Leigh Fisher

In association with

Webber Air Cargo, Inc.

TECHNICAL MEMORANDUM No.3 FINAL

AIR CARGO MARKET ASSESSMENT

Seattle-Tacoma International Airport

Prepared for

Port of Seattle
Seattle, Washington

May 2014

Sustainable Airport Master Plan
Seattle-Tacoma International Airport

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Introduction

In early 2014, the Port of Seattle's Aviation Division commissioned an Air Cargo Market Assessment (the Assessment) as part of the Sustainable Airport Master Plan (SAMP) for Seattle-Tacoma International Airport (SEA).

1.1 Objectives

The objectives of the Assessment were to understand (1) the composition of air carriers and cargo handlers that forms SEA's current air cargo operating environment, (2) the external factors that affect air cargo demand in the region, (3) competitive pressures from other airports and other transport modes that could affect air cargo growth at SEA, (4) the commodity composition of exports and imports transported principally by air, as well as relevant intermodal combinations, (5) the international origins and destinations of commodities traversing regional gateways, and (6) the improvements in facilities and services that could stimulate air cargo growth beyond that reasonably expected through organic growth over the 25-year planning period.

1.2 Approach

This Assessment entailed analyses of public and commercial databases, as well as on-site workshops and interviews providing direct input from SEA's air cargo community, specifically its air cargo carriers, air cargo handlers, freight forwarders and cargo facilities developers. More than twenty members of the local air cargo community provided input. Participants are listed in Appendix A. Information provided by participants was not individually attributed.

Using the most important metric for cargo carriers, this Assessment's quantitative analysis emphasizes weight (specifically the industry standard of metric tonnes) of shipments over dollar value. With chronic trade deficits resulting in surpluses of import (inbound) tonnage from Asia, carriers distinguish between U.S. markets on their ability to improve outbound payloads ("backhaul") on westbound transpacific flights. Consequently, exports are emphasized over imports in this Assessment.

This Assessment has the following elements: 1) Overview of the air cargo industry and recent North America Trends; 2) The SEA air cargo market's trends and carrier shares; 3) Analysis of competition and trade; 4) Assessment of facilities and handling service providers; and 5) Outlook and Recommendations. The preceding elements are presented as a technical memorandum and are complemented by an Excel database which was provided separately.

Overview of the Air Cargo Industry and Recent North America Trends

This chapter identifies air cargo operators, top North American air cargo airports, and trends affecting the industry since its peak in 2000.

2.1 Air Cargo Industry Business Models

The air cargo industry is comprised of four basic types of carriers. The dominant carriers of U.S. domestic cargo are **integrated carriers** (integrators) like FedEx and UPS which operate proprietary aircraft and proprietary trucking that both substitutes and complements its air operation. With this roadway capacity, integrators are able to offer door-to-door service for businesses and consumers. Since airline and commercial trucking deregulation began in the late 1970's, integrators have steadily expanded their networks of national and regional hubs to now dominate the domestic air cargo industry. Integrators also have extensive international networks that transport most export and import tonnage either on their own aircraft through their own hubs or on other international carriers from which the integrators (acting as freight forwarders) buy capacity. Previously DHL and its acquisition, the former Airborne Express, operated as integrators in the U.S. domestic market but since being bought by the German postal company Deutsche Post, DHL has reduced its U.S. activities to only international shipments.

Other **all-cargo airlines**, such as international carriers Cargolux and Nippon Cargo Airlines (NCA) provide only airport-to-airport transport, while off-airport surface transportation is likely to be provided by commercial trucking services. While the carriers just referenced operate their own scheduled service principally for freight forwarder customers, so-called ACMI (aircraft, crew, maintenance, and insurance) carriers such as Atlas Air operate freighter aircraft on a leased basis on both a charter and scheduled basis on behalf of carriers that may not require scheduled service year-round but only on a seasonal basis, such as for the Pacific Northwest's cherry season. Until terminating all operations in December 2013, Oregon-based Evergreen International Airlines was a major international all-cargo airline with its greatest U.S. presence in the Pacific Northwest.

Combination carriers operate both passenger and all-cargo flights on which cargo is carried. While only Alaska Airline* continues to operate as such among U.S. carriers, Northwest Airlines operated freighters until its acquisition by Delta. Most major Asian airlines either have proprietary freighters or freighter- operating subsidiaries. Combination carriers are able to offer shippers network advantages by pairing the dedicated capacity of freighters plus additional destinations and frequencies only justifiable by passenger demand. Combination carriers gain efficiencies from having both passenger and

*Alaska Airlines also operates so-called "combi" aircraft that carry both passengers and main deck freight on the same flight with the passengers in the aft of the aircraft.

all-cargo flights leverage the same facilities and labor but will operate only one type of service if market conditions so dictate.

Much like almost all of its U.S. counterparts, SEA's hub carrier, Delta Airlines, is a **belly carrier** that provides cargo capacity only on passenger flights. While most U.S. legacy carriers previously had their own stations and cargo sales staff in all major markets, the sales function has commonly been outsourced to freight forwarders and general sales agents (GSA's) while the warehouse operations were outsourced to third party cargo handling companies and to other airlines, particularly alliance partners. While belly carriers have lost considerable domestic market share to integrators and trucking companies, they provide essential capacity on transcontinental routes, especially to destinations lacking adequate demand to justify freighters.

Cargo handling companies such as Cargo Airport Services (CAS), Swissport, and Hanjin do not operate aircraft but allow many carriers to maintain a cargo presence that otherwise might be unprofitable if the carrier had to maintain its own warehouse and labor for daily (or less) service. Depending on the terms of its contracts with individual carrier customers, handling companies may provide loading and unloading of aircraft, tug transport to/from the ramp, warehouse functions such as the breakdown and buildup of pallets and containers, as well as the handling of documents on international shipments. By leveraging its warehouse space, labor and ground service equipment, third party cargo handlers maximize utilization of cargo facilities beyond what was possible when each carrier had its own cargo operation. Where enough tonnage justifies it, carriers like Alaska Airlines, Delta, and Southwest may keep their cargo operations in- house, as these three carriers presently do at SEA.

Freight forwarders account for the routing of about 70% of international shipments but only about 10% of domestic shipments. Depending on the needs of their shipper customers, forwarders may provide a variety of services but most commonly they profit from the spread between the rate they pay carriers for transport capacity based on volume purchasing discounts and what they charge shippers for that same capacity. To serve the critical needs of shippers, forwarders must depend upon the frequencies, destinations and capacity types (belly and freighter) provided by air carriers at gateways. The term "gateway airport" may refer to any airport with international service. Forwarders prefer local gateways where routine direct interaction with airline managers, cargo handlers and even federal Customs agents can be beneficial but still truck to/from distant larger gateways access superior transport options - specifically, a diversity of carriers, frequencies and direct international destinations.

