regional
		Coffee People *(a)*	Regional
		Jamba Juice	National
		Panda Express	National
		Pizzicato	Regional
		Quiznos Sub	National
		Rose City Café & Wine Bar *(b)*	Regional
		Sandoval's Fresh Mexican Grill *(a)*	Regional
		Stanford's *(b)*	Regional
		Wendy's *(a)*	National
	Concourse A	Laurelwood *(a)*	Regional
	Concourse B	Coffee People	Regional
		Starbucks Coffee *(a)*	National
	Concourse C	Coffee People *(a)*	Regional
		Good Dog/Bad Dog	Regional
		Gustav's Pub & Grill *(b)*	Regional
		Pizza Schmizza	Regional
		Riverfront Café	Regional
		Sandoval's Fresh Mexican Grill *(a)*	Regional
		Wendy's *(a)*	National
	Concourse D	Starbucks Coffee *(a)*	National
		Rogue Ales Public House	Regional
		Wendy's *(a)*	National
	Concourse E	Coffee People *(a)*	Regional
		Laurelwood *(a)*	Regional
	South Lobby	Caper's café	Regional
		Starbucks Coffee *(a)*	National
	North Lobby	Coffee People *(a)*	Regional
	Baggage Claim	Starbucks Coffee *(a)*	National

Table 5-5 *(page 2 of 2)*
CONCESSIONAIRES

Concessionaire Type	Location	Concessionaire Name	Concept
Retail			
	Oregon Market	Aria	Regional
		Brookstone *(a)*	National
		Made In Oregon *(a)*	Regional
		NIKE Store	Regional
		Norm Thompson	Regional
		The Paper Station	Regional
		The Oregon Pendleton Shop *(a)*	Regional
		The Real Mother Goose	Regional
		Spirit of the Red Horse	National
	Concourse C	Creative Kidstuff	National
		Made In Oregon *(a)*	Regional
		The Oregon Pendleton Shop *(a)*	Regional
	Concourse D	Made In Oregon *(a)*	Regional
	South Lobby	Brookstone *(a)*	National
News/Travel			
	Oregon Market	Hudson News *(a)*	National
		Powell's Books *(a)*	Regional
		Your Northwest Travel Mart *(a)*	Regional
	Baggage Claim	Hudson News *(a)*	National
	South Lobby	Your Northwest Travel Mart *(a)**	Regional
	Concourse A	Your Northwest Travel Mart *(a)*	Regional
	Concourse B	Hudson News *(a)*	National
	Concourse C	Hudson News *(a)*	National
		Powell's Books *(a)*	Regional
		Your Northwest Travel Mart *(a)*	Regional
	Concourse D	Hudson News *(a)*	National
		Powell's Books *(a)*	Regional
		Your Northwest Travel Mart *(a)*	Regional
	Concourse E	Your Northwest Travel Mart *(a)*	Regional
Specialty			
	Concourse D	Oregon Market	
		InMotion Pictures	National
		RelaxStation	Regional

(a) Concessionaire is located in multiple locations.
(b) Concessionaire is a full service restaurant and bar.

Source: Port of Portland.

Passenger Screening

The Transportation Security Administration is responsible for ensuring the security of the nation's transportation systems. TSA provides mandatory passenger and baggage screening services at airports.

Following the check-in process, passengers proceed to one of the two TSA security screening checkpoints located at the northern and southern ends of the main terminal adjoining the concourses. There are eight security lanes at the northern checkpoint and eight security lanes at the southern checkpoint. Express lanes are available at the security screening checkpoints for airline mileage program cardholders and passengers with special needs.

Post Security Circulation Areas

Circulation areas past the security screening checkpoints include the concourse connector, airline holdrooms, boarding gates, and concessions.

Concourse Connector

The secure concourse connector joins the Airport's south concourses (Concourses A, B, and C) with the north concourses (Concourses D and E). The connector allows connecting passengers to transfer between the north and south concourses conveniently on moving walkways without having to pass through a TSA security checkpoint. The connector also allows originating passengers to access the north and south concourses. The location of the concourse connector is shown on Figure 5-8.

Airline Holdrooms and Boarding Gates

The majority of Airport holdrooms and adjoining aircraft boarding gates are on the enplaning level. Departing passengers enplane and arriving passengers deplane into airline holdrooms. Concourse B has three boarding gates shared by one common holdroom (see Figure 5-15**)**. Concourse C has 23 boarding gates and 11 holdroom areas (see Figure 5-17). Concourse D has 15 boarding gates and eight common holdroom areas (see Figure 5-19). Concourse E has seven boarding gates and four common holdroom areas (see Figure 5-19). The boarding gates and holdrooms for Concourse A are located on the deplaning level. Airlines assigned to each boarding gate are listed on Figure 5-7.

Other Areas

Other service areas on the enplaning level include restrooms and Airport utility areas (maintenance/HVAC/electrical). The post security circulation area connects all functional areas. For the comfort of passengers, moving walkways are provided on

Concourses C (three moving walkways), D (two moving walkways), and E (two moving walkways). Concourses A and B do not have moving walkways.

5.2.3 Mezzanine Level (Third Floor)

The mezzanine level is located on the third floor of the passenger terminal and includes Port of Portland administrative offices, various Airport tenant offices, Airport utility areas, and the Airport Conference Center (the mezzanine level of the main terminal area is illustrated on Figure 5-26. See Figures 5-18 and 5-21 for the mezzanine level on Concourses C and Concourses D and E, respectively.

Conference Center

The Airport offers conference facilities and services to passengers and local businesses on the third floor of the main terminal building. Six conference rooms are available as typical business services, such as meeting audio visual equipment, catering, photocopying and facsimile services.

5.2.4 Passenger Amenities

Wi-Fi Services

Wi-Fi is a generic term that refers to wireless Internet service for mobile computing devices, such as notebook computers, personal data assistants (PDAs), and cell phones. Free Wi-Fi service is available in 70% of the main terminal area, which includes most gates, the Oregon Market, and lobby areas near the north and south security screening checkpoints. The widely used free service was implemented in late 2004 and has proven to be enormously popular.

Other Passenger Services

Several other services are provided at the Airport to assist passengers. Volunteer Information Persons are located throughout the main terminal to provide information to passengers. A service dog relief area is located outside baggage claim at the north end of the terminal. Family restrooms are available on several concourses. Children's play areas are located near the northern security screening checkpoint and on Concourses A and D.

Assistance is available for disabled passengers throughout their Airport experience. All quick-pay parking payment machines are wheelchair accessible. Courtesy shuttle buses are accessible for disabled persons and are equipped with a visual announcement system for the hearing impaired. Wheelchair and blind assist services are also offered. Text telephones (TTY) are available in the main terminal and on each concourse for the deaf and/or hearing impaired. Visual paging is available on

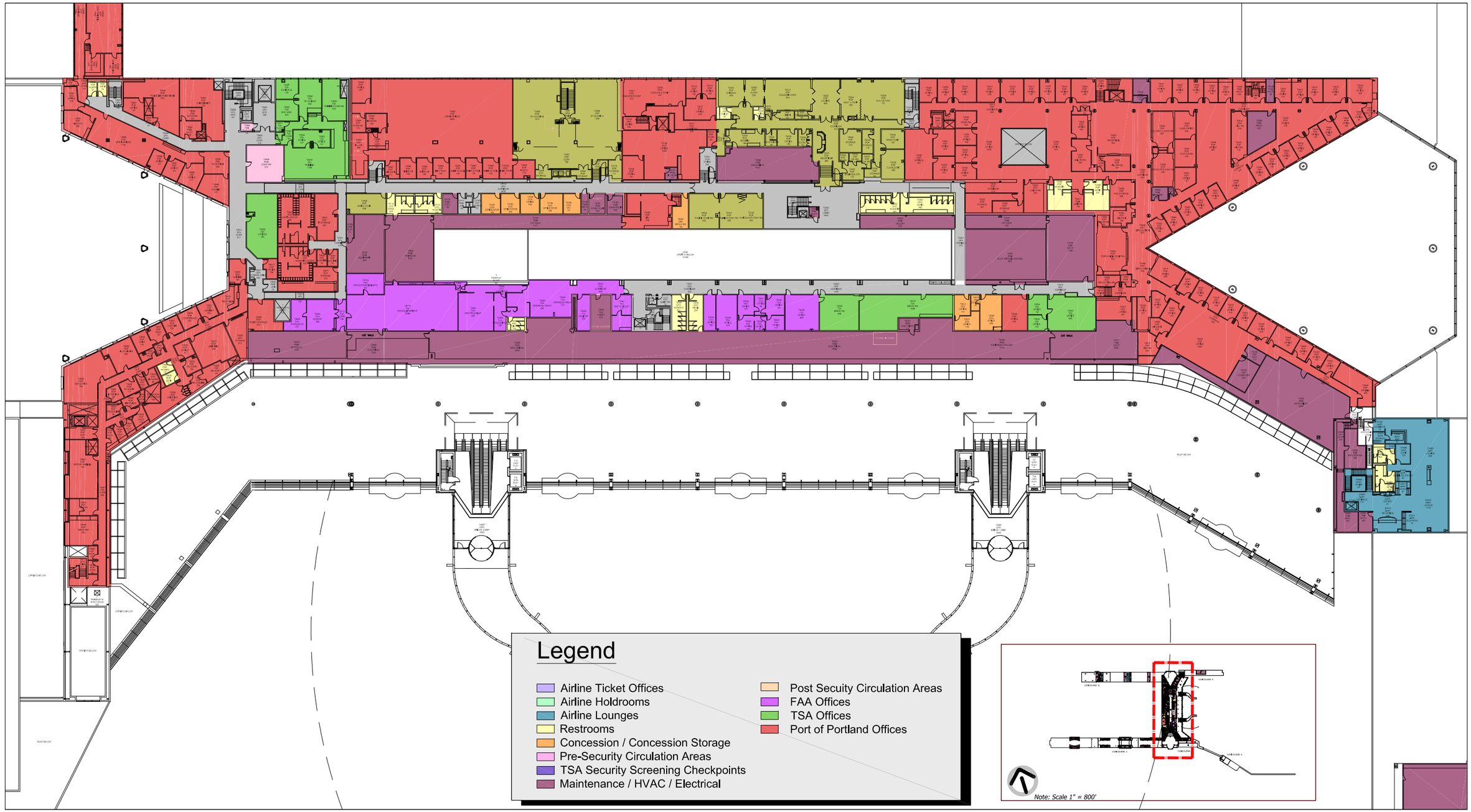

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Figure 5-26

Main Terminal Area: Mezzanine Level (Third Floor)

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

Concourses C, D, and E, in baggage claim, and in the main terminal food court. Drinking fountains are wheelchair accessible. In addition, Areas of Rescue Assistance are available to assist mobility-impaired persons.

5.3 Ground Transportation/Parking

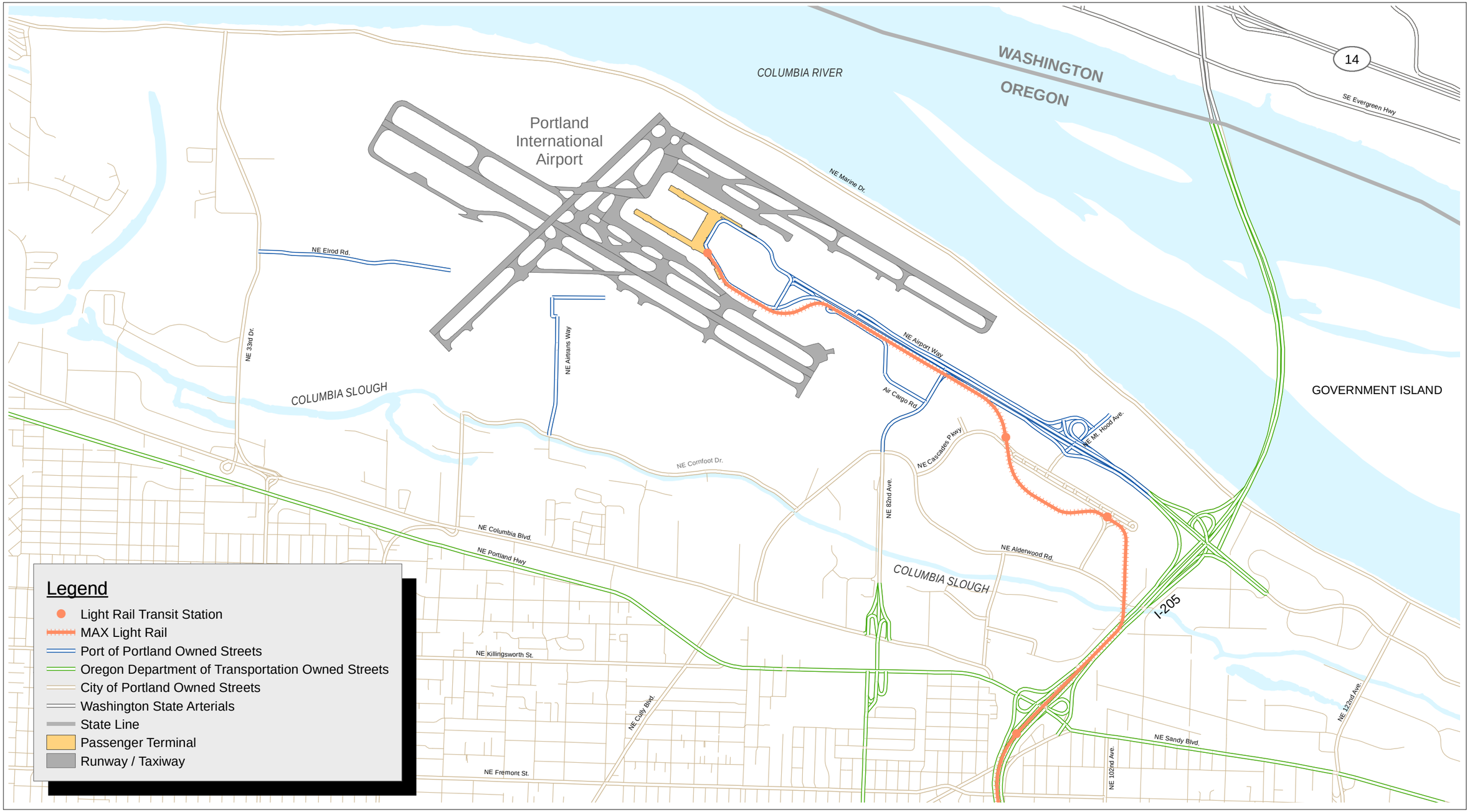
This physical inventory of ground transportation facilities at the Airport provides a baseline for future facility requirements and identifies existing deficiencies. For facilities with improvements currently under way or programmed for completion through 2009, information is provided for both existing conditions and the planned improvements.

The physical inventory of ground transportation facilities was based on three principal data sources: (1) the *Terminal Access Study* prepared for the Port by Jacobs Consultancy, dated March 2005; (2) the *Landside Operational Management Study* prepared for the Port by Jacobs Consultancy, dated April 2007; and (3) additional information provided by Airport staff.

5.3.1 Off-Airport Access System

The off-Airport access system includes freeways, arterials, the Tri-County Metropolitan Transportation District of Oregon (TriMet) Metropolitan Area Express (MAX) light rail system, bicycle routes, and regional trails, which connect the Airport with the surrounding region. The regional ground access facilities that connect to the on-Airport roadway and light-rail systems are described below.

Figure 5-27 depicts the major off-Airport regional roadways and the light-rail line providing access to and from the Airport. Bicycle and regional trails that connect to the Airport's pedestrian and bicycle network are described in Section 5.3.11. I-205, located approximately 2 miles east of the Airport terminal, is the major access route for passengers and employees traveling to and from the Airport. I-205 is a six-lane interstate freeway traversing the east side of the Portland/Vancouver metropolitan area that connects with I-5 in Salmon Creek, Washington, north of Vancouver, and in Tualatin, Oregon, south of Portland. NE Airport Way, a four-lane to six-lane east-west arterial, provides access from I-205 to and from the major destinations on the east side of the Airport, including the terminal building and all public parking facilities. Access to and from NE Airport Way is also provided via NE 82nd Avenue, which connects to NE Killingsworth Street, NE Columbia Boulevard, and NE Sandy Boulevard, and from NE Mt. Hood Avenue, which provides access to the Cascade Station/Portland International Center development area of the Airport.



AIRPORT FUTURES
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Figure 5-27

Regional Roadway System

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Portland International Airport

Source: Port of Portland Staff

September 2008

Access to the Oregon Air National Guard area and the Central, South-Central, and South Ramp areas, which include cargo facilities and other properties on the south side of the Airport, is via NE Cornfoot Road, which connects to NE AirTrans Way. Access to facilities in the South-Central Ramp area, which includes the Bonneville Power Administration (BPA) Hangar and Ameriflight facility, is via NE 33rd Drive and NE Elrod Road. Access to the Northwest Ramp facilities on the north side of the Airport, including the fuel farm, aircraft rescue and fire fighting (ARFF) facility, and U.S. Forest Service property is via NE Marine Drive.

The TriMet MAX light rail (LRT) system's Red Line approaches Airport property from the south and provides direct access to Cascade Station/Portland International Center and the passenger terminal. The light rail system is further described in Section 5.3.7.

Figure 5-27 also indicates the ownership of the roadways on and near the Airport. As shown, the Port of Portland owns many of the roadways on Airport property; the Oregon Department of Transportation owns I-205, NE Sandy Boulevard/NE Killingworth Street/ NE Lombard Street (U.S. Route 30) south of the Airport and NE 82nd Avenue south of the Columbia Slough. The City of Portland owns all of the remaining roadways both on and around Airport property.

5.3.2 Access and Circulation Roadways

As noted above, NE Airport Way is the primary access route to and from the terminal building, public parking facilities, and other facilities located on the east side of the Airport. Generally, NE Airport Way is a six-lane limited access arterial (three lanes in each direction) with a center island median between I-205 and NE 82nd Avenue. West of NE 82nd Avenue, NE Airport Way is a four-lane limited access arterial (two lanes in each direction) with a center median until it reaches the terminal area. As westbound NE Airport Way approaches the terminal area, it widens to four lanes and includes auxiliary drop lanes for access to the many terminal area activity areas, including, but not limited to, long-term parking, short-term parking, rental car return, the commercial roadway, and the enplaning and deplaning levels.

At the south end of the enplaning and deplaning levels, roadways leading from the enplaning level, the deplaning level, the Commercial Roadway, and the rental car ready/return areas merge together to form eastbound NE Airport Way. After a merge from the public parking exit and a diverge for the terminal recirculation road, eastbound NE Airport Way turns to the northeast before it converts to a parallel alignment to westbound NE Airport Way.

Because NE Airport Way is designed to be a high volume, limited access roadway, direct roadway access to adjacent land uses along the corridor is provided by parallel frontage roadways. On the north side of NE Airport Way is NE Frontage Road, which runs east-west for over one mile between NE Mt. Hood Avenue and the North Cargo

Complex and provides access to uses such as the Economy Parking Lot, rental car storage areas, the Sheraton and Hampton hotels, and air cargo uses. On the south side of NE Airport Way is NE Air Cargo Road, which runs west from NE 82nd Avenue for over 0.5 mile and provides direct access to the PDX Cargo Center and the U.S. Post Office.

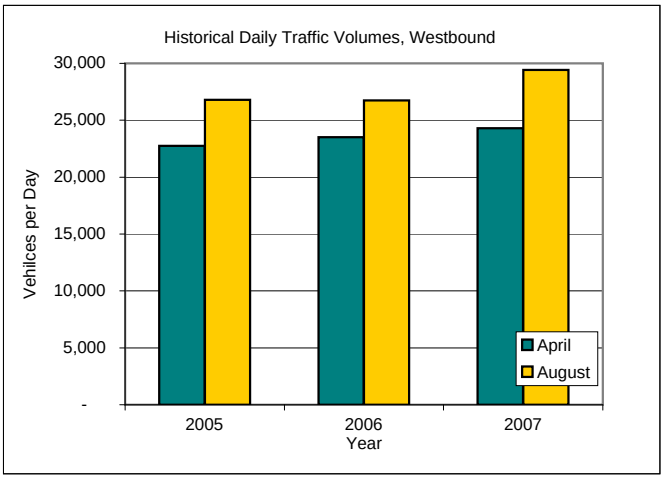
A secondary, but very important, access route to the Airport is NE 82nd Avenue, which is the main arterial access route for a number of Airport support uses on the south side of the Airport, as well as the main public access route for much of north and northeast Portland. On Airport property, NE 82nd Avenue is a five-lane (two travel lanes each direction and a center turn lane) arterial roadway. South of the Airport, NE 82nd Avenue becomes a secondary state highway (Highway 213) running south to Clackamas County.

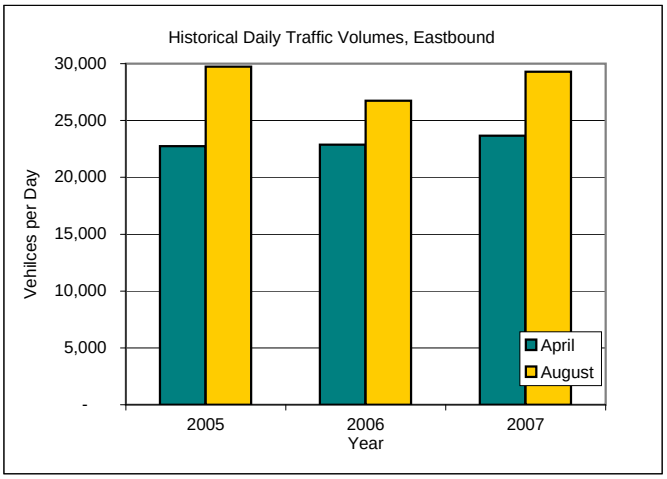
There are eight traffic signals on Airport property. Three are on NE Airport Way, including an emergency access signal on the westbound lanes near the terminal, which is a Department of Homeland Security vehicle inspection signal at the western terminus of NE Frontage Road. The intersection of NE Airport Way and NE 82nd Avenue has a major signal that also controls traffic to accommodate an at-grade crossing of the LRT with NE 82nd Avenue, immediately south of NE Airport Way. Two signals are located on NE 82nd Avenue at its intersections with NE Air Cargo Road and NE Alderwood Road. Two signals are located on NE Cascades Parkway at its intersections with NE Alderwood Road and NE Mt. Hood Avenue, and one signal is located on NE Mt. Hood Avenue at its intersection with the NE Airport Way eastbound on and off ramps. All of these signals are operated and maintained by the City of Portland.

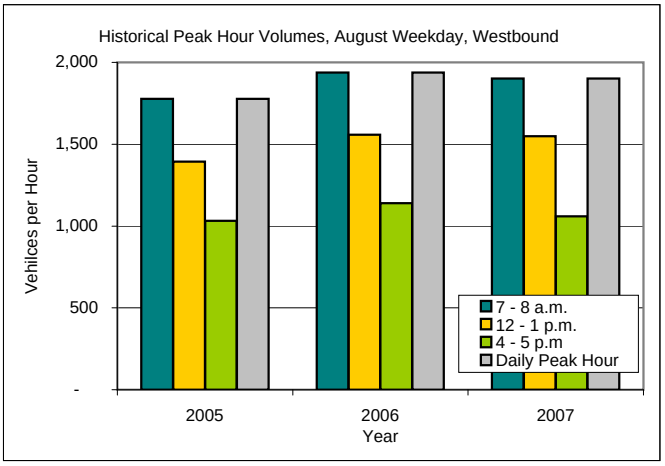
5.3.3 Historical Traffic Volumes and Patterns

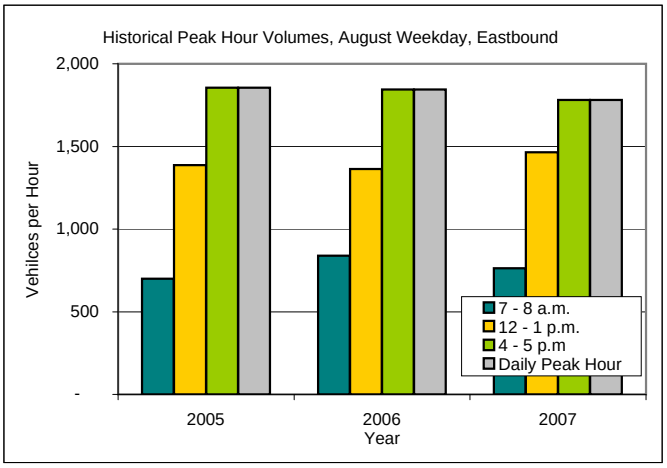
Historical traffic count data were provided by 24-hour machine counts taken by the Port as part of its ongoing traffic monitoring program. Figures 5-28 through 5-31 present selected traffic volume data for a peak month (August) and an average month (April) for traffic volumes at the Airport on four key on-Airport roadways: NE Airport Way, east of NE 82nd Avenue (Figure 5-28); NE Airport Way, west of NE 82nd Avenue (Figure 5-29); NE 82nd Avenue, south of NE Airport Way (Figure 5-30); and the enplaning and deplaning curbside roadways (Figure 5-31). For all locations, the data shown are for a typical midweek day during the selected months.

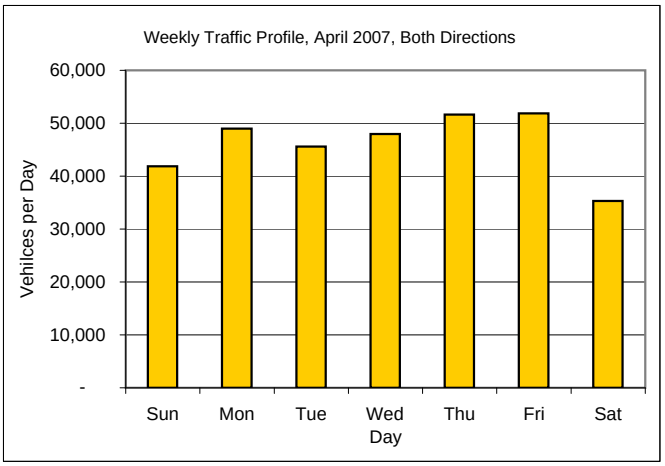
Figure 5-28 presents historical data for traffic entering and exiting the Airport on NE Airport Way, east of NE 82nd Avenue, in 2005 through 2007. This roadway carries the majority of airline passengers and employees, but also accommodates non-Airport-related traffic that may be using Airport roadways to travel to and from I-205. Thus, peak traffic volumes, while affected by Airport passenger and employee activity, also reflect the impact of regional commute patterns. For the three-year period analyzed,











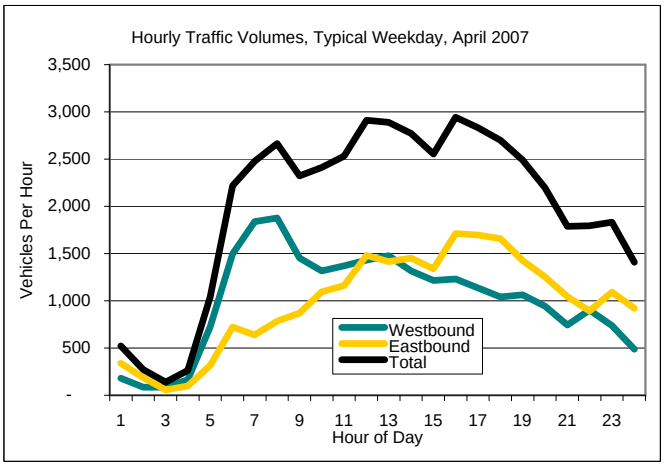


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Figure 5-28

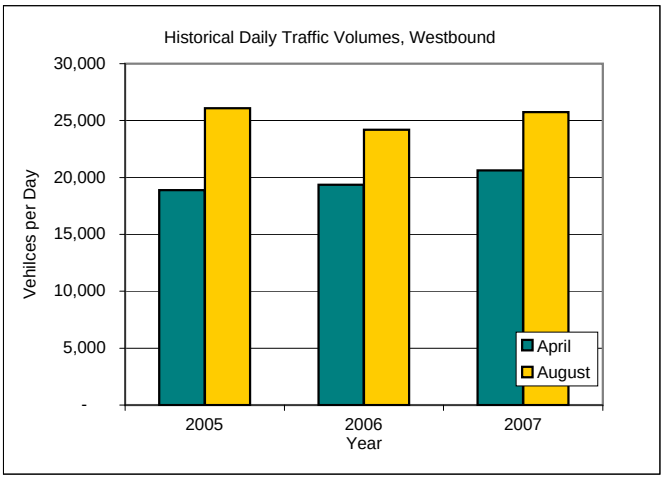
Traffic Volumes

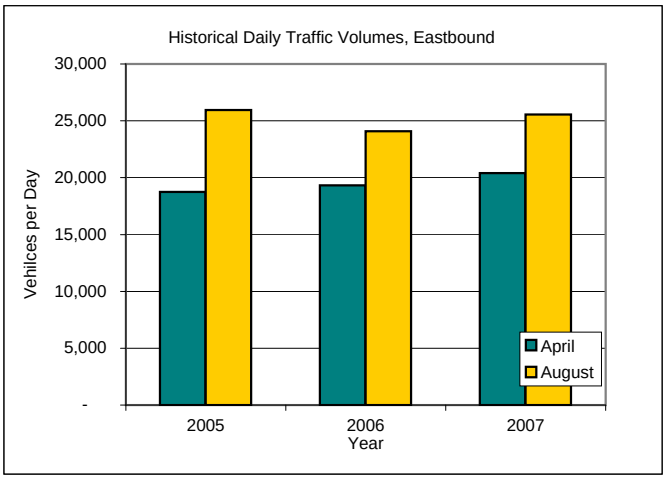
NE Airport Way, East of NE 82nd Avenue

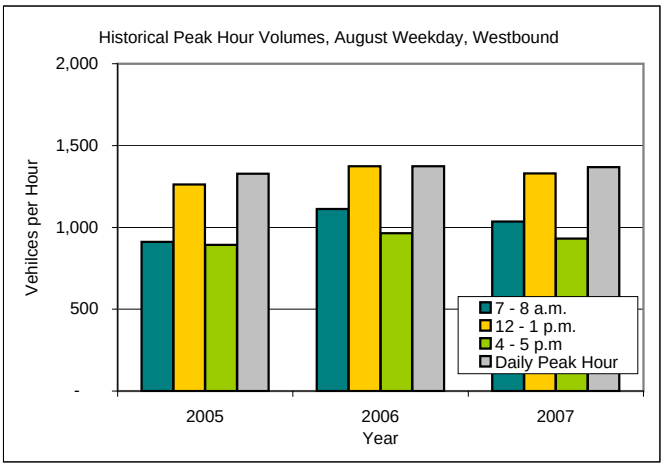
Master Plan Update
Portland International Airport

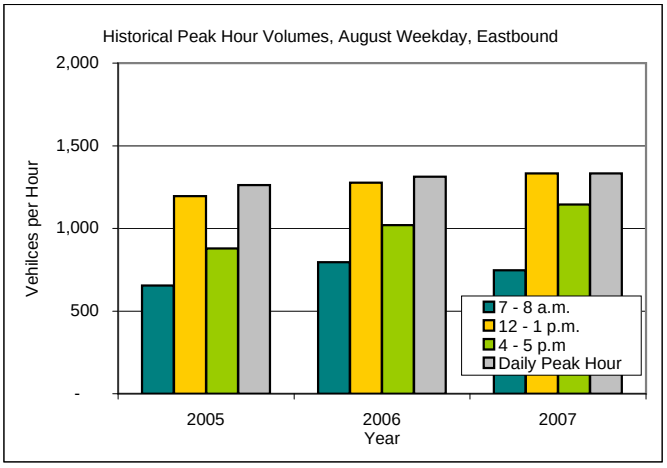
Source: Jacobs Consultancy, based on traffic volume count data provided by the Port of Portland.

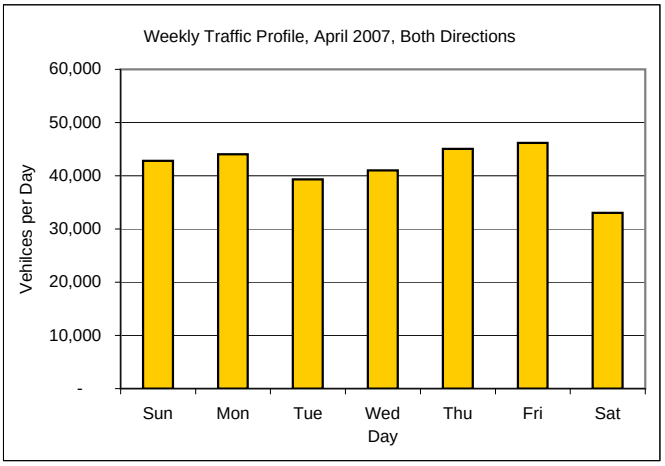
September 2008

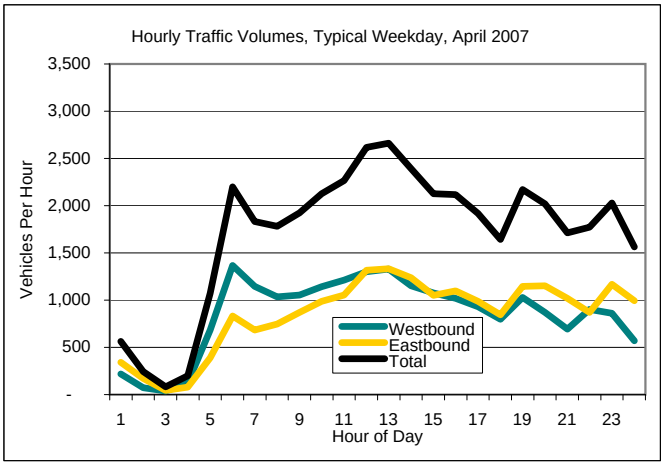












AIRPORT FUTURES
CHARTING A COURSE FOR PDX

Figure 5-29

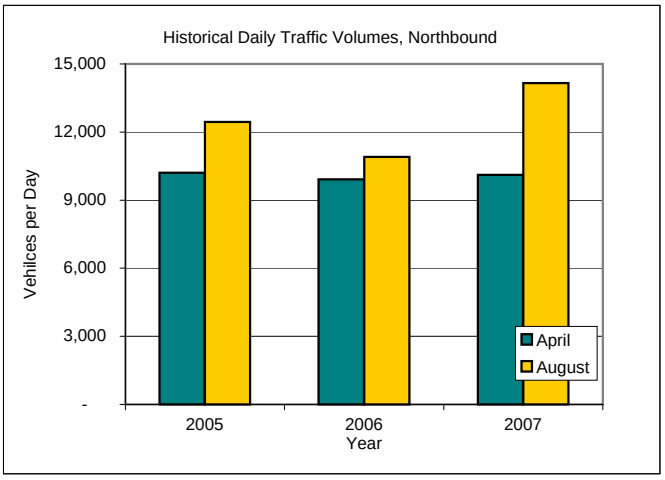
Traffic Volumes

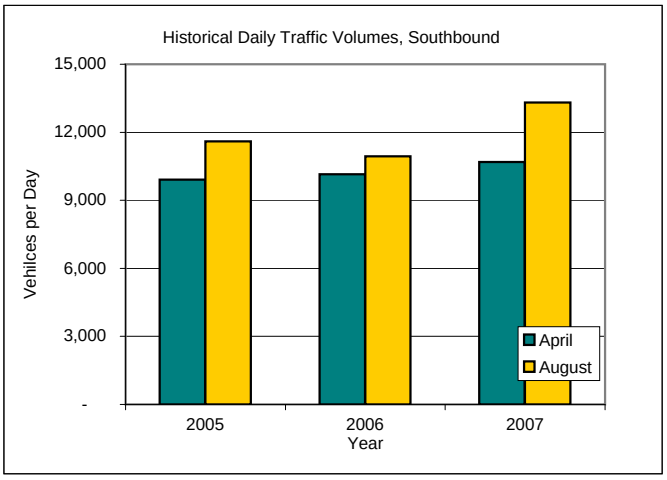
NE Airport Way, West of NE 82nd Avenue

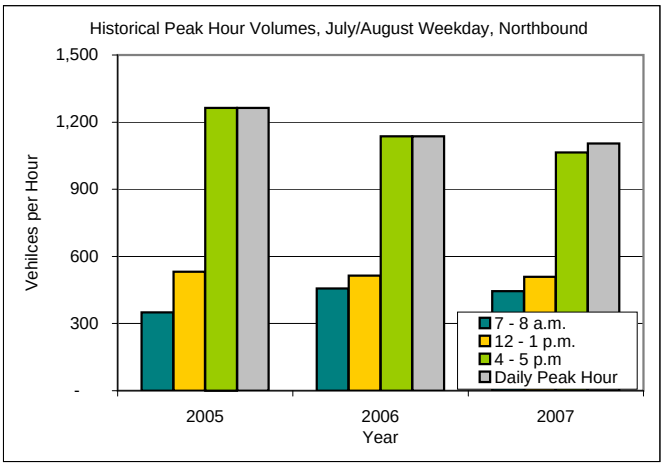
Master Plan Update
Portland International Airport

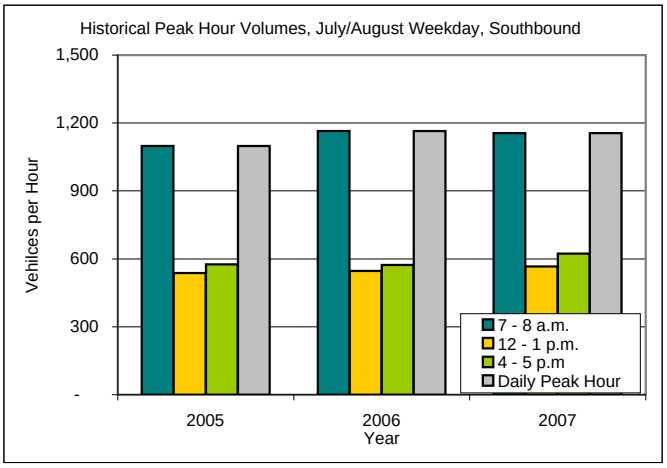
Source: Jacobs Consultancy, based on traffic volume count data provided by the Port of Portland.