Local offices of forwarders may be compelled to support larger gateways when otherwise acceptable local service is available. Forwarders enter into *block space agreements* in which they commit to a quota of capacity in exchange for favorable buying rates but must pay for that capacity whether they actually use it or not. In such conditions, it is common for the feeder markets to be directed to maximize their use of the gateway at which the commitment exists. In other cases, forwarders may not have a truckload of cargo destined for a single destination but may be able to fill a 52-foot truck with exports destined for multiple destinations in Asia. In such cases, a *mixed load* may comprise shipments for some destinations that could be served from a local gateway in the same trailer as exports destined for markets served only at a larger gateway. The preceding describes the challenge for any alternatives in challenging the dominant gateway in the region, in that an airport such as SEA provides at least passenger flights and a

few freighters to most of the important international destinations but must compete for forwarders' business against a gateway at which all of the major destinations are accessible and most are served by multiple carriers and with both belly and freighter capacity.

2.2 North American Air Cargo Airports

Ranked by annual total cargo* tonnage reported to Airports Council International - North America (ACI-NA), the top 25 North American airports, shown in Table 2-1, include ten national and regional cargo hubs for integrated carriers, as well as numerous international cargo gateways. Ranked #2, Anchorage (ANC) is a transpacific technical stop** and sorting center for FedEx, UPS and DHL.

Because integrators provide their own aircraft and trucking, as well as cargo handling, they have often selected less congested secondary airports for hubs. In the western region, FedEx chose OAK over SFO and UPS chose ONT over LAX. Integrators' hubs have made OAK (#13) and ONT (#15) top 15 cargo airports in North America but neither airport has been able to leverage these hubs to attract other cargo carriers and therefore neither competes directly with SEA for international carriers and destinations.

Unlike the single-carrier dominance of most integrator hubs, the largest international cargo gateways typically host a diversity of U.S. and foreign flag air carriers. The dominant international gateway in the western region, LAX, accounted for more than five times the annual tonnage of SEA, which ranked #18 on the basis of about 293 thousand metric tonnes in 2013. Other top 25 airports that potentially compete for the same cargo as SEA include SFO (#17), YVR (#22) and PDX (#25).

2.3 North America Air Cargo Trends for Period 2000 - 2013

The span from Calendar Year 2000 through 2013 began with a peak year for air cargo at many North American airports but - with few exceptions - that peak was followed by double-digit losses. Secondary gateways like SEA had been projected to benefit from overflow cargo, as LAX and other dominant gateways would exhaust their remaining capacity. However, instead of runaway cargo growth, total cargo decreased 14% at LAX between 2000 and 2013. As data in Table 2-1 indicate, 18 of the top 25 North American cargo airports suffered decreases for the same period. Total cargo at SEA declined 29%.

After having equaled freight at many airports in the early 1990's, mail decreased drastically as the internet replaced the postal service first for general correspondence, then for billing and payments. During the same period, the US Postal Service outsourced its Priority and Express Mail to FedEx. Because FedEx reports mail as freight to airports, some former mail tonnage has simply been re-categorized rather than eliminated. Still in total, some industry analysts believe mail has been so marginalized that it will cease to be reported as a separate cargo class this decade.

*Total cargo = enplaned and deplaned freight, express and mail - both domestic and international.

**Technical stops include refueling, crew changes and catering or some combination thereof.

Table 2-1
Top 25 North American Airports, Ranked by 2013 Total Air Cargo
Seattle-Tacoma International Airport
In metric tonnes

ACI Rank	Airport (Code)	2000	2013	Percent Change 2000 - 2013	Cargo Hub Carrier
1	Memphis (MEM)	2,489,078	4,137,938	66%	FedEx
2	Anchorage (ANC)	1,804,221	2,418,762	34	FedEx/UPS
3	Louisville (SDF)	1,519,528	2,216,079	46	UPS
4	Miami (MIA)	1,642,744	1,945,013	18	
5	Los Angeles (LAX)	2,038,784	1,744,101	-14	
6	Chicago (ORD)	1,468,553	1,527,655	4	
7	New York (JFK)	1,818,838	1,286,561	-29	
8	Indianapolis (IND)	1,165,431	991,953	-15	FedEx
9	Newark (EWR)	1,082,407	649,421	-40	FedEx
10	Atlanta (ATL)	868,286	617,714	-29	
12	Cincinnati (CVG)	390,820	594,520	52	DHL
11	Dallas/Ft. Worth (DFW)	903,141	589,320	-35	UPS
13	Oakland (OAK)	685,425	503,917	-26	FedEx
14	Houston (IAH)	368,498	426,384	16	
15	Ontario (ONT)	464,164	418,666	-10	UPS
16	Philadelphia (PHL)	559,340	380,143	-32	UPS
17	San Francisco (SFO)	872,252	363,795	-58	-
18	**Seattle (SEA)**	**411,228**	**293,210**	**-29**	-
19	Phoenix (PHX)	375,250	277,009	-26	-
20	Washington DC (IAD)	383,852	252,483	-34	-
21	Boston (BOS)	474,943	252,132	-47	-
22	Vancouver (YVR)	251,771	228,076	-9	-
23	Denver (DEN)	471,510	226,275	-52	-
24	Detroit (DET)	298,135	214,577	-28	-
25	Portland (PDX)	282,019	199,204	-29	-
	Group (1-25)	23,135,910	22,754,908	-2	

Source: ACI - NA, additional analysis by Webber Air Cargo, Inc.

Prior to these master contracts with all-cargo carriers, mail had been almost exclusively carried by passenger carriers as belly cargo for several decades. The loss of mail compounded other losses by passenger carriers, particularly for domestic cargo. As passenger carriers reduced the use of wide body aircraft on domestic routes, their ability to accommodate palletized and containerized cargo disappeared. The post-9/11 requirement of 100% screening for belly cargo further eroded the competitiveness of passenger carriers by negatively impacting timeliness. The marginalization of domestic belly capacity impacted not only domestic shipments but also the domestic segment of international shipments. The beneficiaries were integrated carriers and the trucking industry.

Trucking also benefited from the demise of multiple formerly large all-cargo airlines that otherwise might have benefitted from the passenger carriers' losses. Among U.S. all-cargo airlines, Kitty Hawk, Emery Worldwide, BAX Global, and Evergreen ceased operating. The former Airborne Express was acquired by DHL which later withdrew from the U.S. domestic market to concentrate exclusively on international shipments. That so much capacity could be reduced from the air cargo industry without replacement illuminates larger issues with demand, specifically the demise of manufacturing in the U.S. and the regionalization of distribution centers by companies like Home Depot. The former reduced demand for time-sensitive inputs and finished products, while the latter reduced the distance time-sensitive shipments must be transported, thereby reducing the need for air transport.

2.4 Summary

The top (by tonnage) North American cargo airports divide into two principal categories - integrated carrier hubs and international gateways. The former have gained greater domestic market share and the latter - including SEA - have hosted a greater diversity of cargo carriers. Between 2000 and 2013, the vast majority of North American airports experienced double-digit losses of total annual cargo as most mail shipments were replaced by internet communications, domestic and international air transport lost market share to trucking and ocean transport respectively.

SEA Air Cargo Market Trends and Carrier Shares

This chapter presents an overview of air cargo trends and market shares of the Airport's domestic and international air cargo carriers.