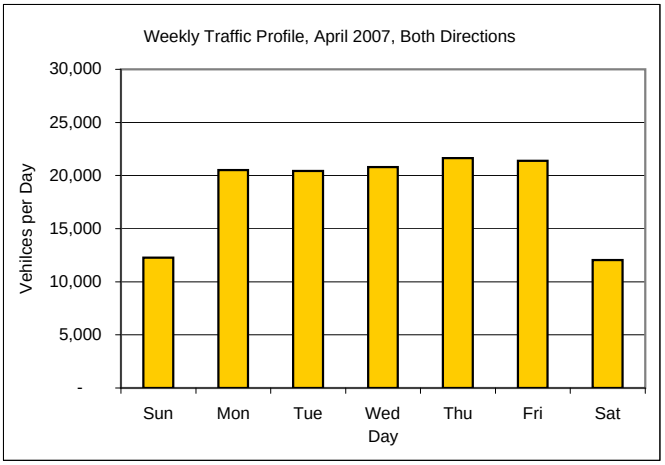
September 2008











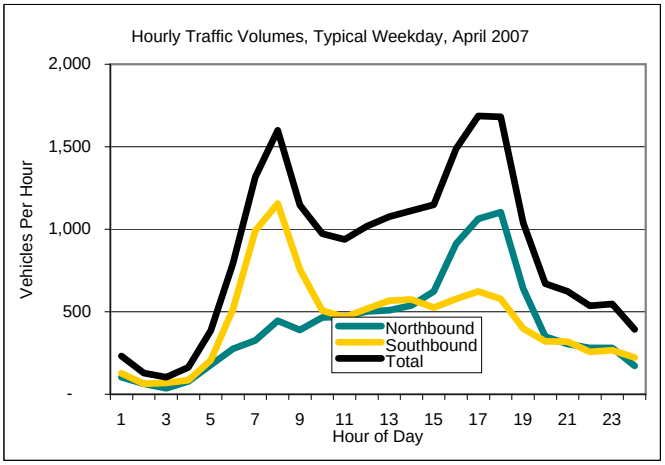


Figure 5-30

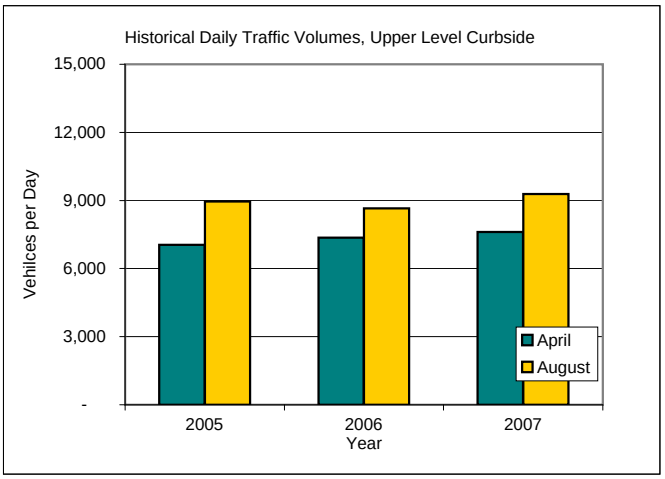
Traffic Volumes

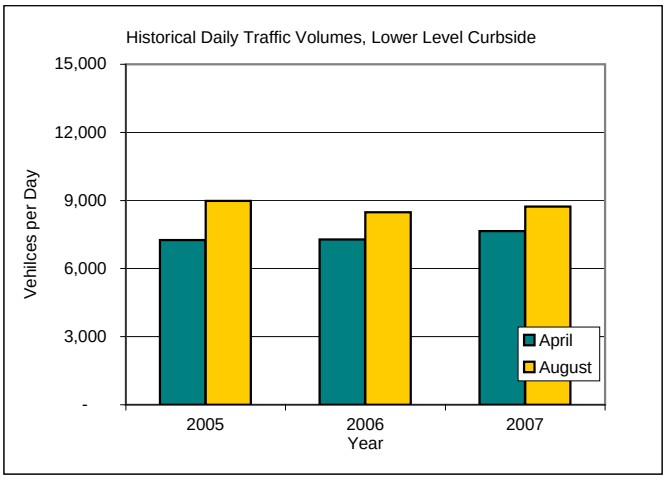
NE 82nd Avenue, South of NE Airport Way

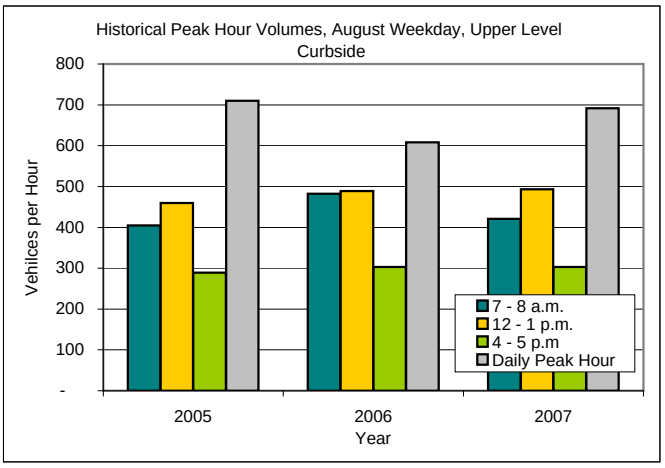
Master Plan Update
Portland International Airport

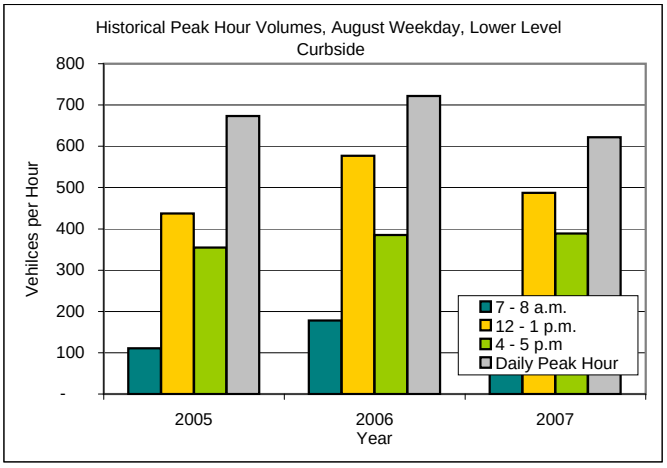
Source: Jacobs Consultancy, based on traffic volume count data provided by the Port of Portland.

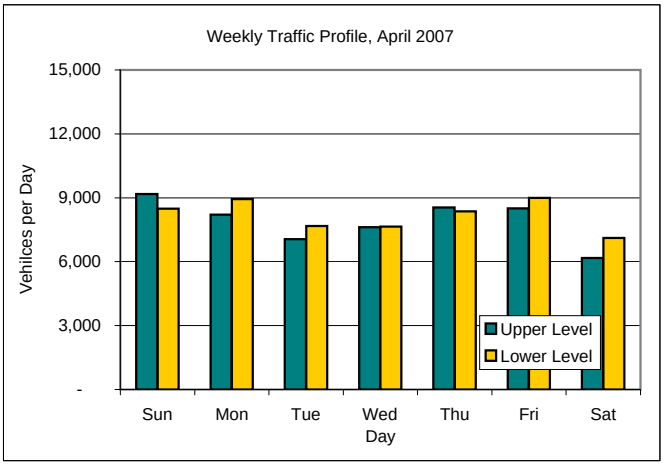
September 2008

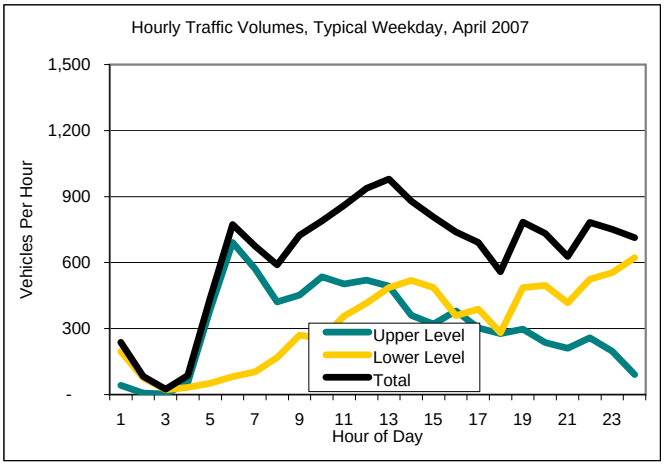












AIRPORT FUTURES
CHARTING A COURSE FOR PDX

Figure 5-31

Traffic Volumes
Curbside Roadways
Master Plan Update
Portland International Airport

Source: Jacobs Consultancy, based on traffic volume count data provided by the Port of Portland.

September 2008

daily August volumes are roughly 20% higher than in April. As shown, traffic varied between 26,000 and 30,000 vehicles per day in each direction during August. During April, however, daily traffic gradually increased. Over the same period, August morning peak hour (7 a.m. to 8 a.m.) and midday peak hour (noon to 1 p.m.) traffic gradually increased, while evening peak hour (4 p.m. to 5 p.m.) traffic remained constant or gradually declined. Figure 5-28 also presents the weekly and hourly profiles of traffic on NE Airport Way, east of NE 82nd Avenue, during a typical week in April 2007. As shown, the highest daily traffic volumes occurred on Monday, Thursday, and Friday. During a given weekday, westbound traffic is highest during the morning (6 a.m. to 9 a.m.) and eastbound traffic peaks during the late afternoon and early evening (4 p.m. to 6 p.m.). Combining traffic in both directions, the roadway also experiences a third peak period between 12 p.m. and 1 p.m.

Figure 5-29 also presents historical data for traffic entering and exiting the Airport on NE Airport Way, west of NE 82nd Avenue. Traffic on this roadway is entirely related to Airport activity. Therefore, peak traffic volumes are highly correlated with peak hour passenger activity and employee shift changes. For the three-year period analyzed, daily August volumes are roughly 29% higher than in April. As shown, August daily traffic volumes were relatively constant at 25,000 vehicles per day in each direction between 2005 and 2007. During April, however, daily traffic gradually increased. Over the same period, August morning peak hour (7 a.m. to 8 a.m.), midday peak hour (noon to 1 p.m.), and evening peak hour (4 p.m. to 5 p.m.) traffic gradually increased. Figure 5-29 also presents the weekly and hourly traffic profiles, respectively, on NE Airport Way west of NE 82nd Avenue during a typical week in April 2007. As shown, the highest daily traffic volumes occur on Monday, Thursday, and Friday. During a given weekday, westbound traffic is highest during the morning (6 a.m. to 7 a.m.) and midday (12 p.m. to 1 p.m.) and eastbound traffic peaks midday, during the late afternoon and evening (4 p.m. to 6 p.m.) and during the night (11 p.m. to midnight). Combining traffic in both directions, the roadway experiences the highest peak between 12 p.m. and 1 p.m.

Figure 5-30 presents historical data for traffic approaching and departing the Airport terminal area on NE 82nd Avenue, south of NE Airport Way. This roadway carries a portion of airline passengers and employees, but also carries non-Airport-related traffic that may be using Airport roadways to travel to and from I-205. Thus, peak traffic volumes, while affected by Airport passenger and employee activity, also reflect the impact of regional commute patterns. For the three-year period analyzed, daily August volumes are roughly 20% higher than in April. As shown, since 2005, August daily traffic increased from approximately 12,000 vehicles per day (in each direction) to approximately 13,000 vehicles per day (in each direction). During April, however, daily traffic northbound remained constant while southbound traffic gradually increased. Over the same period, the northbound July/August morning peak hour (7 a.m. to 8 a.m.) traffic gradually increased, the midday peak hour (noon to 1 p.m.) traffic remained

constant, and the evening peak hour (4 p.m. to 5 p.m.) traffic decreased approximately 25%. Figure 5-30 also presents the weekly and hourly profiles of traffic on 82nd Avenue, south of Airport Way, during a typical week in April 2007. As shown, daily traffic volumes were relatively constant during weekdays, while weekend traffic was significantly lower. During a given weekday, northbound traffic was highest during the evening (4 p.m. to 6 p.m.) and southbound traffic peaked during the morning (7 a.m. to 9 a.m.). Combined, the northbound and southbound traffic reflects the peaking pattern in each direction: a morning peak due predominately to southbound traffic and an evening peak due predominately to northbound traffic.

Figure 5-31 presents historical data for traffic approaching the enplaning and deplaning curbside roadways. Traffic on these roadways is almost exclusively related to originating and terminating passengers and correlates to the schedule of arriving and departing flights. For the three-year period analyzed, daily August volumes are roughly 21% higher than in April. As shown, August daily traffic volumes on each level have been relatively constant at 9,000 vehicles per day since 2005. During April, however, daily traffic on each roadway gradually increased. Over the same period, on the enplaning level roadway, August morning peak hour (7 a.m. to 8 a.m.) traffic increased (although 2007 traffic volumes were lower than 2006 traffic volumes), midday peak hour (noon to 1 p.m.) traffic gradually increased, and evening peak hour (4 p.m. to 5 p.m.) traffic remained constant. On the deplaning level roadway, August morning peak hour (7 a.m. to 8 a.m.) traffic increased, midday peak hour (noon to 1 p.m.) traffic increased (although 2007 traffic volumes were lower than 2006 traffic volumes), and evening peak hour (4 p.m. to 5 p.m.) traffic gradually increased. Figure 5-31 also presents the weekly and hourly profiles of traffic on the enplaning and deplaning level roadways during a typical week in April 2007. As shown, the highest daily enplaning level traffic volumes were recorded on Sunday, Thursday, and Friday while the highest daily deplaning level traffic volumes were recorded on Monday and Friday. During a given weekday, enplaning level traffic is highest during the morning (6 a.m. to 7 a.m.) and deplaning level traffic peaks midday (1 p.m. to 3 p.m.) and during the night (11 p.m. to midnight). Combining traffic on both roadway levels, the roadways experience the highest peak between 12 p.m. and 2 p.m.

Peak Period Terminal Area Volumes

Figure 5-32, in combination with Table 5-6, presents hourly traffic volumes for three peak periods on terminal area roadways in August 2007 (the volumes for the periods shown may not represent the busiest hour for individual roadways). As part of the *Landside Operational Management Plan*, peak period volumes on NE Airport Way in August 2006 were compared with the estimated capacity of the roadway. Table 5-7 summarizes the August 2006 traffic count data for NE Airport Way, west of NE 82nd Avenue, for the 10th busiest hour during the month (this hour was selected as the 'design hour'), presents the peak hour capacity of NE Airport Way (as identified in

Landside Operational Management Plan, dated April 2007), and presents the corresponding volume/capacity ratio and level of service.

Table 5-6

TRAFFIC VOLUME SUMMARY, TERMINAL-AREA ROADWAYS, AUGUST 2007

Location *(a)*	Description	Hourly Vehicle Volume 7:00 a.m. to 8:00 a.m.	Hourly Vehicle Volume 12:00 noon to 1:00 p.m.	Hourly Vehicle Volume 4:00 p.m. to 5:00 p.m.	Daily (24-hour) Vehicle Volume
A	NE Airport Way East, westbound	2,020	1,890	1,230	29,400
B	NE Airport Way East, eastbound	920	1,800	1,870	29,300
C	NE Airport Way West, westbound	1,250	1,670	1,090	25,750
D	NE Airport Way West, eastbound	930	1,630	1,100	25,550
E	NE 82nd Avenue, southbound	1,210	780	720	13,300
F	NE 82nd Avenue, northbound	600	820	1,270	14,150
G	Parking entrance	320	440	170	5,805
H	Enplaning Level	540	590	350	9,300
I	Deplaning Level	160	620	450	8,750
J	Parking exit	100	430	280	7,250
K	Terminal exit	840	1,460	920	18,950
L	Return-to-terminal road	150	490	300	5,700
M	Terminal area exit	830	1,520	980	21,000

(a) See Figure 5-32.

Source: Jacobs Consultancy, based on traffic volume count data provided by the Port of Portland, August 15, 2007, and April 25 and 26, 2007 (adjusted to reflect August conditions).

Table 5-7

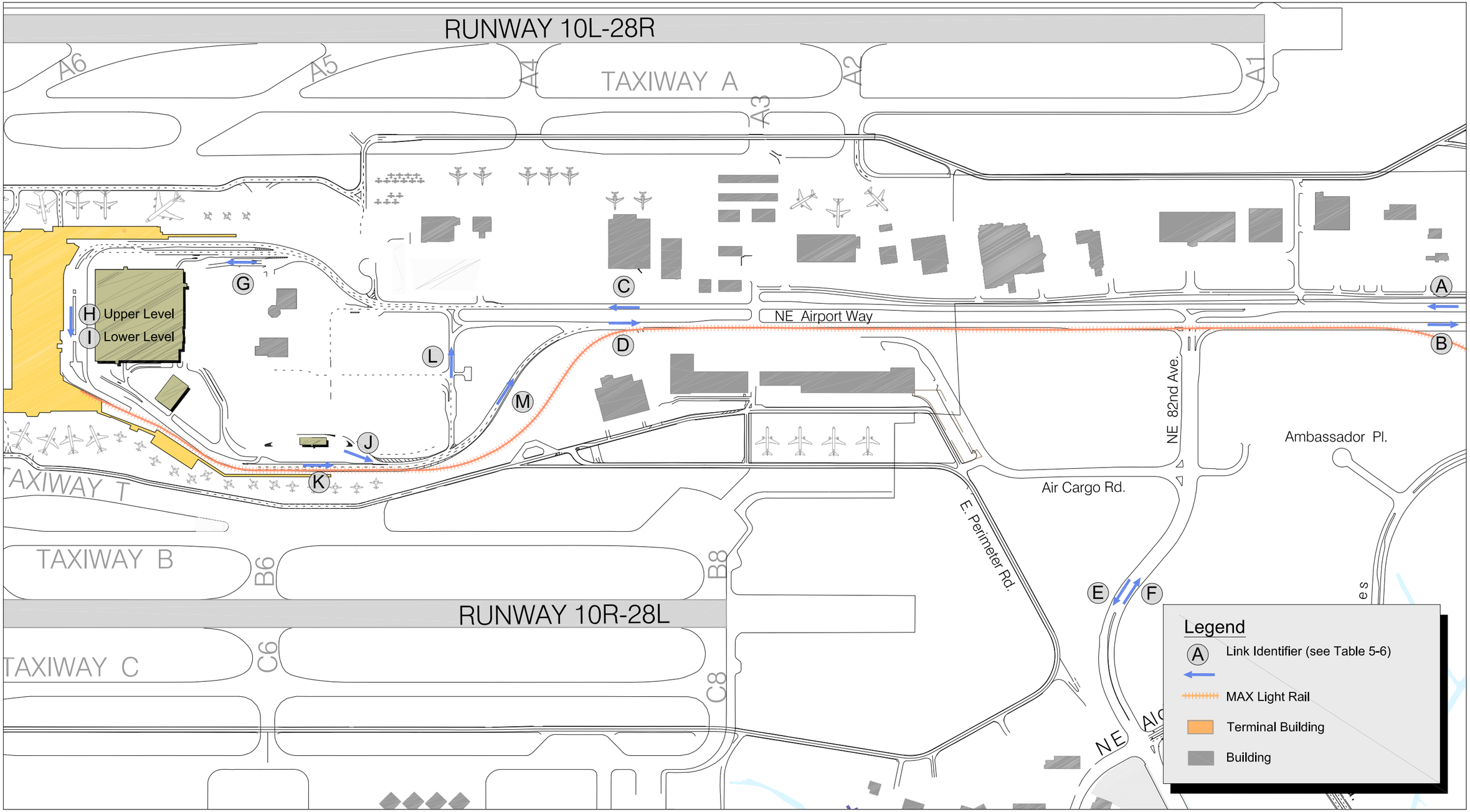
LEVEL-OF-SERVICE ASSESSEMENT, NE AIRPORT WAY, WEST OF NE 82nd AVENUE
August 2006

Direction	Peak Hour Volume	Number of Lanes	Assumed Total Capacity (vph) *(a)*	Volume/ Capacity Ratio	Level of Service
Westbound	1,740 *(b)*	2	2,470	0.70	D
Eastbound	1,810 *(c)*	2	1,900	0.95	E

Vph = Vehicles per hour

(a) Based on green signal time allocated to each direction during peak hour.
(b) 11 a.m. to noon, Thursday, August 17, 2006.
(c) Noon to 1 p.m., Wednesday, August 23, 2006.

Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0" 500'
Scale: 1" = 500'

Figure 5-32

Traffic Volume Locations

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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Programmed Modifications

NE Airport Way was recently realigned to accommodate construction of the P-2 parking garage, to be located east of the P-1 parking garage. Through June 2009, NE Airport Way will be widened to provide three lanes in both directions east of the terminal recirculation road. This widening is intended to increase the capacity of NE Airport Way and is expected to improve the levels of service identified in Table 5-7.

5.3.4 Curbside Roadways

As NE Airport Way approaches the terminal building, it divides into separate roadways leading to the enplaning level (upper roadway) and the deplaning level (lower roadway).

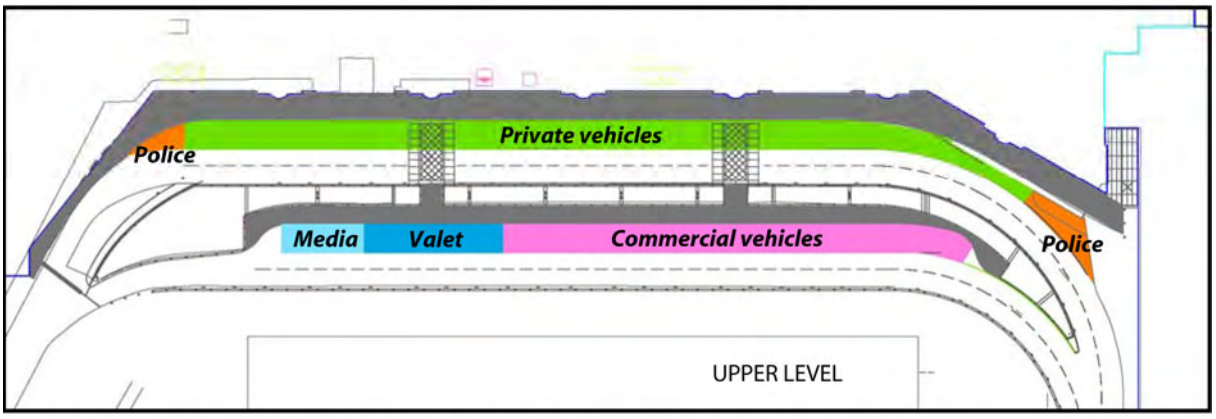
Enplaning Level

The enplaning level roadway provides an unloading area for vehicles dropping off passengers at the terminal. The roadway is divided into two four-lane roadways separated by an island curbside. The innermost roadway is reserved for the unloading of passengers by private vehicles. The two lanes closest to the terminal building are striped and signed for passenger drop-off while the other two lanes are for through traffic. The outer roadway is primarily designated for commercial vehicles dropping off passengers, although the south end is designated for valet parking. The two lanes closest to the island curb are striped and signed for passenger drop-off while the other two lanes are for through traffic. At the south end of the curbside, enplaning level roadways merge prior to merging with the deplaning level roadway and becoming eastbound NE Airport Way. Figure 5-33 shows the enplaning level roadway, including lane configuration, merge and diverge points, and loading areas.

Enplaning Level Curbside Activity and Level of Service

Table 5-8 summarizes the peak-hour analysis for enplaning level curbside parking activity prepared as part of the April 2007 *Landside Operational Management Plan*. The findings of that analysis focused on peak-period curbside activity during August 2006. Because the analysis focused on the peak hour for an individual roadway as opposed to the Airport, the volumes are significantly higher than those presented in Table 5-6. As shown, the enplaning level curbside accommodated the design-hour demand during August 2006 at a level of service of C or better.

Figure 5-33
ENPLANING LEVEL ROADWAY



Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007. (Figure not to scale.)

Table 5-8
ENPLANING LEVEL CURBSIDE PARKING ANALYSIS, AUGUST 2006

Curbside Roadway	Peak Hour Volume (vph) *(a)(b)*	Curb Length (feet)		Demand/ Capacity Ratio	Level of Service
		Required *(c)*	Existing		
Inner	800	730	564	1.29	C
Outer	120	155	414	0.38	A

vph = Vehicles per hour

(a) 5 a.m. to 6 a.m., Monday, August 21, 2006.
(b) Inner curb and outer curb distribution based on observations on Monday, October 23, 2006.
(c) Assuming average dwell times of 90 seconds, as observed on Monday, October 23, 2006.

Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007.

The *Landside Operational Management Plan* also addressed the ability of the enplaning level through lanes to accommodate peak-hour traffic demand. Table 5-9 presents the results of that analysis. As shown, the entrance to the enplaning level inner curbside operated at level of service F during the August 2006 design hour. This condition was due to congestion near the terminal doorways immediately adjacent to the curbside entrance. Limited curbside parking area, combined with the attractiveness of the first door at the curbside, often caused drivers of some commercial vehicles to stop in one of the two through lanes to unload passengers, which reduced the roadway capacity to one through lane.

Table 5-9

ENPLANING LEVEL CURBSIDE ROADWAY CAPACITY ANALYSIS, AUGUST 2006

Curbside Roadway	Peak Hour Volume (vph)	Through Lanes: Assumed Capacity (vph) *(a)*	Through Lanes: Volume/Capacity Ratio	Through Lanes: Level of Service
Inner	800	1,350	0.59	C
Inner (entrance only)	800	500	1.6	F
Outer	120	2,200	0.05	A

vph = Vehicles per hour

(a) Reflects capacity reduction due to crosswalks and curbside activity on adjacent lanes.

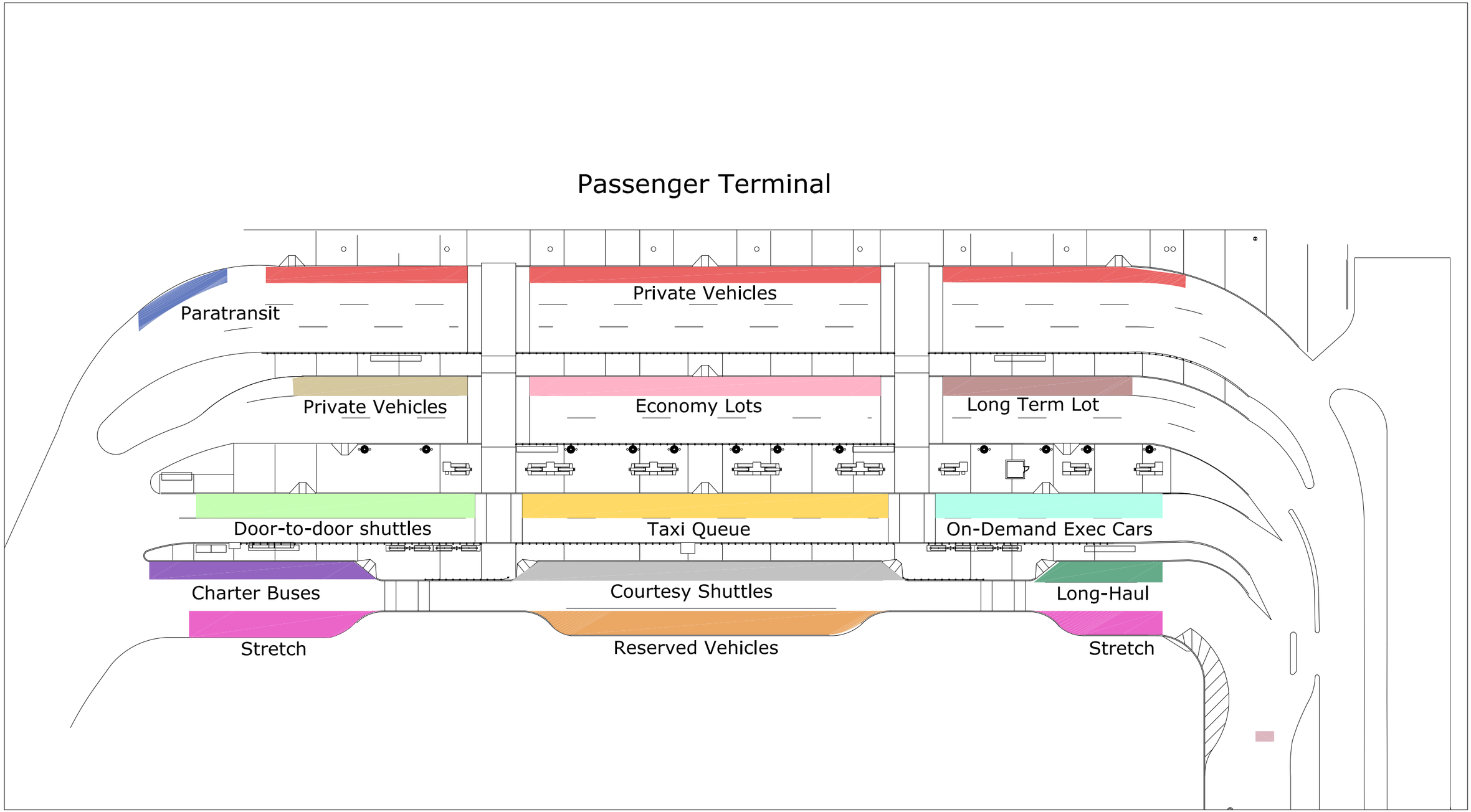
Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007.

Based on the results of this analysis, the Port modified the curbside allocation on the enplaning level roadway. The resulting allocation strategy directs commercial vehicles to drop off passengers on the outer curbside.

Deplaning Level

The deplaning level roadway provides loading areas for vehicles picking up passengers at the terminal. The roadway consists of four lanes reserved for private vehicles and multiple parallel curbsides reserved for one or more commercial vehicle modes.

The public deplaning level roadway, beyond the diverge point to the Commercial Roadway, expands from two lanes to four lanes. The two innermost lanes (closest to the terminal building) are striped and signed for passenger loading by private vehicles, while the other two lanes are reserved for through traffic. At the south end of the curbside, area is reserved for the unloading and loading of passengers using paratransit services. Two crosswalks across the deplaning level provide pedestrian access between the terminal, the commercial roadway, and the P-1 parking garage. Figure 5-34 shows the deplaning level roadway, including lane configuration, merge and diverge points, and loading areas.



AIRPORT FUTURES
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0" NTS
Not to Scale

Figure 5-34

Deplaning Level Roadway

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

Deplaning Level Curbside Activity and Level of Service

Table 5-10 summarizes the peak-hour analysis for deplaning level curbside parking activity prepared as part of the April 2007 *Landside Operational Management Plan*. The findings of that analysis focused on peak-period curbside activity during August 2006. As shown, the deplaning level curbside accommodated the design-hour demand during August 2006 at level of service C.

Table 5-10

DEPLANING LEVEL CURBSIDE PARKING ANALYSIS, AUGUST 2006

Curbside Roadway	Peak Hour Volume (vph) *(a) (b)*	Curb Length (feet) Required	Curb Length (feet) Existing	Demand/ Capacity Ratio	Level of Service
Private vehicles	605	550	500	1.1	C

(a) 7 p.m. to 8 p.m., Sunday, August 20, 2006.
(b) Assuming average dwell times of 90 seconds, as observed on Sunday, October 22, 2006, following arrival of curbside enforcement staff.

Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007.

The *Landside Operational Management Plan* also addressed the ability of the deplaning level through lanes to accommodate peak-hour traffic demand. Table 5-11 presents the results of that analysis. Because the analysis focused on the peak hour for an individual roadway as opposed to the Airport, the volumes are significantly higher than those presented in Table 5-6. As shown, during August 2006, the through lanes on the deplaning level operated at level of service D during busy periods.

Table 5-11

DEPLANING LEVEL CURBSIDE ROADWAY CAPACITY ANALYSIS, AUGUST 2006

		Through Lanes		
Curbside Roadway	Peak Hour Volume (vph)	Assumed Capacity (vph) *(a)*	Volume/ Capacity Ratio	Level of Service
Private vehicles	605	960	0.63	D

vph = Vehicles per hour

(a) Reflects capacity reduction due to crosswalks and curbside activity on adjacent lanes.

Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007.

5.3.5 Commercial Vehicle Facilities

The commercial vehicle facilities at the Airport consist of the Commercial Roadway, where all commercial vehicles pick up passengers, and the Transportation Providers Hold Lot, which provides a staging area for vehicles waiting to be dispatched to the Commercial Roadway.

Commercial Roadway

The Commercial Roadway is located on the deplaning level between the deplaning level curbside and the P-1 parking garage. The area is divided into three parallel roadways providing designated pickup areas for shuttle vehicles serving the public and Airport employee parking lots, taxicabs, on-demand executive sedans, pre-arranged limousines, on-demand and scheduled shuttles, and courtesy vehicles (serving hotel/motels, off-Airport parking lots, and off-Airport rental car companies). The current allocation of this area is provided on Figure 5-34. Pickup areas for taxicabs and on-demand executive sedans are supplemented by nearby staging queues.

The *Landside Operational Management Plan* included an evaluation of the demand for parking on the Commercial Roadway during August 2006. The results of that analysis are presented in Table 5-12. As shown, in August 2006, there was sufficient capacity on the Commercial Roadway to accommodate peak-period parking demand.

Table 5-12

COMMERCIAL ROADWAY PARKING ANALYSIS, AUGUST 2006

Mode	Peak Hour Volume (vph) *(a) (b)*	Curb Length (feet) Required *(c)*	Curb Length (feet) Existing	Demand/ Capacity Ratio
Taxicab	79	120	180	0.67
Pre-arranged limousine	2	20	160	0.13
On-demand executive sedan	7	25	220	0.11
Door-to-door van	11	50	180	0.28
Courtesy vehicle, off-Airport parking	19	60	0	-- *(c)*
Airport public parking shuttle	41	135	135	1.00
Airport employee parking shuttle	5	45	45	1.00
Courtesy vehicle, hotel/motel	43	120	180	0.67
Charter bus	0	0	45	0.00
Courtesy vehicle, off-Airport rental car	8	20	60	0.50
Other	10	30	30	1.00
Total	225			

vph = Vehicles per hour

(a) 7 p.m. to 8 p.m., Sunday, August 20, 2006.
(b) Assuming average loading/dwell times of 120 seconds, as observed on Sunday, October 22, 2006.
(c) Shared space with courtesy vehicles serving off-Airport rental car companies.

Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007.

Transportation Providers Hold Lot

Currently, ground transportation providers waiting for dispatch to the curbside to meet passengers dwell in the Transportation Providers Hold Lot, located east of the ATCT and the Central Utility Plant. This lot is approximately 65,000 square feet and accommodates taxicabs, on-demand shuttles, scheduled vehicles, and charter buses waiting to be dispatched to curbside.

5.3.6 Mode Choice and Travel Patterns

Airport passenger mode choice data were obtained from periodic surveys conducted by the Port's Research and Marketing Department. Table 5-13 presents historical mode choice data. As shown, once the use of the Tri-Met MAX light-rail system increased, following its introduction in 2001, the use of shuttles, which include shared-ride (door-to-door) vans and scheduled vans and buses, decreased.

Table 5-13

HISTORICAL AIRLINE PASSENGER MODE CHOICE DATA

Mode	1997/1998	2001	2003	2006
Private vehicle – picked up or dropped off *(a)*	66% *(b)*	54% *(b)*	61% *(b)*	41%
Private vehicle – parked for duration of trip				17
Rental car	15	19	20	19
Taxicab/limousine	4	4	4	6
Shuttles *(c)*	11	15	9	12
Tri-Met (MAX light rail transit after 2001)	1	5	6	5
Other	3	3	--	--

(a) Includes vehicles parking in parking facilities for short durations (less than 2 hours).
(b) Passenger surveys data prior to 2006 do not distinguish between vehicles parked for the duration of an airline trip versus those parked while picking up or dropping off passengers.
(c) Includes shared-ride (door-to-door) vans, buses, and courtesy vehicles operated by hotels and motels.

Source: Port of Portland, Research and Marketing Department.

5.3.7 Transit Facilities

TriMet provides direct access to the Airport from the tri-county Portland metropolitan area (Multnomah, Washington, and Clackamas counties) and C-Tran provides indirect access to the Airport from Clark County, Washington. Since September 2001, the TriMet MAX LRT has provided regional train service to the Airport (Airport MAX) from the Portland metropolitan area. The Airport MAX Red Line operates directly between the Airport and the Beaverton Transit Center via downtown Portland. Although the LRT

is the only means of public transportation providing direct access to the Airport terminal, regional bus lines provide access to and from the Airport by transferring passengers to the LRT system; primarily at the Gateway Transit Center and Parkrose Transit Center.

The LRT extension from the Gateway Transit Center generally uses a double track to the Airport, but uses a single track as it crosses I-84 and in the last half mile of track as it approaches the Airport terminal. The LRT track ends at the south end of the main terminal at the deplaning level. The light rail system route maps and stop locations are illustrated on Figure 5-35.

Based on TriMet ridership data, in 2007 the LRT station at the Airport was used by approximately 3,000 people per weekday and about 2,500 people per weekend day. Surveys indicate that 65% to 70% of MAX passengers using the Airport station are airline passengers, about 20% are Airport employees; the remaining 10% to 15% are meeters/greeters or other users.

As shown in Table 5-13, approximately 5% of Portland airline passengers used the Tri-Met MAX light-rail system in 2006 to travel to and from the Airport. It is estimated that of the 12% of passengers using "shuttles", approximately 33% (or 4% of all passengers) used modes intended to serve more than one passenger party. These modes include shared-ride (door-to-door) vans, scheduled buses, and public transit. Table 5-14 presents a summary of ridership of these modes at PDX and other West Coast airports.

Table 5-14

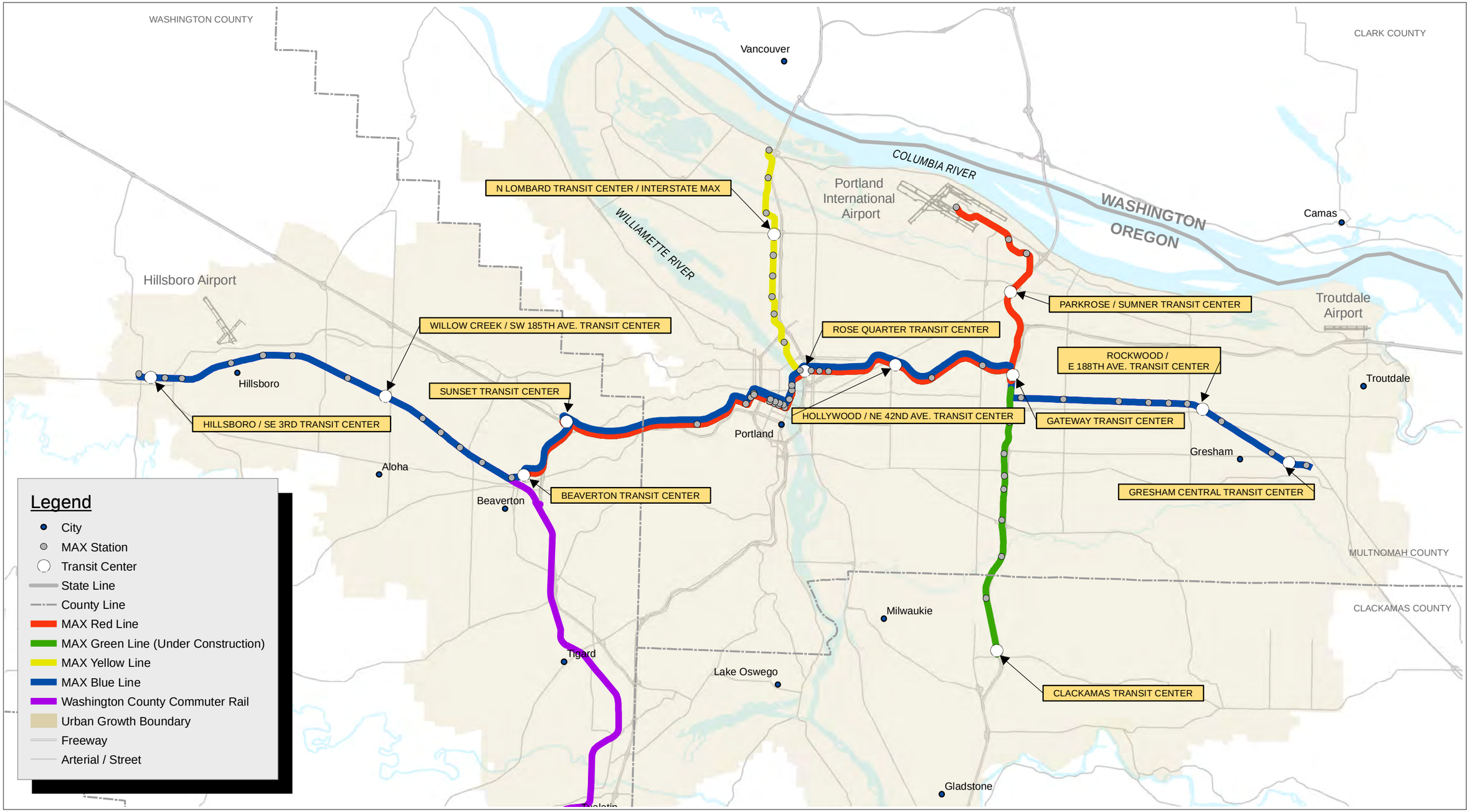
PUBLIC TRANSIT RIDERSHIP COMPARISON (2005)

Airport Location	Bus/Van *(a)*	Rail
Portland	4%	5%
Oakland	4	14 *(b)*
Seattle-Tacoma	11	--
San Francisco	7	9

(a) Includes shared-ride (door-to-door) vans, scheduled buses, and public transit.

(b) Indirect service to airport. Passengers ride a shuttle bus between the terminal(s) and the rail station.

Source: Transportation Research Board, *Airport Cooperative Research Program Report 4, Ground Access to Major Airports by Public Transportation,* July 2008.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

Figure 5-35

Tri-Met MAX Light Rail System

Master Plan Update
Portland International Airport

Source: Tri-Met

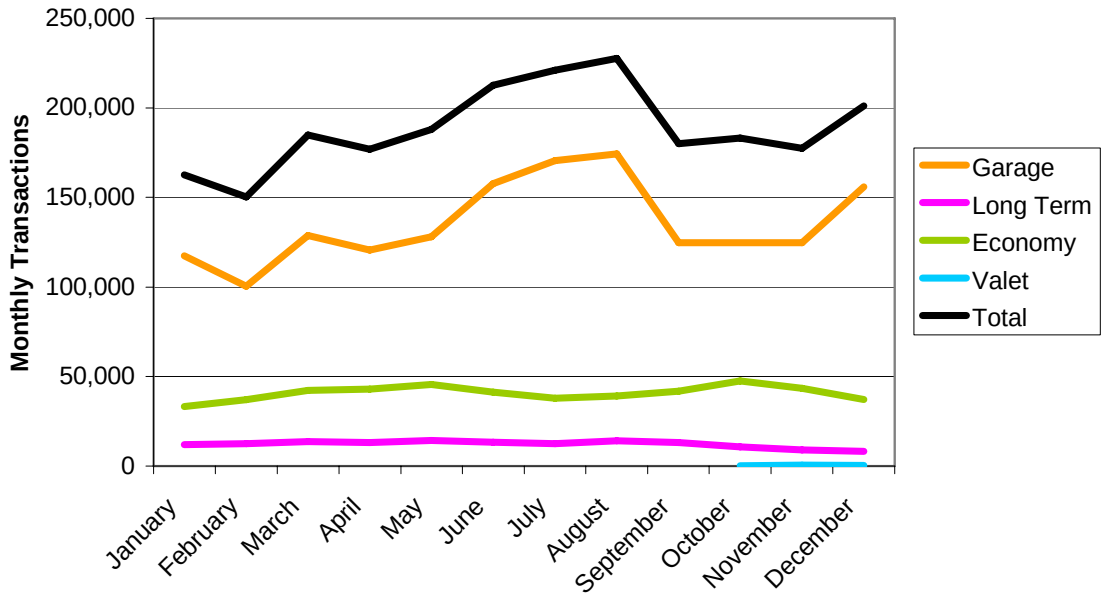
September 2008

5.3.8 Public Parking Facilities

Public parking at the Airport is provided in the P-1 parking garage, the Long-Term Lot, and the Economy Lot. The locations of these facilities are shown on Figure 5-36. P-1 and the Long-Term Lot are located near the terminal, while the Economy Lot is located near the intersection of NE Frontage Road and NE Mt. Hood Avenue. Patrons using the P-1 garage walk to and from the terminal. Long-Term Lot patrons may either walk or ride a shuttle bus. Economy Lot patrons are transported to and from the terminal via shuttle bus.

Figure 5-37 shows monthly public parking transactions at the Airport during 2007. As shown, July and August were the busy months for overall public parking transactions, with the majority of transactions occurring in the P-1 garage. Transactions in the Long Term Lot started to decline in October due to the removal of spaces as part of the P-2 construction program.

Figure 5-37
MONTHLY PUBLIC PARKING TRANSACTIONS, 2007



Source: Port of Portland Parking Reports.

NE Marine Dr.

North Perimeter Rd.

RUNWAY 10L-28R

TAXIWAY A

TAXIWAY T

P-1 Garage

P-2 Garage (Under Construction)

Employee Parking

Valet Storage Lot

Economy Lot

Economy Lot

NE Airport Way

Mt. Hood Ave.

Ground Transportation Providers Hold Lot

Parking Toll Plaza

Long Term Parking

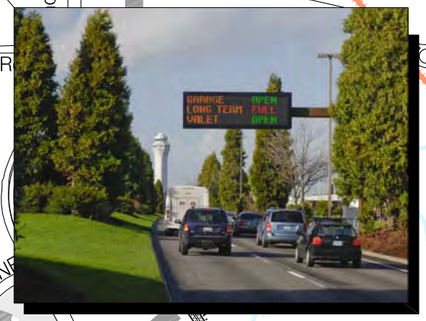
Cell Phone Lot

Air Cargo R

E. Perimeter Rd.

NE Holman St

RUNWAY 10R-28L



NE Alderwood Rd.

Employee Parking

I-205

TAXIWAY J

NE Cornfoot Rd.

NE Alderwood Rd.

NE 82nd Ave.

Legend

- Parking Areas
- Buildings in Parking Area
- Buildings
- Passenger Terminal
- Airport Property Line
- MAX Light Rail

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 1000'
Scale: 1" = 1000'

Figure 5-36

Parking Facilities

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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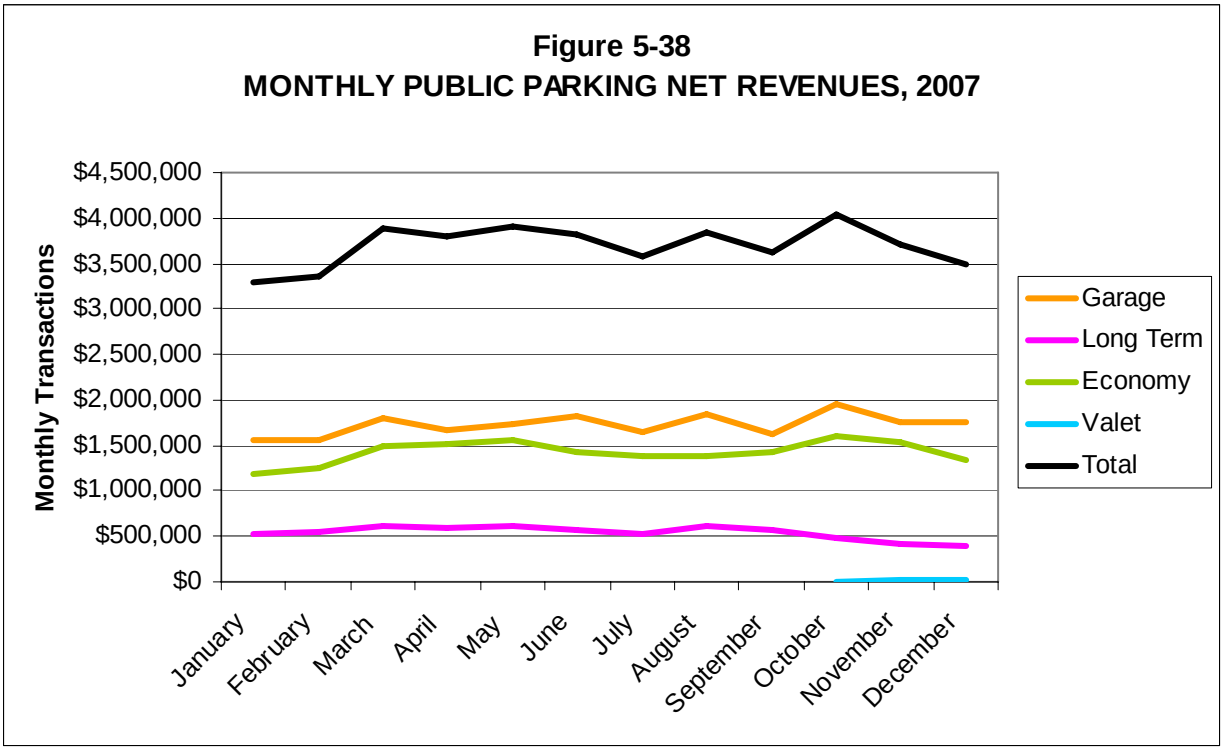
Figure 5-38 shows monthly public parking net revenues at the Airport for 2007. As shown, activity in October generated the highest monthly revenues in the P-1 garage and the Economy Lot. Revenues generated in the Long Term Lot started to decline in October due to the removal of spaces as part of the P-2 construction program.

Figure 5-38
MONTHLY PUBLIC PARKING NET REVENUES, 2007

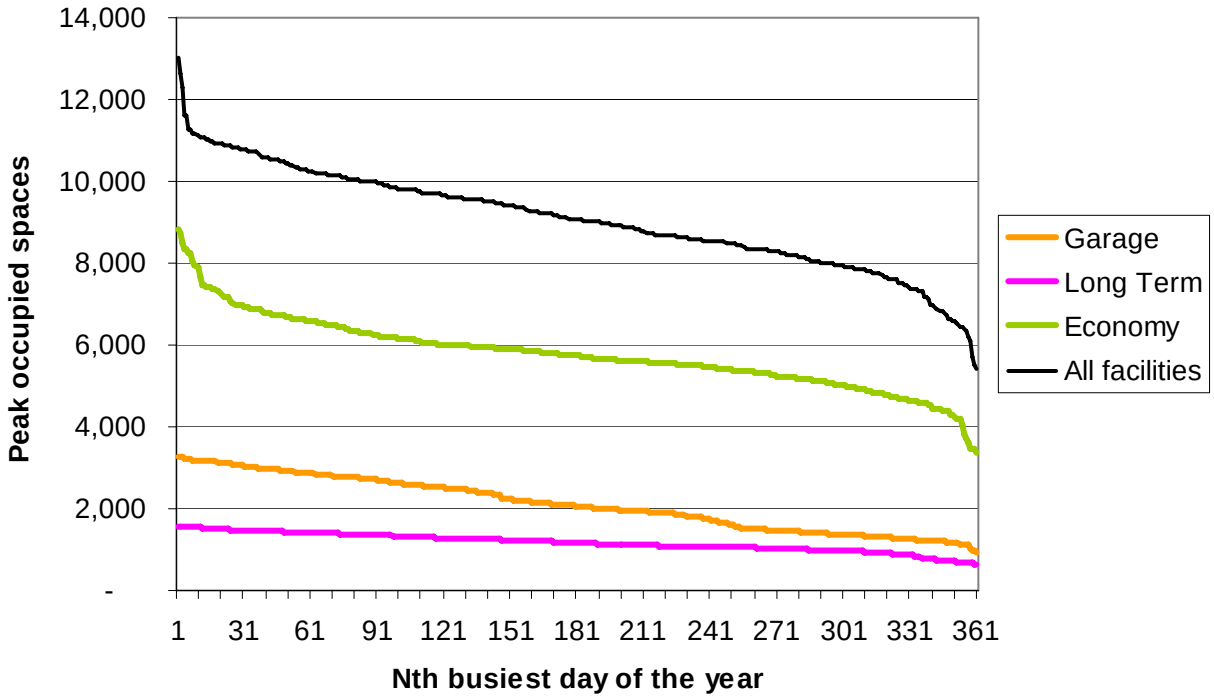


Source: Port of Portland Parking Reports.

Demand and Capacity

The Port of Portland tracks, on a daily basis, the peak number of vehicles parking in each public parking facility at the Airport. Figure 5-39 depicts the daily peak occupancies in each public parking facility (and the combined peak for all facilities) during 2007, sorted highest to lowest. As shown, there were approximately 10 days when parking demand was significantly higher than other days during the year (these days usually occur during holiday periods, such as Christmas, Thanksgiving, and Spring Break).

Figure 5-39
PEAK PUBLIC PARKING OCCUPANCY, BY DAY, 2007



Source: Port of Portland.

For the *Landside Operational Management Plan,* peak parking demand (which included peak occupancy plus a 5% circulation factor) was compared against available capacity. Table 5-15 presents the results of the analysis, in which peak occupancies observed during October 2006 were evaluated (October is typically the Airport's peak month for parking).

Table 5-15

PUBLIC PARKING CAPACITY AND DEMAND, 2006

Facility	Capacity (number of vehicles)	Peak Period Demand (number of vehicles) *(a)*	Demand/Capacity Ratio
P-1 Garage	3,305	2,740 *(b)*	0.83
Long-Term Lot	1,075	1,570 *(b)*	1.46
Economy Lot	7,788	6,340 *(c)*	0.82
Total	12,168	10,650 *(d)*	0.88

(a) Includes 5% circulation factor.
(b) Based on average midday occupancy on Wednesdays in October 2006.
(c) Based on average midday occupancy on weekend days in October 2006.
(d) Based on average midday occupancy for all parking facilities combined on Thursdays in October 2006.

Source: Jacobs Consultancy, *Landside Operational Management Plan*, April 2007.

Off-Airport Parking Supply

In addition to the on-Airport public parking spaces, three private operators provide a total of approximately 1,300 parking spaces off-Airport. Two operators are located on NE 82nd Avenue, south of NE Alderwood Road, and the third is located east of I-205 on NE Holman Street, near the intersection with NE Airport Way. These operators transport customers between the parking facilities and the terminal on shuttle buses.

Public Parking Amenities

The Port of Portland has installed two amenities in the P-1 parking garage intended to improve customer service, reduce operating costs, and reduce vehicle emissions. See discussion of PDX intelligent transportation systems in Section 5.3.12 below.

In 2005, the Port installed QuickPay, a pay-on-foot revenue control system that allows patrons to pay their parking fees at kiosks located at the entrances to P-1 at the skybridge and ground levels. Once the fee has been paid, the kiosk issues an exit pass that the patron then uses at the parking exit plaza. Currently, the QuickPay system is used by over 80% of parking garage customers and has significantly reduced cashiering requirements, queues, and auto emissions at the exit plaza.

P-1 includes an automated parking guidance system to help the drivers of private vehicles navigate the parking garage. Space occupancy information is collected by sonic detectors located at each parking space. At the entrance to each floor and each parking bay, variable signs indicate the number of spaces available in each floor or bay.

A green/red light located above each parking space indicates which spaces are available (green light) and which are occupied (red light). Airport staff indicate that the automated parking guidance system has reduced the amount of time it takes drivers to find available parking spaces and, thus, has also reduced automobile emissions.

In addition to QuickPay and the automated parking guidance system, a system of variable message signs located on NE Airport Way provides real-time information on the availability of parking spaces in all public parking lots.

Cell Phone Lot

A 30-space cell phone parking lot is provided in a temporary location at Air Cargo Road near NE 82nd Avenue. Drivers unwilling to use the public parking garage may park in the Cell Phone Lot for a limited period of time (e.g., 30 minutes or less) while awaiting a call from their arriving passengers.

Other Services

Other parking-related services include a 24-hour valet service, which was initiated in 2007 to provide an improved level of service during construction of the P-2 parking garage. The valet parking service operates from the outer curbside of the enplaning level. Vehicles are stored east of the ATCT, near the North Employee Lot and the Transportation Providers Hold Lot.

P-2 Parking Garage

A second parking garage, referred to as P-2, is under construction adjacent to the P-1 parking garage. The new structure is planned to add 3,500 spaces in 2010 (approximately 500 of the 3,500 spaces are to be used for rental car parking). Upon completion of P-2, the capacity of the Long-Term Lot will increase by approximately 400 spaces.

5.3.9 Employee Parking

Employee parking, shown on Figure 5-36, is provided on Airport property in the Portland International Center, off Alderwood Road (2,394 spaces), and in the North Employee Lot (150 spaces), located near the Transportation Providers Hold Lot. Employees using the lot near the Portland International Center are transported via shuttle buses to and from the terminal. Airport staff indicate that peak occupancy of the Portland International Center lot is approximately 1,500 to 1,600 vehicles while peak occupancy of the North Employee Lot is approximately 130 to 140 vehicles.

5.3.10 Rental Car Facilities

Five rental car companies—Avis, Budget, Dollar, Enterprise, and Hertz—operate at the Airport from facilities in the P-1 parking garage. The facilities include a ready and return car area on the first two floors of the parking garage (981 spaces occupying 354,762 square feet) and a customer service area on the first floor (12,836 square feet) of the garage. Just south of the parking garage is a service center (104,387 square feet) with 30 fuel nozzles, five car washes, and stacking and circulation space. Facilities for rental car maintenance and storage are also provided near the NE Mt. Hood Avenue and NE Airport Way interchange.

Although approximately 78% of the PDX rental car market is served by the five on-Airport rental car companies, other rental car companies have access to passengers at PDX via two customer service kiosks on the first level of the P-1 parking garage. These limited service operators include Vanguard (Alamo and National) and Thrifty. These two operators provide shuttle bus service between the terminal and their off-Airport rental car facilities.

As described in the 2005 *Terminal Access Study*, the limited capacity of the service center (and inability to add capacity) restricts the number of rental car companies that can be accommodated within P-1. Upon completion of P-2, approximately 500 additional spaces will be available for rental car company use.

5.3.11 Pedestrian/Bicycle Facilities

The Airport is served by a series of regional trails and bicycle facilities. These trails and routes predominately follow the main roadway access routes to and from the Airport: NE 82nd Avenue and NE Airport Way for terminal access; NE Cornfoot Road for properties on the south side of the Airport; NE 33rd Drive for properties on the west; and NE Marine Drive for properties on the north. Figure 5-40 depicts the bicycle and pedestrian paths located within the terminal area, as well as those providing access to and from the Airport. In addition to the paths, bicycle parking is available at the north and south ends of the deplaning level of the terminal. According to Port staff, employees account for the greatest share of bicycle use.

Pedestrian access to the main terminal area is provided on three levels. On the uppermost level, two skybridges pass over the enplaning level roadway to connect the fourth level of P-1 with the mezzanine level of the terminal. On the deplaning level roadway, two pedestrian crosswalks connect the first level of P-1 to the deplaning level of the terminal. Pedestrian access between P-1, the Long Term Lot, and the terminal is also provided via a tunnel under P-1.