3.1 Air Cargo Trends at SEA for Period 2000 - 2013

In 2000, domestic freight accounted for 57% of SEA's total cargo, domestic mail for 23%, and international freight for only 18%. However as represented in Table 3-1, the three elements had very different trajectories as domestic freight decreased 34% and domestic mail decreased 50%. In contrast, international freight increased 17% between 2000 and 2013. International mail has never exceeded 1%. In 2013, domestic freight represented 53% of a much smaller cargo total and domestic mail represented only 16%. In contrast, international freight's share grew to 30%.

Table 3-1
Air Cargo 2000 - 2013
Seattle-Tacoma International Airport
In metric tonnes

Cargo Segment	2000	2013	Change (Percent)
Domestic Mail	94,198	47,544	-50%
Domestic Freight	236,428	155,868	-34
Domestic Total	330,626	203,412	-38
International Mail	4,908	593	-88
International Freight	75,694	88,580	17
International Total	80,602	89,173	11
Total Cargo	411,228	292,585	-29%

Source: Port of Seattle, additional analysis by Webber Air Cargo, Inc.

3.2 Carrier Market Shares at SEA

3.2.1 Domestic Market

With decreases in domestic mail and domestic freight, an erosion of market share and tonnage by passenger carriers was predictable. As shown in Table 3-2, Alaska Airlines' share (including Horizon) of domestic cargo rose from 11% in 2000 to 14% in 2013, even as its actual tonnage decreased 22%. Delta Air Lines and Northwest Airlines each had 6% of the domestic cargo market at SEA in 2000 but by 2013, Delta's total (after acquiring Northwest) was only 7% and its tonnage had decreased 63% from the

combined total of 2000. United Airlines' domestic cargo tonnage decreased 71% during the period, as its local market share decreased from 8% to only 4% and its domestic wide body capacity was diverted to other gateways. Serving a domestic air cargo route for which trucking cannot be substituted, Hawaiian Airlines increased its tonnage and doubled its market share to 3% at SEA. Southwest Airlines retained its 2% market share, in spite of its local tonnage decreasing by 36%.

Table 3-2
Domestic Cargo Tonnages and Market Shares (percent) by Carrier 2000 and 2013
Seattle-Tacoma International Airport

2000			2013		
FedEx	109,220	33%	FedEx	134,631	66%
Alaska Airlines	36,012	11	Alaska Airlines	28,152	14
Emery Worldwide	29,440	9	Delta Air Lines	14,852	7
United Airlines	25,864	8	United Airlines	7,506	4
Northwest Airlines	21,235	6	Hawaiian Airlines	5,218	3
Delta Air Lines	19,140	6	Southwest Airlines	4,838	2
DHL Airways	12,499	4	US Airways	2,172	1
Evergreen Int'l Airlines	12,484	4	JetBlue Airways	1,312	1
Kitty Hawk Aircargo	9,648	3	Empire Airlines	1,074	1
American Int'l Airways	7,654	2	Other	3,766	2
ABX Air	7,598	2	Total	203,521	100%
Southwest Airlines	7,569	2			
American Airlines	6,921	2			
Continental Airlines	5,298	2			
Hawaiian Airlines	4,519	1			
US Airways	3,706	1			
Trans World Airlines	2,655	1			
Ameriflight	2,157	1			
America West Airlines	1,742	1			
Other	5,265	2			
Total	330,626	100%			

Source: Port of Seattle, additional analysis by Webber Air Cargo, Inc.

Among all-cargo carriers, FedEx increased its tonnage by 23% and doubled its domestic market share to a commanding 66% of the entire SEA domestic cargo market. While some of that gain undoubtedly came at the expense of passenger carriers, SEA lost six all-cargo airlines (Emery Worldwide, DHL Airways, Evergreen International Airlines, Kitty Hawk, American International Airways, and ABX Air) that accounted for 24% of total domestic market share in 2000. Both Kitty Hawk and Evergreen were lost to bankruptcy. ABX was acquired by DHL which later left the U.S. domestic market. American International Airways had been owned by Kitty Hawk but was absorbed by Kalitta Air in 2000. Much of Emery Worldwide was acquired by UPS, which kept its forwarder unit at SEA but its air operations at King County International Airport (Boeing Field).

3.2.2 International Market

In contrast with the decrease in domestic cargo, international cargo grew a total of 11% between 2000 and 2013. As evident in Table 3-3, market shares shifted as some carriers left the market and others entered. Delta Air Lines is the single largest international cargo carrier at SEA after increasing its international tonnage more than 52% over the combined totals of Delta and Northwest in 2000. After having been the airport's fourth largest carrier in international tonnage in 2000, American Airlines eliminated its international operations at SEA. Of the remaining U.S. belly cargo carriers with international flights at SEA, United Airlines' international market share fell from 9% to only 5% in 2013, as its tonnage decreased almost 36%.

Table 3-3
Cargo Tonnages and Market Shares (percent) by Carrier 2000 and 2013
Seattle-Tacoma International Airport

2000			2013		
Cargolux	13,500	17%	Delta Air Lines	16,627	19%
Northwest Airlines	10,964	14	Korean Air	11,530	13
Martinair	10,074	12	Cargolux	9,423	11
American Airlines	8,152	10	China Airlines	8,161	9
SAS Scandinavian Airlines	7,547	9	EVA Air	7,895	9
United Airlines	7,088	9	All Nippon Airways	6,833	8
British Airways	6,850	8	Emirates	5,287	6
EVA Air	6,034	7	British Airways	5,102	6
Asiana Airlines	4,138	5	Lufthansa Airlines	4,981	6
China Eastern Airlines	1,905	2	Hainan Airlines	4,852	5
China Airlines	1,528	2	United Airlines	4,567	5
Western Express Airlines	1,466	2	Asiana Airlines	2,474	3
Other	1,357	2	Other	1,440	2
Total	80,602	100%	Total	89,173	100%

Source: Port of Seattle, additional analysis by Webber Air Cargo, Inc.

European carriers (Cargolux, Martinair, SAS Scandinavian Airlines, British Airways) held a collective 46% of international cargo in 2000 but only 23% in 2013. During that period, Martinair and SAS exited the SEA market and Lufthansa entered. Providing main-deck capacity to Europe, all-cargo carrier Cargolux was SEA's largest international cargo carrier in 2000 but experienced a 30% decrease in total cargo through 2013 which was still enough to be the airport's third-largest international cargo carrier.

As European carriers receded at SEA, Asian carriers' collective share rose from only 16% in 2000 to 47% in 2013. Korean Air became SEA's second largest international carrier, largely at the expense of its direct rival Asiana Airlines which experienced a 40% decrease in tonnage. Taiwanese carriers China Airlines and EVA Air increased each of their shares to 9% from what had been a combined 9%. Delta's Chinese code-share partner China Eastern Airlines exited the SEA market but Beijing-based private

company Hainan Airlines entered and has built a 5% market share. Both All Nippon Airways and Emirates Airlines initiated belly cargo service at SEA since 2000.

3.3 Summary

Between 2000 and 2013, cargo development at SEA followed a trajectory that was altogether consistent with industry trends at U.S. international gateways. As mail and domestic freight decreased, international freight increased modestly in tonnage terms but dramatically as a share of total cargo at SEA. Passenger carriers' share of cargo declined as mail shipments were replaced by the internet and the U.S. Postal Service outsourced Priority Mail to FedEx.