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0" 2,000'
Scale: 1" = 2,000'

Figure 5-40

PDX Bicycle and Pedestrian Plan Route Map

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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5.3.12 Intelligent Transportation Systems

Since 2001, the Port has made numerous investments in intelligent transportation systems (ITS). The goal of these systems has consistently been to increase the capacity and/or level of service of existing roadway and parking infrastructure while avoiding significant capital investments and construction. ITS investments have included:

- QuickPay and the automated parking guidance system (described above in Section 5.3.8), which reduced the amount of delay experienced by drivers exiting the P-1 garage and the amount of time required to locate an available parking space within P-1.

- Permanent Vehicle Data Collectors, which are installed at four locations and provide count, speed and classification data used for roadway operations and planning

- Dynamic Message Signs, which are installed at four locations and provide traveler advisories and parking information to drivers on Airport roads.

- Taxicab and limousine dispatch system, which decreased the time required to request and deliver taxicabs and limousines from the Transportation Providers Hold Lot to the designated passenger loading areas.

5.4 Air Cargo

The facilities essential for processing air cargo are described in this section. For master planning purposes, cargo is defined to include both freight and mail. Cargo services at the Airport are provided by numerous freight forwarders, passenger airlines, and 10 all-cargo and integrated cargo airlines. In 2007, the 11 all-cargo airlines serving the Airport transported a total of approximately 280,000 tons of air cargo. The 10 all-cargo and integrated cargo airlines include:

- Air China Cargo
- Ameriflight
- BAX Global
- DHL
- Empire Airlines
- Evergreen International Airlines
- FedEx
- Kitty Hawk Air Cargo
- United Parcel Service (UPS)
- Western Air Express

5.4.1 Cargo Buildings/Services

Facilities designated for cargo use at the Airport occupy approximately 200 acres of land and approximately 763,539 square feet of building space as of 2007. Cargo areas and facilities are shown on Figure 5-41. Approximate square footages of air cargo buildings are summarized in Table 5-16.

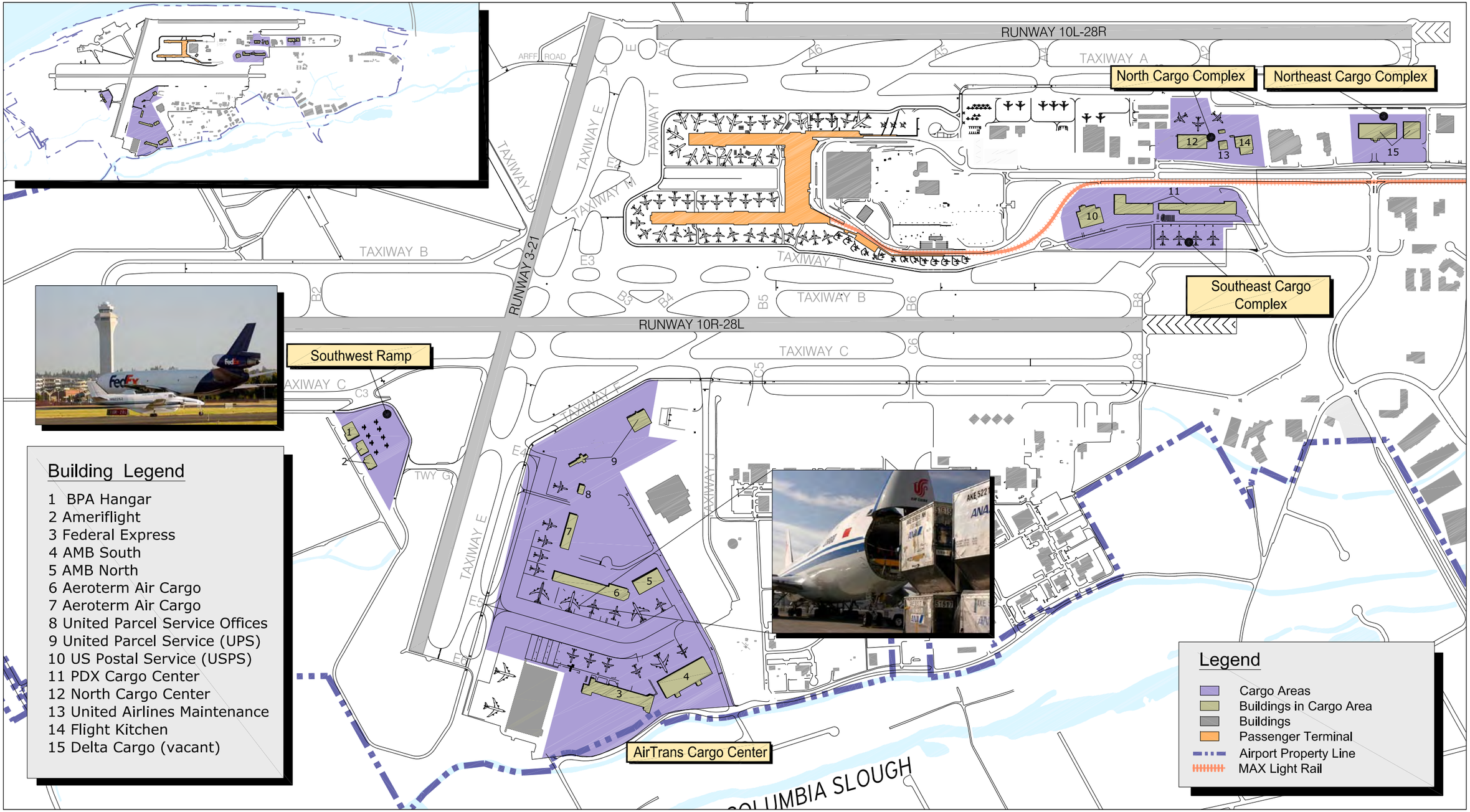
Table 5-16

AIR CARGO BUILDING SQUARE FOOTAGES (2007)

Cargo Complex	Building Square Footage
North Cargo Complex (multitenant building)	42,000
Northeast Cargo Complex (multitenant building; former Delta Complex)	63,500
Southeast Cargo Complex	
United States Postal Service (USPS)	114,500
PDX Cargo Center - East Cargo Complex	77,645
PDX Cargo Center - West Cargo Complex	52,612
AirTrans Cargo Center	
AMB (2 multitenant buildings)	159,500
Aeroterm (2 multi-tenant buildings)	91,554
FedEx	101,500
UPS	10,914
Southwest Ramp	
Bonneville Power Administration (BPA) Hangar	20,816
Ameriflight	28,998
Total	763,539

Source: Port of Portland.

Cargo facilities used by the passenger airlines for belly cargo are located in the North Cargo Complex, Northeast Cargo Complex, and Southeast Cargo Complex. The major passenger airlines that carry belly cargo at the Airport include Alaska Airlines, American Airlines, Continental Airlines, Delta Air Lines, Lufthansa German Airlines, Northwest Airlines, Southwest Airlines, United Airlines, and US Airways. Cargo facilities used by the all-cargo airlines are located in the AirTrans Cargo Center. Other cargo facilities are located at the Southwest Ramp.



AIRPORT FUTURES
CHARTING A COURSE FOR PDX

Source: Port of Portland Staff

Figure 5-41

Cargo Areas

Master Plan Update
Portland International Airport

September 2008

North Cargo Complex

The North Cargo Complex, located on the north side of NE Airport Way east of the general aviation hangars, currently accommodates the North Cargo Center, United Airlines Maintenance (includes SkyWest Airlines), and Gate Gourmet, a flight kitchen facility. The facilities in the North Cargo Complex are owned and managed by the Port.

Northeast Cargo Complex

The Northeast Cargo Complex, located east of the North Cargo Complex and directly east of the Hampton Inn on NE Airport Way, was formerly occupied by Delta Air Lines and is currently vacant. The complex is owned and managed by the Port.

Southeast Cargo Complex

The Southeast Cargo Complex, located on the south side of NE Airport Way and directly across from the North Cargo Complex, accommodates the U.S. Postal Service (USPS) and 13 tenants in two buildings, together called the PDX Cargo Center. The two buildings are individually referred to as the East Cargo Complex and the West Cargo Complex. The East Cargo Complex currently accommodates Horizon Air ground service equipment (GSE), Airport Terminal Services, Inc. (ATS), Southwest Airlines, and Horizon Air Cargo. The West Cargo Complex currently accommodates Air Truck, American Airlines, ATS, the Port, the Sheraton Inn (for storage), Horizon Air, and PDX Environmental. Excluding the U.S. Postal Service, the facilities in the Southeast Cargo Complex are owned and managed by the Port.

AirTrans Cargo Center

The AirTrans Cargo Center, located between Taxiways E, F, and J, accommodates a number of integrated cargo carriers. Facilities include FedEx, Aeroterm Air Cargo, AMB North, AMB South, and UPS. The majority of facilities in the AirTrans Cargo Center are tenant owned and managed.

Southwest Ramp

The Southwest Ramp accommodates the BPA hangar and Ameriflight facilities.

5.4.2 Cargo Ramps

Cargo ramps at the Airport accommodate approximately 21 widebody, 11 narrowbody, and 38 propeller aircraft on approximately 2,312,256 square feet of ramp space. The aircraft accommodated in each cargo area are summarized in Table 5-17.

Table 5-17
AIRCRAFT PARKING FOR CARGO SERVICES

Cargo Ramp	Ramp Area (sq ft)	Cargo Complex	Status	Aircraft Positions	Operator/Notes
Northeast Ramp	~281,000	Northeast Cargo Complex	Port controlled	3 widebody, 1 narrowbody	This location is currently used for occasional RON parking for passenger aircraft. No cargo aircraft are scheduled as of 2007.
Southeast Ramp	~326,000	Southeast Cargo Complex – PDX Cargo Center	Port controlled	4 narrowbody	This location is currently used for RON parking for one passenger aircraft
Central Ramp	293,847	AirTrans Cargo Center - UPS	Leased	2 widebody	UPS
			Port controlled	2 widebody, 3 narrowbody	These three positions are currently closed for construction in the area
South Central Ramp	50,750	AirTrans Cargo Center - Aeroterm	Port controlled	2 narrowbody	
			Leased	4 widebody	UPS
South Ramp	586,137	AirTrans Cargo Center – Aeroterm and AMB	Leased	6 widebody, 1 narrowbody, 2 propeller aircraft	DHL/Airborne, Air China
	324,522	AirTrans Cargo Center – FedEx		4 widebody, 12 propeller aircraft	Empire Airlines
Southwest Ramp	~450,000	Southwest Ramp	Ameriflight lease	24 propeller aircraft	Ameriflight, BPA
TOTAL	2,312,256			21 widebody, 11 narrowbody, 38 propeller aircraft	

Source: Port of Portland.

5.4.3 Feeder Lines

Regional cargo feeders use small propeller-driven planes weighing 12,500 pounds or less that operate at slower speeds than jet aircraft. At PDX, regional cargo feeder service, delivering cargo overnight or within 2 days between small communities in Oregon, is provided primarily by Empire Airlines/FedEx and Ameriflight/UPS. Empire Airlines and Ameriflight partner with FedEx and UPS, respectively, to provide nationwide service. Service typically is provided on weekdays, with peak demand in the morning and evening hours. Because of the proximity of the cargo facilities on the south side of the Airport, cargo feeders typically use the south and crosswind runways. Approximately 84 cargo feeder flights operate per day (Empire Airlines operates 20 flights, Ameriflight operates 64 flights).

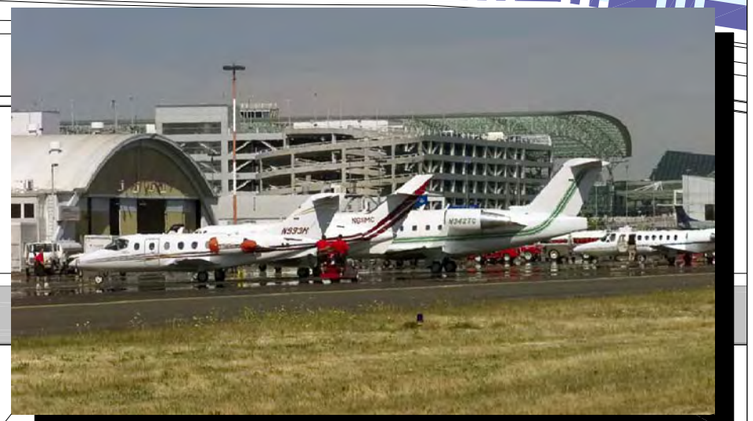
In 2005-2006, a cargo feeder study was conducted to recommend a strategy for managing small aircraft, particularly regarding noise. Cargo feeders along with general aviation aircraft are known as small aircraft, and are unable to follow the same noise abatement procedures as larger aircraft. As a result, noise from small aircraft is often a concern for residents in surrounding neighborhoods. In the cargo feeder study, the neighborhoods in north and northeast Portland and in Vancouver were targeted. It was recommended in the study that small aircraft flight paths be concentrated in a small area. Recommendations included limiting the height at which small aircraft can begin to turn, prohibiting runway intersection departures, raising the glidepath, and involving cargo feeder and general aviation operators in developing the FlyQuiet outreach program.

5.5 General Aviation

General aviation consists of all civil aircraft operations not classified as either air carrier or air taxi/commuter operations, including those for business travel, medical transport, law enforcement, and recreational flying. The 36-acre general aviation area at PDX, shown on Figure 5-42, is located north of NE Airport Way and just east of Concourse E.

General aviation facilities include a terminal building and nine maintenance or storage hangars, totaling approximately 175,000 square feet. The terminal building consists of storage and office space totaling approximately 12,700 square feet. Tee-hangars are planned to be removed in the long-term to accommodate larger high-end aircraft. Approximately 180,000 square feet of transient aircraft parking is also available.

A single full-service fixed base operator (FBO), Flightcraft, provides services that include aircraft storage, fueling, maintenance and sales. Flightcraft manages all the facilities in the general aviation area, with the exception of the PacifiCorp hangar and three business aviation hangars. The approximately 98 general aviation aircraft currently based at PDX include single- and multi- engine propeller aircraft, jets, and helicopters. There are no very light jets (VLJs) currently based at PDX.



RUNWAY 10L-28R

A6

A5

A4

TAXIWAY A

A3

TAXIWAY T

Building Legend

1 Flightcraft Managed Hangars
2 Flightcraft General Aviation Terminal
3 Flightcraft Managed Tee Hangars
4 Flightcraft Maintenance Hangar
5 Pacificorp Hangar
6 Business Aviation Hangars

Legend

- General Aviation Areas
- Buildings in General Aviation Area
- Buildings
- Passenger Terminal
- Airport Property Line
- MAX Light Rail

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 400'
Scale: 1" = 400'

Figure 5-42

General Aviation Area

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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General aviation aircraft, which typically use Runway 10L-28R because of its proximity to the general aviation ramp, completed approximately 27,600 operations at PDX in 2007. Although general aviation aircraft can land and take off at any time of the day, the peak period for arrivals and departures occurs in the afternoon from 2 p.m. to 5 p.m. General aviation reliever airports for PDX include Hillsboro Airport, Troutdale Airport, and Scappoose Industrial Airpark.

5.6 Military

Military facilities at the Airport are located on 246 acres of land south of Runway 10R-28L. Since the 2000 Master Plan was completed, the 939th Air Refueling Wing was reassigned and no longer leases land from the Port or operates at PDX. This reassignment was recommended by the U.S. Department of Defense as part of the 2005 Base Realignment and Closure (BRAC) Commission study. Units leasing the military area from the Port include the 142nd Fighter Wing of the Oregon Air National Guard (ORANG), the 224th Combat Communications Squadron, the 272nd Combat Communications Squadron, the 366th Operating Location-Alpha (OL-A) Communications Squadron, and the 123rd Weather Flight unit. The 142nd Fighter Wing unit currently flies 20 F-15 Eagle aircraft. However, the Wing could switch to the F-22 Raptor aircraft in the coming years.

Buildings occupied by ORANG include 5 administrative, 63 industrial, and 4 service buildings, totaling approximately 691,839 square feet. A total of 576 full-time personnel are employed, increasing to 1,332 personnel twice a month during the 142nd Fighter Wing unit drill. The annual number of military aircraft operations at the Airport is 10,000, compared to approximately 260,000 for nonmilitary operations at PDX. The location of military facilities is shown on Figure 5-43.

The Oregon Air National Guard leases the military area from the Port. The lease is scheduled to expire in 2029. It was recommended in the 2000 Master Plan that the site used by the military be vacated. Later, the Port of Portland conducted a Military Siting Analysis Study. Initially, eight airports, including PDX, were evaluated to rank how well the airport suited military needs. PDX ranked the highest. Later, military siting concepts were identified to accommodate the “centralized” and “decentralized” Master Plan development alternatives. These concepts were developed with the intention that they would be further considered in the current master planning process.

5.7 Airport/Airline Support

Airport and airline support facilities include the fuel farm, aircraft rescue and fire fighting (ARFF), Airport Traffic Control Tower (ATCT), Central Utility Plant, ground run-up enclosure, Horizon Air Maintenance Hangar, FAA offices, Airport maintenance, flight kitchen, and rental car facilities, Existing Airport and airline support facilities are illustrated on Figure 5-41 (air mail facilities) and Figure 5-44.

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 750'
Scale: 1" = 750'

Figure 5-43

Military Area

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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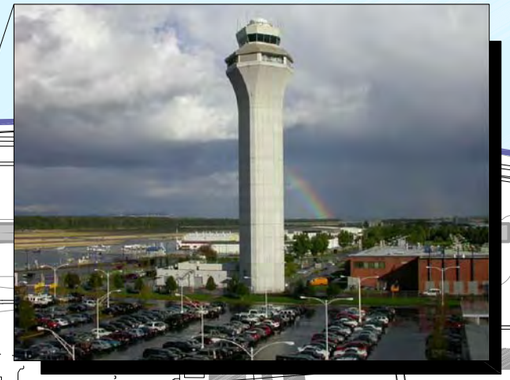

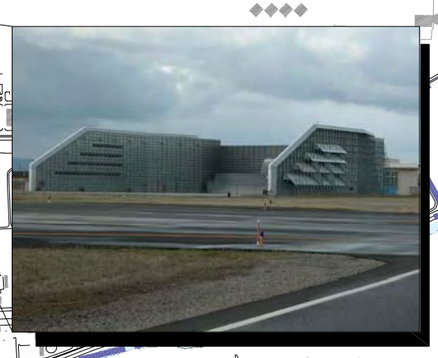

Building Legend

1 Fuel Farm
2 Aircraft Rescue and Fire Fighting (ARFF)
3 Airport Traffic Control Tower
4 Central Utility Plant
5 Ground Run-up Enclosure
6 Horizon Airlines Maintenance Hangar
7 FAA Offices / Airport Maintenance
8 Flight Kitchen
9 Delta GSE
10 Rental Car Facilities
11 Aircraft Maintenance Hangar

Legend

- Support Areas
- Buildings in Support Area
- Buildings
- Passenger Terminal
- Airport Property Line
- MAX Light Rail

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 1,250'
Scale: 1" = 1,250'

Figure 5-44

Airport and Airline Support Areas

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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5.7.1 Fuel Farm

The fuel farm is located just west of the ARFF. It consists of three above ground storage tanks with a total capacity of 3,360,000 gallons of jet fuel. Two tanks are each approximately 65 feet in diameter and 33 feet high. These tanks hold approximately 840,000 gallons each. A 1,680,000-gallon tank was recently added to the fuel farm. In general, one tank receives fuel, one sits idle, and the third pumps fuel.