Through 2013, FedEx's share of SEA's domestic cargo grew to 66%. Both of SEA's hub carriers, Alaska Airlines and Delta Air Lines, experienced double-digit decreases in domestic cargo between 2000 and 2013 but retained prominent market shares almost by attrition, given the bankruptcies of numerous domestic all- cargo carriers that had once been prominent.

International cargo remained as widely distributed among carriers in 2013 as it had been in 2000. European carriers that left the market were replaced, albeit with Asian carriers capturing market share previously held by U.S. and European carriers. Asian carriers ended 2013 with a collective 47% share of SEA's international cargo, compared with the European carriers' 23%. As Europe and the U.S. have effectively exchanged one another for Asia as trading partners, that trend is unlikely to reverse. With only belly capacity but service to both Asia and Europe, Delta Air Lines became SEA's leading international cargo carrier (in tonnage, departures and destinations) with a 19% market share.

Analysis of Competition and Trade

This chapter compares the Airport's cargo service to the largest cargo destinations in Asia and Europe with service from Vancouver, Los Angeles, and San Francisco.

4.1 Competing Gateways

International gateways compete on the basis of network connectivity, typically characterized by the available mix of carriers (passenger and all-cargo), frequencies and direct destinations. Shipping rates charged by carriers are important but often a function of the competition between the airlines that provide an airport's network connectivity.

For both ease and control, a forwarder working in Kent, WA would rather use SEA than LAX. With shorter and more reliable trucking times to the airport, shippers are able to deliver freight later and warehouse staff can extend cut-off times for building consolidations. Still, forwarders located around SEA routinely use LAX and to a lesser degree, SFO and YVR. Forwarders may do so for access to a destination such as Bangkok, which is only served directly from LAX. They may also do so for access to freighters when oversized cargo cannot be accommodated on international passenger flights (e.g., those operated to Shanghai by Delta at SEA).

Among western region international gateways, LAX accounts for about five times the total annual air cargo tonnage of its next largest competitor (SFO). More comparable in terms of total annual cargo tonnage are SFO, SEA, YVR and PDX. SFO experienced a 58% decrease in annual tonnage between 2000 and 2013 but is still about 25% larger than SEA. SFO loses much of the Bay Area's integrator tonnage to FedEx hub OAK, while SEA loses about 100,000 annual metric tonnes transported by UPS and DHL traffic at Boeing Field.

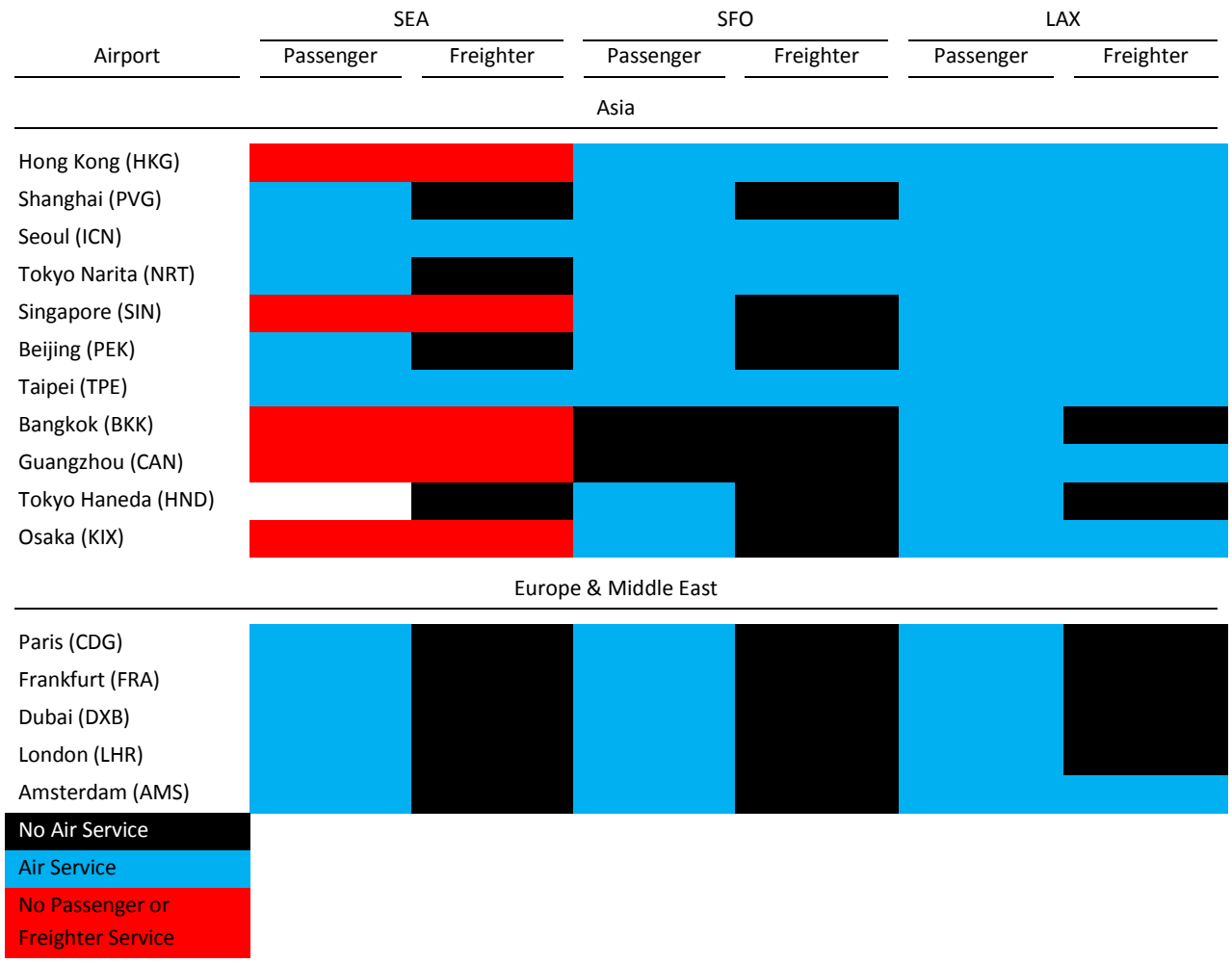
Table 4-1 compares the availability of wide body passenger (PAX) and all-cargo (FRTR) direct flights from SEA, SFO and LAX to the largest non-U.S. cargo airports, ranked by 2013 annual tonnage reported to ACI. The Table includes all of the ACI Top global top 30 cargo airports, except U.S. airports and overseas airports currently lacking any air service from SEA, SFO and LAX.

All five of SEA's service gaps in Table 4-2 are destinations in Asia, specifically Hong Kong (HKG), Singapore (SIN), Bangkok (BKK), Guangzhou (CAN) and Osaka (KIX). Delta cancelled service between SEA and KIX in November 2013 but announced it would initiate flights between SEA and both ICN and HKG in Summer 2014. The ICN service from SEA is anticipated to begin in June 2014 and the HKG service is also scheduled to begin in June 2014. The Delta network change gives SEA direct flights to the biggest cargo airport (HKG) in the world in exchange for the third largest cargo airport in Japan but Delta's ICN service adds a third carrier to that route.

The critical destinations of Bangkok and Guangzhou are also missing from SFO. Dominant regional gateway LAX has only passenger service to BKK but both passenger and freighter service to Guangzhou

operated by China Southern Airlines (CZ). Singapore Airlines operates passenger service to both SFO and LAX but only operates freighters to LAX.

Table 4-1
Largest *(a)* Foreign Airports Served by Passenger and Freighter Flights from SEA, SFO and LAX
Seattle-Tacoma International Airport



(a) Ranked by 2013 total air cargo reported to ACI.

Source: OAG Cargo Flight Guide, additional analysis by Webber Air Cargo, Inc.

In terms of competition for the same regional shipments and for the same carriers' gateway service to the Pacific Northwest, SEA's two natural competitors have historically been PDX and YVR. However, PDX has only attracted and retained international service through incentive programs that have proven insufficient to sustain operations. PDX's intercontinental service is limited to subsidized Delta flights to destinations also served from SEA.

Based on interviews with forwarders and carriers serving SEA, the Airport competes most directly with YVR. As evident in Table 4-2, YVR already has direct service provided by both passenger and freighter

flights to Hong Kong. This service gap will be partially closed in June when Delta initiates service to HKG from SEA but YVR will still have an advantage in offering freighter service to HKG from Cathay Pacific Airways, which also operates passenger flights from YVR. China Southern Airlines gives YVR advantages over SEA on two routes, operating freighter service to Shanghai - served only by Delta passenger flights from SEA - and by operating passenger flights to Guangzhou, a major Chinese market not served from SEA. Alternatively, SEA has advantages over YVR in freighter service to Taipei and to Luxembourg,* as well as passenger service to Paris and to Dubai. With SEA and YVR considered close substitutes by regional forwarders and shippers, every competitive advantage - e.g., a unique destination or freighter service - results in diversions of local shipments trucked to the competing gateway.

Table 4-2
Largest Foreign Airports Served by Passenger and Freighter Flights from SEA and YVR
Seattle-Tacoma International Airport

	Passenger flights		Freighter flights	
Airport	SEA	YVR	SEA	YVR
	Asia			
Hong Kong (HKG)	X (June 2014)	AC, CX	X	CX
Shanghai (PVG)	DL	AC, MU	X	CZ
Seoul (ICN)	KE, OZ	AC	KE, OZ	KE
Tokyo Narita (NRT)	DL, NH	AC, JL		
Beijing (PEK)	DL, HU	AC, CA		●
Taipei (TPE)	BR	BR, CI	BR, CI	
Guangzhou (CAN)	X	CZ		
Tokyo Haneda (HND)	DL	NH		
	Europe & Middle East			
Paris (CDG)	DL	●		
Frankfurt (FRA)	LH	LH		
London (LHR)	DL	AC, BA		
Amsterdam (AMS)	DL	KL		
Luxembourg (LUX)			CV	●
Dubai (DXB)	EK	●		

Advantage YVR = X
Advantage SEA = ●
Airline codes:

AC = Air Canada	CX = Cathay Pacific Airways	JL = Japan Airlines
BR = EVA Airways	CZ = China Southern Airlines	KE = Korean Air
CA = Air China	DL = Delta	MU = China Eastern Airlines
CI = China Airlines	EK = Emirates	NH = All Nippon Airways
CV = Cargolux	HU = Hainan Airlines	OZ = Asiana

Source: OAG Cargo Flight Guide, additional analysis by Webber Air Cargo, Inc.

*Although not a top 30 cargo airport, LUX was added to highlight a specific advantage for SEA in this comparison.

4.2 International Trade by Customs Port of Entry

The analysis that follows will illuminate how SEA compares with other western gateways in international trade. Because the U.S. Census Bureau data provides the source data for this section and no comparable Canadian source was available, YVR was not included in this analysis. Of the almost 400 U.S. Customs Ports, this section emphasizes those which compete directly with SEA. When trade totals are presented by state, the four largest states of origin for the SEA gateway are shown.

Large consolidations made at gateway airports occasionally cause shipments originating in or destined for other states to be attributed to the gateway state of export or import. Conversely, shipments transported in-bond to/from Customs ports of entry may be attributed to the port of record for filing purposes, although trucked to/from the gateway at which they are actually enplaned or deplaned. Consequently, while Census Bureau data is a credible indicator of trends based upon documents filed by shippers and forwarders, it rarely reconciles perfectly with local air cargo tonnage reports derived from documents filed by airlines.

As presented in Table 4-3, Seattle-Tacoma International Airport's U.S. Customs Port* ranks #13 among all U.S. Customs ports ranked by 2013 air cargo export tonnage. Compared with its ranking among U.S. airports in total air cargo tonnage, SEA's higher ranking in international tonnage is not surprising given the higher rankings of several integrator hubs more dependent upon domestic cargo. The SEA Customs Port's air cargo exports rose about 35% between 2003 and 2013. SEA's air cargo imports performed similarly, ranking #14 nationally. While SEA's Customs port's shares of total U.S. air cargo exports and imports - 2.0% and 1.2%, respectively - seem modest, the top four U.S. Customs ports for both air cargo exports and imports account for more than 50% of the national total. The relative rankings of LAX, SFO, SEA and PDX are consistent with total cargo tonnages in ACI-NA rankings.

Table 4-3
2013 Air Cargo Exports to all Countries by Seattle and Competing U.S. Customs Ports
Seattle-Tacoma International Airport

U.S. Rank	U.S. Customs Port	Metric Tonnes	Share of U.S. Total (Percent)
3	LAX	406,490	12.5%
7	SFO	147,945	4.5
12	ANC	72,370	2.2
134	**SEA**	**66,225**	**2.0**
31	PDX	6,164	0.2
	ALL PORTS	3,263,438	

Source: U.S. Census Bureau, Foreign Trade Division, additional analysis by Webber Air Cargo, Inc.

*The Customs port serving the airport does not always share the airport's name but for the purposes of this Assessment, Customs ports will be identified with the airport's own designator code.

In order, the four largest U.S. states of origin for air cargo exports moving through the SEA Customs Port in 2013 were Washington, Oregon, California and Idaho. As shown in Table 4-4, SEA is the dominant Customs Port for exports from Washington, capturing about 56% of the state's air cargo exports. LAX was second, followed by SFO. With a 27% share, SEA was also the leading Customs port for air cargo exports from Oregon, more than doubling the shares of PDX, LAX and SFO. While less than half of the shares of LAX and SFO, SEA still had a considerable 12% share of Idaho's air cargo exports, as well.

Table 4-4
Air Cargo Exports from Seattle's 4 Largest States of Origin in 2013
Seattle-Tacoma International Airport
(metric tonnes & market share)

	Washington		Oregon		California		Idaho	
SEA	47,055	56%	10,796	27%	3,581	1%	882	12%
PDX	1,254	2	4,671	12	92	0	41	1
SFO	4,504	5	4,526	11	124,503	21	1,899	25
LAX	6,253	7	4,976	13	323,369	55	1,605	21
Others	24,311	30	14,551	37	138,981	23	3,232	41
Total	83,377	100%	39,520	100%	590,526	100%	7,659	100%

Source: U.S. Census Bureau, Foreign Trade Division, additional analysis by Webber Air Cargo, Inc.