Jet fuel is pumped to the fuel farm by an underground pipeline system, owned and maintained by Chevron, from a transfer facility located along the Willamette River. Jet fuel is then pumped from the storage tanks to various sites throughout the Airport via an underground distribution system. Aircraft parked at the gates receive fuel via an underground hydrant system. The fuel island located on the north side of Taxiway F across from the Horizon Air Maintenance Facility provides jet fuel to trucks, which are used to fuel aircraft parked at the FBO cargo facilities and general aviation and cargo aircraft parked at the North and South Cargo Areas. Portland Fueling Facilities Corporation owns the three large storage tanks in addition to the fuel and distribution system from the tanks on the Airport. Portland Fueling Facilities Corporation retains Aircraft Services International, Inc., to operate and manage its fuel distribution system at the Airport.

Several facilities on-Airport have separate storage tanks to hold different types of fuel. Flightcraft has storage tanks that hold 100 octane low lead aviation fuel used by small piston-driven general aviation aircraft. The Airport maintenance facility, ground service refueling by Flightcraft, and another ground service refueler located southwest of the U.S. Postal Service building all have storage tanks that hold gasoline for ground service vehicles. These fuel storage areas are supplied by truck deliveries and fuel is dispensed on-Airport by tanker trucks.

5.7.2 Aircraft Rescue and Fire Fighting

Personnel at the PDX ARFF facilities are responsible for all Airport fire fighting and emergency services. The primary ARFF facility is the fire station located in the northwest corner of the Airport near Taxiway D.

The 29,200-square-foot primary ARFF facility contains space for living, administration, training, and equipment storage, as well as several bays for washing vehicles. It also includes six 10-foot bays (26 feet deep), seven 16-foot bays (42 feet deep), and one 24-foot bay (42 feet deep for washing vehicles). Other ARFF facilities include a live fire training facility located north of Taxiway B near the end of Runway 10R, a hazardous materials building located off the northeast corner of the Colwood Golf Course (located off-Airport), and an alert shelter located off the Colwood Golf Course and south of the end of Runway 28L.

The existing ARFF facility does not have the capacity to store all ARFF vehicles and meet growing fire fighting and rescue requirements. Alternatives recently considered to meet these requirements include building a new ARFF facility approximately half the size of the existing facility and located on the south side of the airfield.

Two elements determine the level of ARFF capability at an airport—the size of the aircraft operating at the Airport and the number of daily departures. PDX is classified as a Class I airport with scheduled and unscheduled large air carrier aircraft (30+ seats) and scheduled small aircraft (10-30 seats). The Airport also has an ARFF Index E designation. Index E indicates that the longest aircraft using the Airport is 200 feet. The ARFF facility is shown on Figure 5-44.

5.7.3 Airport Traffic Control Tower

Federal Aviation Administration staff at PDX primarily operate from the Airport Traffic Control Tower, located near the parking garages and the terminal curbside roadway loop. The initial level of aircraft departures and the final level of aircraft arrivals are controlled from the ATCT. Air traffic control at the Airport is handled through air/ground communications and visual signaling from the ATCT.

5.7.4 Air Mail

The U.S. Postal Service (USPS) has two facilities at the Airport. The facility located in the Southeast Cargo Complex has limited sorting operations. Full operations are conducted at the facility only during peak holiday periods. The facility is also a storefront facility serving the public. The other USPS facility is located at the AirTrans Cargo Center, with full year-round operations, but no storefront.

5.7.5 Ground Run-up Enclosure

The noise produced by FAA-required aircraft engine run-up maintenance tests is of concern to the surrounding community, especially during nighttime hours. To reduce noise exposure from these tests, the Port of Portland conducts engine run-up tests inside a sound insulated ground run-up enclosure. The ground run-up enclosure at the Airport was constructed in 2001 adjacent to Taxiway J and is a three-sided enclosure measuring 55 feet high, 236 feet wide, and 291 feet deep. It is large enough to accommodate an MD-11 size aircraft. An evaluation of the enclosure conducted in 2001 found that it was effective in reducing noise by 18 decibels, or 75%. This reduction is consistent with results from evaluations at other airports.

5.7.6 Maintenance Hangars

Currently, the Horizon Air and the Aircraft Maintenance Hangar are the two civilian aircraft maintenance facilities on Airport property. Horizon Air occupies the Horizon Air Maintenance Facility located just south of the ground run-up enclosure near the

intersection of the south parallel and crosswind runways. This facility occupies 150,935 square feet with an additional ramp occupying 427,324 square feet.

The aircraft maintenance hangar is located in the AirTrans Cargo Center at the south end of Runway 3-21. This hangar occupies approximately 289,000 square feet, with ramp space totaling 348,500 square feet. Currently this maintenance facility is used to paint Boeing aircraft.

5.7.7 FAA Offices

FAA offices are located near the intersection of NE 82nd Avenue and NE Alderwood Road.

5.7.8 Airport Maintenance

Airport maintenance facilities are provided at four separate sites. Three of these sites are on Airport property and one is off-Airport. On-Airport sites are the Maintenance Facility located off the southeast end of Runway 28L, the Central Utility Plant, and the Airport terminal. The off-Airport site is the Myers Drum Building, located on NE 82nd Avenue.

The Maintenance Facility was initially constructed in 1982 and consists of five buildings, including a fuel island, storage building, and wash rack constructed in 1985, 1986, and 1987, respectively. The Maintenance Facility contains 71,820 square feet of shop and administrative space, as well as vehicle, bulk and pallet storage areas. The Myers Drum Building contains 13,440 square feet of electrical and general maintenance area in addition to bulk material, vehicle, and long-term storage space.

Because tenant space has priority at the terminal building, only a small amount of storage space for parts and tools is allotted to Airport maintenance. The Central Utility Plant has adequate space for the Heating, Ventilation, and Air Conditioning (HVAC) Maintenance Group, which is located there.

Overall, the Maintenance Facility is in good condition. However, it does not function efficiently to meet current Airport needs. There is a shortage of storage space, adequate office space, workshop space, and parking area. A central storage facility for materials, equipment, and vehicles is also needed.

5.7.9 Flight Kitchen

Two in-flight catering companies that service the airlines are located on the Airport: Gate Gourmet and Sky Chefs, Inc. Gate Gourmet is located on the north side of NE Airport Way and occupies a 32,076-square-foot building on leasehold of approximately 2.6 acres. Sky Chefs is located on NE Alderwood Road near its intersection with NE 82nd Avenue. Sky Chefs occupies a 39,469-square-foot building

on leasehold of approximately 3.1 acres. The flight kitchens occupy a leasehold of approximately 6.5 acres.

5.7.10 Utilities

The utility systems serving the Airport have been upgraded several times in recent years, as demand on existing service lines increased and projects providing additional capacity or extended services were completed. The utility system includes the Central Utility Plant, and systems for electrical, natural gas, telecommunications, water, sanitary sewer, and stormwater services.

Planned expansion of the terminal facilities will require consideration of utility system expansions to meet increased demand. The existing terminal contains a broad range of underground utilities, which would need to be removed and/or relocated as future developments occur. Projects needed to repair, upgrade, or replace existing utility lines may temporarily affect some existing airfield areas during construction.

Central Utility Plant

The Airport's Central Utility Plant is located just east of the P-1 parking garage between the west and eastbound lanes of NE Airport Way. The Central Utility Plant was upgraded in 1995 with a 1,700-square-foot boiler house added at the northeast corner of the building and a 35-foot-wide extension to the southwest corner of the building to accommodate expanded steam and emergency power systems. The two-level addition provided approximately 2,300 square feet on the ground level, with space for up to five ten-megawatt generators. Four of the five spaces are currently occupied. The second level is used to house switchgear equipment.

A second phase expansion of the Central Utility Plant was completed in 1999. The expansion included a 50-foot addition to the east side of the building, and relocation to accommodate the existing east-side access road. The primary purpose of the expansion was to increase the capacity of the steam and chilled water systems to meet the heating and cooling needs of existing facilities and expanded terminal facilities, in addition to replacing inefficient and aging equipment. The location of the Central Utility Plant is shown on Figure 5-44.

Electrical System

Pacific Power (a Division of PacifiCorp) supplies the main power feed to the Airport via three 12.5 kilovolt (kV) alternating current (AC), three-phase lines. The Airport is served from the south by the Cully Substation and the Killingsworth Substation and from the east by the Alderwood Substation, located near I-205.

The plant power distribution consists of a combination of primary and secondary selective systems plus standby generators, resulting in high reliability. Two unit

substations are connected at their breaker and bus, resulting in a primary selective system. This primary selection ensures against loss of one of the two primary service laterals from Pacific Power. Upon failure of one normal source, each substation can be switched to its alternate source.

In addition to daily distribution capabilities, the power plant is equipped with emergency power generators. Three 1.0-megawatt (MW) and one 1.5-MW, 4,160-volt, generators provide emergency power at the Central Utility Plant in the event of a utility outage.

The Central Utility Plant distribution lines feed the terminal building to the west through the utility tunnel. Airfield facilities, such as runway and taxiway lights and signs, are supplied from a series of regulators in the Central Utility Plant.

The current project to construct a new Port Headquarters and second parking garage (the combined headquarters and second parking garage project is referred to as HQP2), as well as other long-term projects at the Airport, is expected to require additional capacity. The capacity of the existing electrical lines is considered adequate at this time, although expansion of circuits is expected to be necessary as growth continues.

Natural Gas System

NW Natural serves the Airport with three main lines. A 4-inch line serving the terminal and support facilities enters Airport property along NE 82nd Avenue south of the intersection with NE Alderwood Road. The line continues north along NE 82nd Avenue to the intersection with NE Airport Way and then west through the landscaping berm between the inbound and outbound lanes of NE Airport Way. The 4-inch line terminates approximately 300 feet east of the Central Utility Plant.

A 2-inch line serving the AirTrans Cargo Center from a line off NE Cornfoot Road runs north along NE AirTrans Way to a termination point at the intersection with NE Transport Way.

A 2-inch line serving the AirTrans Center West Cargo facilities runs west along a vacated portion of NE Elrod Road, then north approximately 950 feet along the vacated portion of NE 47th Avenue.

Numerous 2-inch lines feed off the main lines to serve Port facilities and local businesses throughout the Airport.

Telecommunications System

The Qwest Corporation serves the Airport with a sharp route dual feed system. The primary feed is from the Atlantic central office. The secondary feed is from the Alpine

central office. The dual feed is a two-line looped system used to protect the Airport from total system failure should one of the feeder lines be taken out of service.

The Alpine fiber feeder line enters Airport property running west along NE Airport Way. The line continues west to the south side of the Central Utility Plant where it enters a utility tunnel running to the terminal building. The line terminates inside the terminal building. Expansion of the conduit to accommodate additional fiber capacity is anticipated.

The Atlantic fiber feeder line enters Airport property running north of NE 47th Avenue and NE Cornfoot Road along the vacated portion of NE 47th Avenue. The line turns east at Taxiway E, then runs generally northeast to Runway 10R-28L, and then north to the terminal building where it terminates with the Alpine feeder line.

The AirTrans area is served from the Atlantic central office via the NE 47th Avenue alignment, which enters the AirTrans area at the easterly end of Air Cargo Road. An equipment vault has been installed on AirTrans Way to convert light wave signal to conventional signal.

Water System

Until recently, the Port of Portland owned and operated the water system as its own purveyor and sold water to its tenants. In December 1995, the Port transferred ownership of the water system serving the NE Airport Way facilities and the terminal building to the City of Portland. The transferred water system begins at the master meter located at the intersection of NE Cornfoot and NE Alderwood roads. A 24-inch ductile iron and a 12-inch cast iron pipe run parallel north on NE Alderwood Road and the vacated portion of NE 82nd Avenue to NE Airport Way. At that point, the line connects to a 12-inch cast iron pipeline that runs from the east near I-205. Two lines continue west along NE Airport Way: a 12-inch cast iron pipeline on the north side of the road and a 16-inch cast iron pipeline on the south side of the road. The two lines loop and then connect just east of the P-1 parking garage.

A second system begins with a 12-inch cast iron pipeline at the intersection of NE Cornfoot Road and NE 47th Avenue and runs north, parallel with the vacated portion of NE 47th Avenue. After crossing Taxiway B, the line gradually bends east to parallel NE Marine Drive. A significant portion of this line was constructed in 1947 using transit pipe. This pipe has been replaced in sections, as required; however, the entire line warrants an investigation of replacement possibilities. At a point just east of the north end of Runway 3-21, the line turns south where it connects to the terminal building and the above-mentioned loop.

The AirTrans Cargo Center is served by a 20-inch ductile iron pipeline that begins at the intersection of NE Cornfoot Road and NE 47th Avenue and runs north along NE AirTrans Way.

Sanitary Sewer Systems

The sanitary sewer systems serving the Airport, including the terminal building, facilities along NE Airport Way, and the AirTrans Cargo Center, were designed as public facilities and are owned and operated by the City of Portland. The City's system begins at a sanitary lift station located under the elevated roadway behind Concourse B. The 18-inch reinforced concrete pipe runs east past the intersection of NE Airport Way and NE 82nd Avenue. From this point, the line is a 36-inch cast iron gravity pipe running east to NE 105th Avenue. The line then runs southeast along NE 105th Avenue to the Holman pump station just west of I-205. Numerous smaller (6 inch to 14 inch) service lines run parallel and/or adjacent to the main line to serve the Port and private facilities along NE Airport Way. The AirTrans Cargo Center system is a combination of gravity and force main lines running from NE Cornfoot Road north along NE AirTrans Way.

Sanitary waste from the AirTrans Cargo Center flows into a City line running along NE AirTrans Way, and then to a small lift station. From that point, waste water is transferred to a Port line crossing the airfield and to a pump station on the airfield near Taxiway B. An Oregon Air National Guard line also leads to this airfield lift station. Waste is then pumped to a City lift station located under the elevated roadway just behind Concourse B.

Stormwater System

The stormwater system at PDX consists of drainage facilities and deicing facilities, as discussed below.

Drainage

Stormwater at the Airport is collected through a series of drainage ditches and stormwater pipes that discharge into the middle reach of the Columbia Slough or its tributaries. The waters of the Slough are pumped or gravity flowed to the lower Slough via the Multnomah County Drainage District pump station #1. The lower Slough, which is tidally influenced, flows into the Willamette River and finally to the Columbia River.

The drainage system is divided into nine drainage areas. Each drainage area has one or two major outfalls where stormwater leaves Airport property. The total drainage area discharged through the Port's outfalls consists of approximately 3,700 acres, which includes runoff from areas not owned or managed by the Port. The Oregon Air National Guard leases land from the Port and maintains a separate storm sewer system. However, some areas of the ORANG site discharge stormwater to the Port's storm sewer system. Table 5-18 provides a description of each drainage area.

The stormwater drainage system consists of a series of closed pipes and open drainage ditches. The overall drainage pattern at the Airport is generally from north to south, and all flows eventually drain into the main channel of the Columbia Slough, which flows from east to west. The closed system consists of pipes of varying sizes and materials. Pipe sizes range from 8 inches to 78 inches. The pipes are composed of corrugated steel, aluminum, acrylonitrile butadiene styrene (ABS), concrete, and reinforced concrete. The Airport has three quiescent ponds that collect and settle sediments from stormwater runoff. In addition to the quiescent ponds, five detention ponds retain stormwater during major rain events to reduce flow to the Slough and its tributaries. This system is used to drain paved, nonpaved, and building areas, including the runways, taxiways, apron areas, terminal building, access roads, infields, and commercial development areas. The pipes may flow into open ditches, which range from very flat grass-lined swales adjacent to the runways to very wide, deep drainage channels.

Deicing

On May 18, 2004, the Oregon Department of Environmental Quality (DEQ) issued National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit Number 101647 to the Port, 36 airlines, and the Oregon Air National Guard. The permit authorizes discharges of aircraft and pavement anti-icing and deicing materials in stormwater runoff, rinse water, shear, overspray, and drip, including such materials discharged from the Airport's stormwater deicing collection system, into the Columbia Slough. The permit establishes waste discharge limitations, in the form of waste load allocations based on total maximum daily load limits for the Columbia Slough.

The Port and the airlines serving PDX committed to implementing system enhancements and are working with the Oregon DEQ and external stakeholders to design, construct, and implement those improvements. These enhancements are described in Technical Memorandum No. 3, Facility Requirements.

Table 5-18

DRAINAGE AREAS

Drainage Area	Description	Outfall
1	Contains a portion of Runways 10R-28L and 3-21, a section of Northwest Ramp, Southwest Ramp, Taxiways D, G, H, and M; Portions of Taxiways B, C, E, and T; the ARFF station, fire training facility, Portland Fueling Facilities Corporation fuel farm, Ameriflight, and BPA and its associated ramps.	Has two major discharge points: one to the SW Quadrant ditch and a second to the Elrod Canal ditch
2	Southern portion of Runway 3-21, Taxiways E and F, Central Ramp, PFFC fuel island and UPS buildings and Central Ramp. Drains to the West Quiescent Pond then to the West Detention Pond.	Discharges directly to a tributary of the Columbia Slough off NE Cornfoot Road
3	Drains the roof of the Boeing hangar as well as the adjacent parking lot.	Discharges directly to the Columbia Slough south of the Boeing hangar
4	Contains the South Ramp Area, FedEx, UPS –Cartage Services, DHL Express and BAX Global buildings. Drains to the Central Quiescent Pond.	Discharges directly to the Columbia Slough off NE Cornfoot Road
5	Contains areas outside the airfield fence, including the Aircraft Service International Group Building, International Air Cargo Center building and ramp, Horizon Air; UPS-Cartage Services, Airborne Express, BAX Global loading docks, and USPS Annex.	Discharges directly to the Columbia Slough off NE Cornfoot Road
6	Contains mid Runway 10R-28L, Taxiway J, portions of Taxiways B, C, and J; terminal gates B, C, and south D; a portion of the parking garage, Horizon Air Maintenance Building and associated ramp, ORANG buildings and ramp, USAF Reserve buildings and ramp, ground run-up enclosure, terminal building, deicing concentrated storage tank, and dilute detention basin. Basin 6 drains to the East Quiescent Pond then to the East Detention Pond.	Discharges directly to the Columbia Slough off NE Cornfoot Road
7	Contains Runway 10L-28R and the east portion of Runway 10R-28L; General Aviation Ramp; North, Northeast, and Southeast Ramps; Taxiway A and portions of Taxiways B and C. Terminal A, E, and north D gates, taxicab hold area, Port maintenance facility, Port maintenance annex, Central Utility Plant, Port Hazardous Materials Building; PDX Cargo Center; PacifiCorp; Flightcraft, USPS, Sky Chef, United Airlines Maintenance, Gate Gourmet, long-term parking; a portion of short-term parking (parking garage), fuel island, tenant glycol tanks storage area; and the TriMet MAX light rail.	There are three discharge points from PDX to the McBride Slough, which then flows into a culvert and hard pipe to the Columbia Slough

Table 5-18 *(page 2 of 2)*
DRAINAGE AREAS

Drainage Area	Description	Outfall
8	Contains Portland International Center, parking lots and the rental car companies, Sheraton Inn, Hampton Inn, Embassy Suites, Port Central Storage Facility, and TriMet MAX light rail. Basin 8 has a system of open ditches and storm lines. One detention pond captures runoff from NE International Parkway and NE Cascades Parkway, then discharges to an open ditch. The west half of the employee parking lot off NE Alderwood Road also discharges to Outfall 8.	Drains directly to the Columbia Slough located off NE 92nd Avenue
9	Contains Portland International Center, IKEA, the retail center, parking lots, and TriMet MAX light rail. Basin 9 has a system of open ditches and storm lines. The majority of Basin 9 drains through two detention ponds before discharging to the Columbia Slough. A storm pipe that collects runoff from properties east of I-205 not owned by the Port discharges into the East Detention Pond.	Drains directly to the Columbia Slough off Glass Plant Road and Alderwood Road

Source: Port of Portland.

The deicing collection system became operational on November 1, 2003. The deicing system collects deicing fluid and storm runoff from Airport drainage basins 2, 4, 6, and 7. The system is designed to handle a 5-year winter storm event and consists of both concentrated and dilute collection infrastructure, as described below.

Deicing fluids from the terminal ramps are collected by a series of pump stations (pump stations A, C, and L) and discharged to a 2-million-gallon concentrated storage tank. The material in the concentrated storage tank is discharged via pump station J to the City of Portland's Columbia Boulevard Wastewater Treatment Plant under the terms of the Port's pretreatment permit with the City. The material can also be offloaded via the truck load-out facility near the concentrated storage tank to a tanker truck (see Table 5-19).

Table 5-19

DEICING SYSTEM INFRASTRUCTURE—CONCENTRATE SYSTEM

Description	Location	Purpose – Size
Pump Station A (PS-A)	Wet Well – Airside - East of intersection of Taxiways A and V Building – Airside adjacent to perimeter gate NA09 at the southwest corner of the SkyWest ramp area	Collect and convey stormwater affected by aircraft deicing fluid to the concentrated storage tank (CST) 5.76 million gallons per day (MGD) design capacity
Pump Station C (PS-C)	Wet Well – Airside - Between Taxiway B and Runway 10R-28L, East of Taxiway B-5 Control Room – Airside - Located beneath terminal in Room T-1783A BIOX Enclosures – Airside - C-East Ramp level adjacent Gate C-3 - C-West Ramp level adjacent Gate C-19	Collect and convey stormwater affected by aircraft deicing fluid to the CST 10.1 MGD design capacity
Pump Station L (PS-L)	Wet Well – Airside - East of Concourse A ramp, north of Taxiway B, and south of Perimeter Road Building – Airside at east end of Concourse A ramp	Collect and convey stormwater affected by aircraft deicing fluid to the CST 2.3 MGD design capacity
Pump Station J (PS-J)	Building - Landside - East of Taxiway J and west of ORANG Base	Discharge of stormwater affected by aircraft deicing fluid to the sanitary sewer for treatment at the City of Portland's Columbia Boulevard Wastewater Treatment Plant Up to 0.43 MGD discharge
Snow Containment Pad	Pad – Airside - East of Pump Station L, north of Taxiway B, south of Perimeter Road and the USPS	Location for snow affected by aircraft deicing chemicals to be deposited by truck following collection from around terminal Drains into PS-L wet well 3 acres of asphalt pavement
CST	Tank – Landside - East of Taxiway J and west of ORANG Base	Storage of stormwater affected by aircraft deicing fluid prior to discharge to the sanitary sewer for treatment 2 million gallon capacity
Truck Load-Out Pad	Pad - Landside - Southwest of the southern end of Taxiway J, east of AirTrans Way, and north of the dilute detention basin	Infrastructure to facilitate off-site disposal of stormwater affected by aircraft deicing fluid from the CST 265 gallon per minute throughput capacity

Source: Port of Portland.

Deicing fluids from airfield pavements and cargo areas are collected by a series of pump stations (pump stations E, F, G, and 6) and discharged to a 13-million-gallon dilute detention basin. The material in the dilute detention basin is discharged via pump station I to the Columbia Slough in accordance with the waste load allocation for biological oxygen demand (BOD) (see Table 5-20).

Ten STIP/ISCO BIOX meters (Model – Airport BIOX 1015) are used for real-time monitoring of BOD, diversion of deicing storm water runoff to concentrated or dilute storage based on the BOD concentration of the runoff, and metered discharge from the concentrated storage tank and dilute detention basin. Two additional BIOX meters in drainage basin 1 provide real time monitoring of BOD. A programmable logic control system monitors and controls the deicing collection system. A supervisory control and data acquisition system provides graphical screens to display facility operations and allow operator control of the system components.

The deicing system infrastructure is illustrated on Figure 5-45. The deicing collection system is illustrated on Figure 5-46 and the system of stormwater drainage basins is illustrated on Figure 5-47.

5.8 Commercial/Industrial

Cascade Station/Portland International Center (CS/PIC) is a 458-acre planned mixed-use development area designated as the CS/PIC Plan District by the City of Portland in February 1999. CS/PIC, illustrated on Figure 5-48, is located north of the Columbia Slough, east of the terminal area and NE 82nd Avenue, south of NE Airport Way, and west of I-205. CS/PIC is currently the site of the employee parking lot, the Embassy Suites hotel, and several industrial and commercial businesses. The area known as Cascade Station includes a commercial area with stores such as IKEA, Staples, Linens & Things, and various restaurants.

Several non-aviation-related facilities are located on-Airport. Hotels (Sheraton Inn, Hampton Inn, and Embassy Suites) are located east of the terminal complex along the NE Airport Way corridor. A marina is also located northwest of the terminal complex along NE Marine Drive and is part of Airport property.

The land on which CS/PIC is located was purchased by the Port in the 1970s to protect approach path to Runway 28L. Today, much of the land has been developed or will be developed with offices, retail stores, hotels, and industrial facilities and services. This development was made possible by a public/private partnership established in the 1990s between the Port, the Cascade Station Development Company (Bechtel and Trammel Crow), TriMet, and the City of Portland. From this partnership, funding was provided for roadway, light rail, and utility improvements and for developing retail uses on approximately 125 acres of land known as Cascade Station or Subdistrict A,

PS-A
RUNWAY 10L-28R
TAXIWAY A
ARFF ROAD
TAXIWAY D
TAXIWAY H
TAXIWAY E
TAXIWAY T
TAXIWAY M
Connected to Sanitary Sewer Main
NE Airport Way
PS-L
Snow Containment Pad
PS-C
TAXIWAY B
RUNWAY 3-21
TAXIWAY T
Air Cargo Rd.
E. Perimeter Rd.
NE 82nd Ave
Ambassador Pl.
Pkwy
RUNWAY 10R-28L
TAXIWAY B
TAXIWAY C
PS-E
Southwest Ramp
TAXIWAY F
Alderwood
NE Cascades Pkwy
TWY G
Concentrate Storage Tank
PS-J
TAXIWAY E
Perimeter Rd
NE Cornfoot Rd.
PS-I
Tank Truck Load Out Pad
PS-6
NE Elrod Rd.
PS-F
PS-L
Dilute Detention Basin
Outfall to Slough
COLUMBIA SLOUGH

Legend
- Dilute System Piping or Canal
- Concentrated System Piping
- Sanitary Discharge to Treatment Plant
- Outfall Line to Slough
- Pump Station
- Primary Study Area Boundary
- Airport Property Line
- Building
- Passenger Terminal

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

Not to scale
Locations are approximate

Figure 5-45

Deicing System Basic Diagram

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Figure 5-46

Deicing Collection System

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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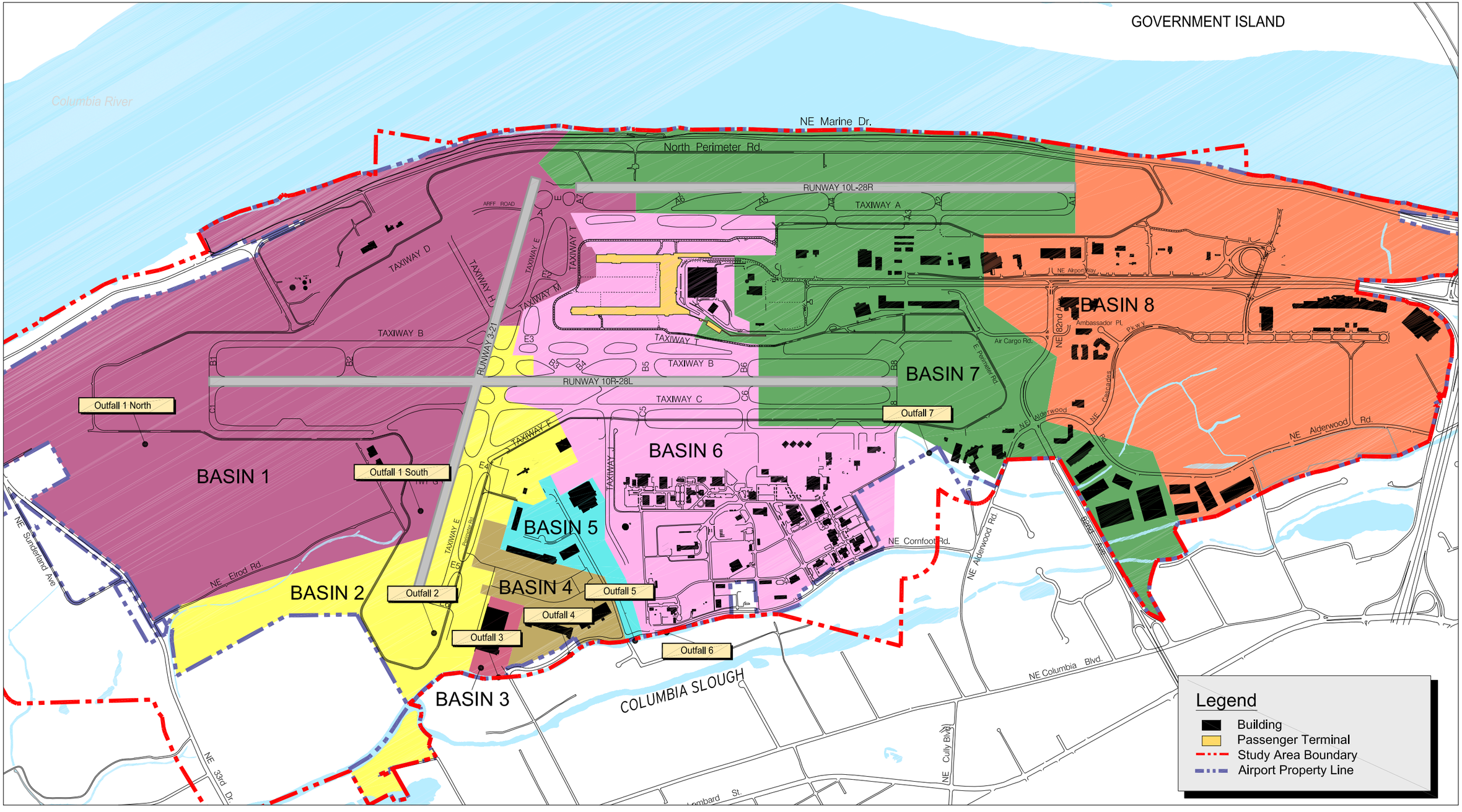

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

NOT TO SCALE

Source: Port of Portland Staff

Figure 5-47

Stormwater Drainage Basins

Master Plan Update
Portland International Airport

September 2008

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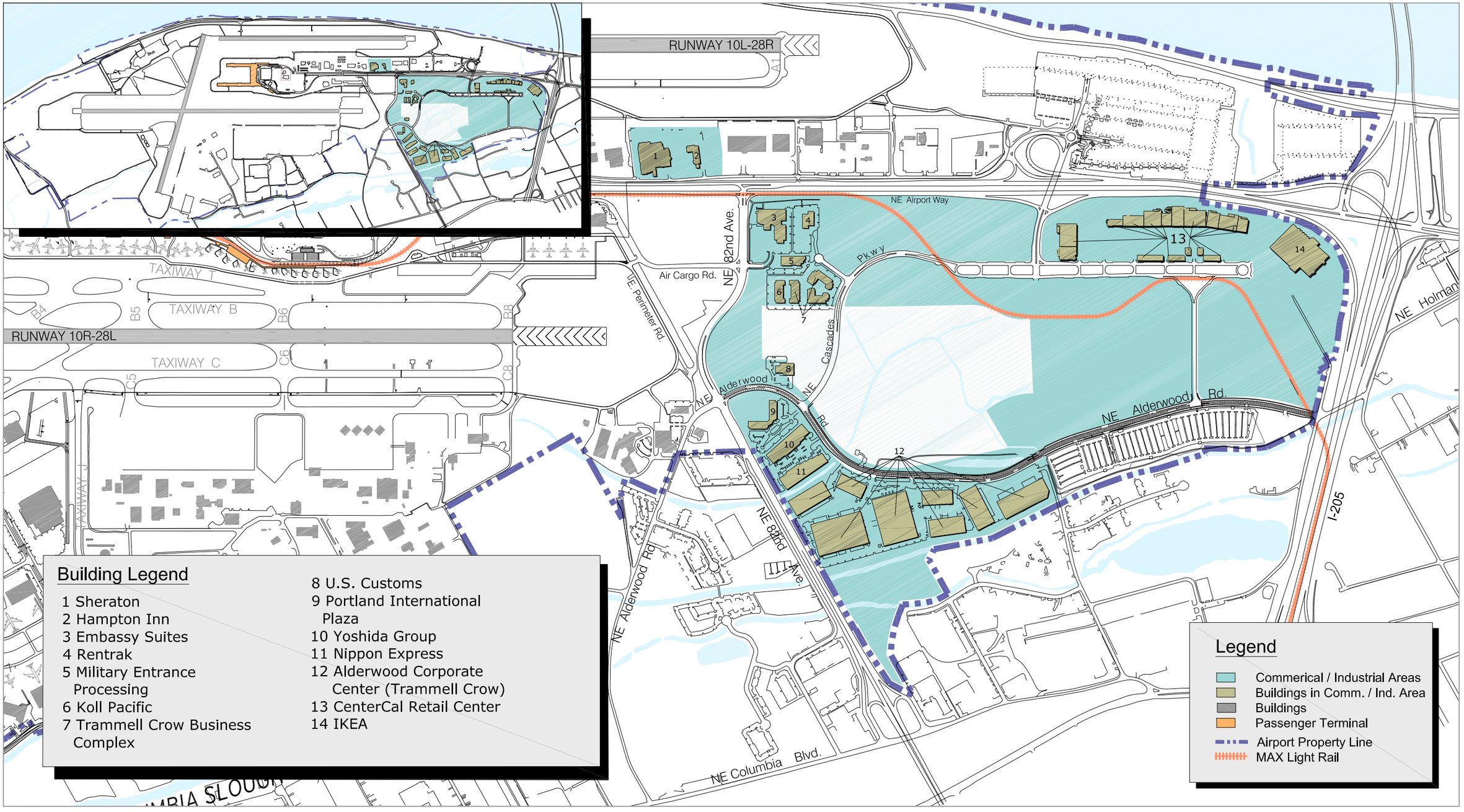

AIRPORT FUTURES
CHARTING A COURSE FOR PDX

0' 1,000'
Scale: 1" = 1,000'

Figure 5-48

Commercial and Industrial Areas

Master Plan Update
Portland International Airport

Source: Port of Portland Staff

September 2008

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Table 5-20

DEICING SYSTEM INFRASTRUCTURE—DILUTE SYSTEM

Description	Location	Purpose – Size
Pump Station E (PS-E)	Wet Well and Building – Airside, Northwest corner of Aircraft Maintenance Hangar	Intercept and convey stormwater affected by deicing chemicals (aircraft and pavement) to storage Collects Basin 7 22.84 million gallons per day (MGD) design capacity
Pump Station F (PS-F)	Wet Well – Airside, West of Boeing hangars, east of Perimeter Road and south of Taxiway E-6 Building – Airside, SW of Boeing hangars and east of Perimeter Road	Intercept and convey stormwater affected by deicing chemicals (aircraft and pavement) to dilute detention basin (DDB) Collects Basin 2 7.2 MGD design capacity
Pump Station G (PS-G)	Wet Well and Building – Landside, North of NE Cornfoot Road adjacent to FedEx cargo facility	Intercept and convey stormwater affected by deicing chemicals (aircraft and pavement) to DDB Collects Basin 4 5.9 MGD design capacity
Pump Station 6 (PS-6)	Building, Wet Well and Pumps – Landside, Northeast of intersection of NE Cornfoot Road and NE AirTrans Way, west of ORANG Base adjacent to DDB and Pump Station I (also referred to as AirTrans Pump Station)	Intercept and convey stormwater affected by deicing chemicals (aircraft and pavement) to DDB Collects Basin 6 and Basin 7 when Pump Station E is in diversion 40.8 MGD design capacity
Pump Station I (PS-I)	Wet Well – Landside - Located on east berm of DDB Building - Landside, Northeast of intersection of NE Cornfoot Road and NE AirTrans Way, west of ORANG Base adjacent to DDB and Pump Station 6	Discharge stored stormwater affected by deicing chemicals (aircraft and pavement) to the Columbia Slough (via Outfall 6) in compliance with waste load allocation 5.9 MGD design capacity
DDB	Basin - Landside, Northeast of intersection of NE Cornfoot Road and NE AirTrans Way, west of ORANG Base	Storage of stormwater affected by deicing chemicals (aircraft and pavement) 13 million gallon design capacity

Source: Port of Portland.

covering primarily the area north of NE Cascades Parkway. The rest of the 458 acres is known as Subdistrict B, part of which is used for industrial uses, and part (some 100 acres) of which is set aside for aviation purposes (Aviation Reserve), including the employee parking lot.

5.9 Strategic Reserve

The Southwest Quadrant refers to the area of the Airport formed by the axis of Runway 10R-28L to the north (the longest runway at the Airport) and Runway 3-21 to the east. The strategic reserve areas in the Southwest Quadrant, as shown on Figure 5-2, contain several wetland areas and groves of trees. In 2004, the wetlands were recommended in the *PDX Wildlife Hazard Management Plan* to be filled and the trees removed, thereby resolving the concern of bird strikes posing a serious safety hazard to aircraft operations. As a result of the plan recommendation, the wildlife area was moved further from the Air Operations Area (AOA).

5.10 Mitigation Site

Management Area F, known as Buffalo Street/Cornfoot Road, is a 23-acre mitigation site located just outside the perimeter fence of PDX, north of the Columbia Slough and NE Buffalo Street, east of NE 33rd Drive, south of NE Cornfoot Road and the Broadmoor Golf Course, and west of NE 42nd Avenue. The site, shown on Figure 5-2, is managed by the Port's Marine and Industrial Development Mitigation program.

The site was established in 1994 as a mitigation site for the Southwest Quadrant fill project. It remains a mitigation site today and encompasses a large upland and riparian area as a result of the Southwest Quadrant fill project. The northern portion of the site along the Columbia Slough was revegetated. The soil consists of Rafton silt loam and Sauvie silt loam. The Sauvie silt loam is protected from flooding by the Columbia River levee.

The mitigation site is a safety concern for the Port because it lies partially within the runway protection zone (RPZ) for Runway 3-21. Potential wildlife issues are of concern. The southern portion of the property is classified as a City of Portland habitat of concern and falls within the City of Portland conservation zone. The mitigation site also lies partially within the Federal Emergency Management Agency (FEMA) 100-year floodplain. Because the site lies within the floodplain, mitigation measures must conform to sustainable balance cut and fill standards (where no soil can be carted in or trucked out of the site). No future development projects are planned for this site.

5.11 Natural Resources

A natural resources site is located on Airport property, as shown on Figure 5-2. Classified by the City of Portland as the Environmental Conservation Zone and by Metro as a Class 1 Riparian Corridor/Wildlife Habitat, this zone is located in the center of

Economy Lot E and extends north to the base of the levee of the Columbia River. The 8.7-acre zone consists of a grove of cottonwood trees, wetlands, slough, and swales. The swale was created to handle stormwater runoff from the parking lot and discharges into a ditch that discharges into the Slough. The soil consists of Pilchuck sand, which is protected from flooding by the Columbia River levee.

The Environmental Conservation Zone is in the 50:1 approach surface and the 7:1 transitional surface for Runway 28R. In 2000, a number of cottonwood trees had to be topped to comply with FAR Part 77, *Objects Affecting Navigable Airspace,* surfaces. As runway configurations change, the height of vegetation is monitored for compliance. No future development projects are planned for this site.