While California is SEA's third largest state of origin for air cargo exports, SEA's share of that market is less than one percent. Interviews with forwarders and carriers revealed that SEA is used by cargo operators in Southern California when demand for air cargo space at LAX exceeds capacity.

Chapter 3 revealed that Asian carriers increased their share of international air cargo tonnage at SEA from 16% in 2000 to 47% in 2013, even as the share carried by European carriers had fallen from 46% to only 23%. U.S. carriers - specifically Delta in 2013 - accounted for the balance, carrying cargo to and from both Asia and Europe.

As shown in Table 4-5, the transfer of international market share from European to Asian carriers is consistent with how export and import trade growth with Asia drastically outpaced trade with Europe. At the SEA Customs Port between 2003 and 2013, Asian exports almost doubled and Asian imports more than doubled in terms of tonnage, while trade with Europe grew less than 6%.

Table 4-5
Air Exports and Imports with Asia and Europe at Seattle Customs Port, 2003, & 2013
Seattle-Tacoma International Airport

	2003	2013	Percent Change 2003 - 2013
Exports			
Asia	22,137	42,309	91.1%
Europe	12,846	13,525	5.3
Imports			
Asia	12,755	28,239	121.4%
Europe	12,357	12,968	4.9

Source: U.S. Census Bureau, Foreign Trade Division, additional analysis by Webber Air Cargo, Inc.

Listed in Table 4-6, the top ten export markets based on 2013 air cargo tonnage from the SEA Customs Port include Asian countries ranked #1 through #5, as well as #10. European countries provide the balance. Triple-digit percentage growth occurred for trade with China, Hong Kong, and Korea, even as net decreases occurred in SEA's air cargo export trade with Japan and Taiwan. SEA ranked in the top ten among all US Customs Ports in air cargo export tonnage to each of its top 5 markets, while its highest ranking to any European market is #12 to France, which more than doubled its tonnage between 2003 and 2013. Air cargo exports to the Netherlands nearly halved during the same period, coinciding with Dutch all-cargo carrier Martinair and to a lesser degree Scandinavian Airlines (SAS) having left the SEA market.

Table 4-6
Top Ten Air Cargo Export Markets for Seattle Customs Port, 2003 - 2013
Seattle-Tacoma International Airport
(In metric tonnes)

Rank	Export Country	2003	2013	Change (Percent) 2003-2013	SEA Port's Share of U.S. Total
1	China	1,250	12,286	882.9%	4.7%
2	Japan	8,362	7,376	-11.8	3.0
3	Hong Kong	1,612	6,024	273.7	5.0
4	Korea, Republic of	1,055	4,789	353.9	3.4
5	Taiwan	4,388	3,545	-19.2	4.7
6	Germany	2,198	3,031	37.9	1.6
7	United Kingdom	3,023	3,026	0.1	1.3
8	Netherlands	4,818	2,791	-42.1	2.7
9	France	1,117	2,632	135.6	2.4
10	Singapore	1,621	2,548	57.2	2.0

Source: U.S. Census Bureau, Foreign Trade Division, additional analysis by Webber Air Cargo, Inc.

Table 4-7 shows the top twenty air cargo export commodities (by weight and by value) from the SEA Customs Port to all trade partners. The top two commodities are (in order) seafood and fruit, which account for a combined 33% of all exports from SEA, by weight. Typically, fruit exports outpace seafood but 2013 was a relatively poor harvest year. Conventionally, the focus of trade is on weight, rather than value for the purpose of air cargo development because revenue-bearing payloads will be determined on the basis of kilos and not specifically dollar value.

The premium paid for air transport compared with cheaper, slower modes of transport dictates that such commodities transported by air will have enough value and need for timeliness to justify a higher transport cost. Table 4-7 shows that SEA's top two export commodities have relatively low value/weight ratios, compared with the high-end manufactured products that fill the next three positions by rank. Ordinarily, such commodities are ideal for belly cargo transport that can be made available for reliable demand that is time-sensitive but not of such value to justify dedicated freighters. However, the relative brevity of the peak associated with the harvest dictates that dedicated freighters are required to meet demand that outstrips the remainder of the year.

Table 4-7
Air Cargo Export Commodities by Weight and Value for Seattle Customs Port, 2013
Seattle-Tacoma International Airport
(In metric tonnes)

		Metric tonnes		Value (1,000's $)		Value $/kg
Rank	Export Commodities	2013	Share	2013	Share	2013
1	Fish, Crustaceans & Aquatic Invertebrates	11,077	16.7%	100,414	1.5%	9.07
2	Edible Fruit & Nuts; Citrus Fruit or Melon Peel	10,988	16.6	65,054	1.0	5.92
3	Industrial Machinery, Including Computers	6,882	10.4	1,030,885	15.7	149.79
4	Electric Machinery etc.; Sound Equip; Tv Equip; Pts	4,840	7.3	1,178,714	17.9	243.54
5	Optic, Photo etc., Medic or Surgical Instruments etc.	3,494	5.3	1,335,426	20.3	382.21
6	Inorg Chem; Prec & Rare-Earth Met & Radioact Compd	2,924	4.4	74,958	1.1	25.64
7	Aircraft, Spacecraft, and Parts Thereof	2,784	4.2	1,810,313	27.5	650.26
8	Footwear, Gaiters etc. and Parts Thereof	2,353	3.6	73,575	1.1	31.27
9	Articles of Iron Or Steel	1,848	2.8	32,591	0.5	17.64
10	Edible Vegetables & Certain Roots & Tubers	1,814	2.7	15,546	0.2	8.57
11	Plastics And Articles Thereof	1,365	2.1	81,825	1.2	59.95
12	Miscellaneous Articles of Base Metal	1,054	1.6	26,807	0.4	25.43
13	Live Trees, Plants, Bulbs, etc.; Cut Flowers etc.	934	1.4	3,292	0.1	3.52
14	Aluminum and Articles Thereof	927	1.4	16,938	0.3	18.27
15	Miscellaneous Chemical Products	732	1.1	139,057	2.1	189.97
16	Vehicles, Except Railway or Tramway, and Parts etc.	720	1.1	30,558	0.5	42.44
17	Prep Cereal, Flour, Starch or Milk; Bakers Wares	697	1.1	3,643	0.1	5.23
18	Paper & Paperboard & Articles (Inc Papr Pulp Artl)	678	1.0	3,664	0.1	5.40
19	Base Metals Nesoi; Cermets; Articles Thereof	664	1.0	62,649	1.0	94.35
20	Oil Seeds etc.; Misc. Grain, Seed, Fruit, Plant etc.	641	1.0	18,783	0.3	29.30
	All Other Export Commodities	8,809	13.3	477,731	7.3	54.23
	Total	66,225		6,582,423		99.39

Source: U.S. Census Bureau, Foreign Trade Division, additional analysis by Webber Air Cargo, Inc.

4.3 Multimodalism & Intermodalism

For transoceanic trade, the relatively higher cost of air transport determines whether commodities are shipped by air or ocean, depending on their value per kilo and time sensitivity. As indicated in the preceding analysis, some commodities are ideal for belly cargo transport because they are too time-sensitive for slower ocean transport but have too little value to justify dedicated freighters. Some commodities that used to routinely support chartered freighters have not increased in value enough to keep pace with the operating costs of freighters and so have switched to belly carriers. Absent adequate capacity to meet the demand of the cherry harvest's peak, seasonal freighters continue to be essential in the market.

Through the 1990's, the intermodal sea-air combination was common, albeit a niche, at both SEA and YVR. This combination was used mostly for Asian exports to Europe which had relatively inferior westbound options from Asia during the Cold War period, when the former U.S.S.R. and its satellites did not permit technical stops without charging significant over-flight fees. Sea-air transport lowered costs from all-air transport while being faster than all-ocean.

According to representatives of the carriers and forwarders, sea-air transport has all but disappeared at both SEA and YVR for a variety of reasons. The expansion of Asian carriers and liberation of trade lanes to Europe greatly reduced the need for intermediate stops in the U.S. This proved devastating to Fairbanks, Alaska which used to be a technical stop for multiple carriers operating freighters serving the Asia-Europe market but has lost 100% of that segment. Forwarders also reported that cheaper transpacific belly cargo capacity closed the gap with ocean rates.

During the same period, ocean transport made competitive gains for some commodities that traditionally were transported by air. Harvesting and packaging techniques for agriculture and aquaculture products have facilitated some commodities to be effectively transported by the slower mode without unacceptable levels of spoilage. Moreover, the value of many consumer electronics has fallen such that they no longer justify the premium paid for air transport.

While sea-air transport has become marginalized as a niche, the combination of an international seaport and airport still provides competitive advantages compared with inland markets. Specifically, the exponentially greater international tonnage transported by ocean carriers supports trade services - specifically freight forwarders, customs brokers and regulatory agents - far in excess of what the international air cargo at SEA could support alone.

Domestic air cargo has been greatly diminished by the increased utilization of trucking for shipments between domestic markets, as well as for transport of international shipments between gateways and feeder markets. While trucking is a competitive substitute for air transport, it also provides the so-called "first and last mile" transport of cargo between airports and shippers. At SEA, landside and roadway congestion issues for trucking were the sources of forwarders' complaints more than any airside issues and will be explored further in Chapter 5.

4.4 Summary

Area forwarders often must truck shipments to and from dominant gateways to access unique destinations, for freighters when only belly capacity is available locally and occasionally for superior frequencies. According to local forwarders, 20-30% of area air cargo is trucked to/from LAX but by comparison SFO is a relatively minor gateway option from SEA's market area.

SEA and YVR compete for the same shippers and air carriers so much that area forwarders describe the latter as "Seattle's other airport". YVR has both passenger (Air Canada and Cathay Pacific) and freighter service (Cathay Pacific) to HKG, while SEA will gain only passenger service on the route from Delta in June. While both airports have passenger service to Shanghai (PVG), YVR also has scheduled year-round freighter service provided by China Southern Airlines, which also provides YVR with passenger service to Guangzhou.

SEA offers freighter service from two different carriers to TPE, while YVR has only passenger service. SEA offers the only freighter capacity in the region to Europe with Cargolux's service to Luxembourg, as well as Delta's passenger service to Paris, not served from YVR. SEA also offers the region's only belly capacity to the Middle East with Emirates' service to Dubai. In addition to destination-specific competition, forwarders acknowledged Air Canada's willingness to compete aggressively on rates for the business of SEA-area forwarders. With announced summer service additions, Delta will serve three more intercontinental routes from SEA than Air Canada serves from YVR.

As a Customs port, SEA's air cargo trade flows tracked closely with Asia-leaning trends already described pertaining to the Airport's reported tonnage and regional service development. Air cargo exports and imports with Asia roughly doubled between 2003 and 2013, while increasing around 5% with Europe. SEA's five leading air export markets, as measured by tonnage, are (in order) China, Japan, Hong Kong, Korea, and Taiwan. SEA experienced triple-digit growth to China, Hong Kong and Korea and double-digit decreases to Japan and Taiwan. SEA's largest destination in Europe was Germany, followed by the U.K., Netherlands, and France.

In order by tonnage, SEA's top export commodities are seafood and fruit (with fruit atypically in the #2 position due to a weak 2013 harvest), accounting for a combined 33% of air cargo exports. Between 2003 and 2013, seafood export tonnage increased by almost 400% and fruit by 73%. While these two commodities have relatively low value/weight ratios, they are time-sensitive enough to require air transport and they provide reliable demand for belly cargo capacity in particular. In the case of seasonal fruit, peak volumes over a short harvest window continue to bring significant numbers of additional freighters from June through August, and thus continue to create demand for freighter-specific air cargo facilities (e.g. freighter parking apron areas).

The cost premium required for air transport dictates whether commodities are transported by air or a slower, cheaper mode. According to area forwarders, the sea-air intermodal combination that once was common at SEA and YVR has practically disappeared. The presence of a seaport and international airport supports a greater presence of international trade services and regulatory agents than justified by either mode independently but has very little current utility as an intermodal combination.

Assessment of Facilities and Handling Service Providers

This chapter provides an overview of the facilities and service providers utilized by the Airport's air cargo operators.

5.1 SEA Cargo Facilities

A 29% decrease in total cargo between peak year 2000 and 2013 may have created a surplus of air cargo operating capacity at SEA but several cargo facilities utilized in 2000 have grown obsolete. A former US Postal Service facility was razed to accommodate ramp expansion and a former Prologis facility that once hosted the Cargo Airport Services (CAS) cargo handling operation has been vacated elsewhere for the same purpose. Table 5-1 summarizes the occupants and utilization rates for those on-airport facilities currently used for cargo operations by carriers and handlers at SEA. Figures 5-1 and 5-2 show the physical location of SEA's cargo facilities by each building's identifying number.

Facilities planners historically utilized a metric of one annual tonne/one square foot of cargo operating warehouse (excluding office space) but the high mechanization of integrated carriers and increased productivity of third party cargo handlers have produced greater productivity of cargo facilities.

Table 5-1
Occupants and Utilization Rates for Occupied Seattle Air Cargo Buildings
Seattle-Tacoma International Airport

Single-Tenant (Building #)	2013 tonnes	Warehouse (sf)	Utilization (tonnes/sf)
FedEx (#7)	134,631	76,000	1.77
Southwest (#11)	4,838	11,000	0.44
Alaska Airlines (#12)	28,151	55,000	0.51
Delta Air Lines (#15)	31,478	50,000	0.63
Cargo Handling Company			
Hanjin (#3)	16,511	24,000	0.69
CAS (#9)	28,578	43,000	0.66
Swissport (#14)	42,656	26,000	1.64

Source: Port of Seattle, additional analysis by Webber Air Cargo, Inc.

SEA's air cargo facilities with immediate air operations area (AOA) access include four single-carrier warehouses and three multi-tenant warehouses.* **FedEx** has its principal operation at a dedicated facility (Building #7 in Cargo Area 3) with a second operation in Building #1 in Cargo Area 1. As an integrator, FedEx has a more automated on-airport operation typically leading to higher efficiency. Based on 2013 tonnage, FedEx's facility had a utilization rate of about 1.77 metric tonnes/sq. foot of warehouse space.**

The facility is contiguous to tenant-leased ramp with dedicated parking for FedEx. The ramp provides hard stands able to accommodate up to five widebody freighters including up to 2 B-777F aircraft. After 23% growth since 2000, FedEx is likely to face limitations on its ramp capacity before warehouse capacity, which can be supplemented by existing off- airport resources. Freighter operations that exceed leased ramp capacity are accommodated, on nearby common use ramp facilities.

SEA's next largest cargo carrier, **Delta Air Lines,** operates in the former Northwest Airlines cargo hub (Building #15) warehouse which has the advantage of being SEA's newest cargo facility (built in 2000) and the only one on the Airport's south end, so it experiences relatively little roadway congestion. The facility was designed for Northwest's B747-200 freighter operation which Delta did not retain, so many features go unutilized. Delta uses only half of its landside doors and uses its adjacent freighter parking ramp for ULD storage and overnight aircraft parking. Delta's existing capacity should be adequate to accommodate near- term Seoul and Hong Kong destination additions, as well as increased wide body service to Delta's U.S. hubs at ATL, MSP and JFK. While Delta experienced impressive 52% growth in international cargo from the combined total of Delta and Northwest in 2000, its 63% decrease in domestic tonnage still resulted in a 39% decrease in total cargo for the period. Using Delta's 2013 total cargo tonnage, the facility had a utilization rate of 0.63 tonne/SF.

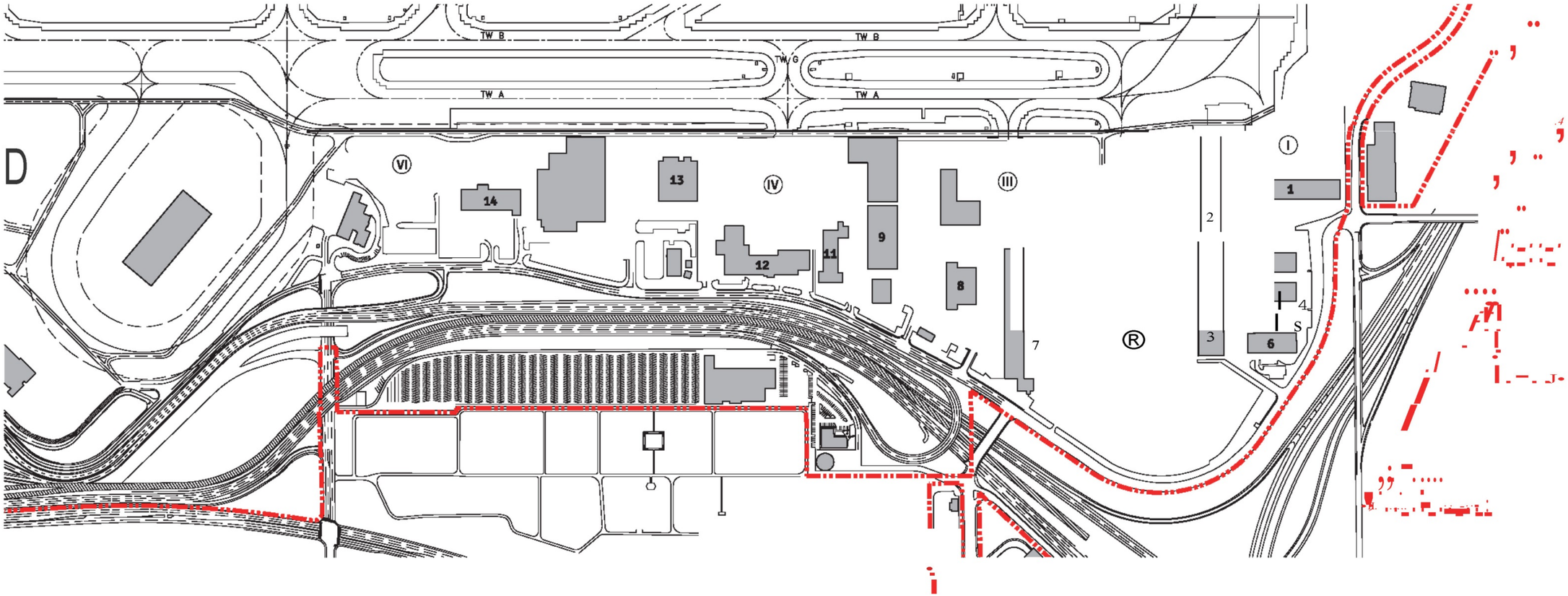
SEA's third largest cargo carrier (#2 in domestic tonnage), **Alaska Airlines,** operates in Building #12 in Cargo Area 4. With a 22% decrease in annual tonnage since 2000, Alaska Airlines' utilization rate for its 55,000 SF cargo warehouse decreased to only 0.51 tonne/sf in 2013. The facility has freezer and cooler space for perishables, supporting the carrier's targeting of Alaska's seafood shippers. The facility has adjacent dedicated ramp able to simultaneously accommodate two B-737-400 aircraft. After a recent fleet upgrade, Alaska Airlines has one B-737-400 freighter and five B-737-400 combi aircraft in its fleet. The latter are ramp-handled at the passenger terminal.

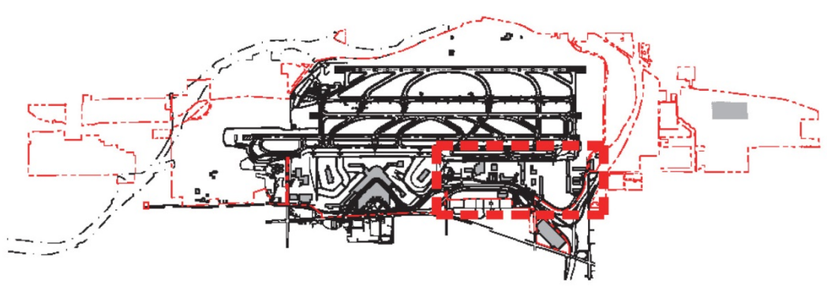
The final current single-cargo-tenant facility is Building #11, a Prologis-owned building hosting **Southwest Airlines** Cargo, and several non-cargo tenants. Southwest is the building's only cargo tenant but also has a provisioning operation there. The building lists as 25,702 SF but only 11,000 SF is used for cargo operations. Based on that warehouse allocation, Southwest had a utilization rate of 0.44 tonne/SF in 2013. Operating only passenger flights, the Southwest warehouse has no dedicated ramp but utilizes an airside tug alley.

*Strictly speaking, a single third party handler may be the sole tenant of a facility's warehouse but will be counted as multi-tenant due to the multiple carriers handled therein.

**Past SEA analysis used a building's total size to calculate utilization rates but office and other non-warehouse operating area has been omitted in this assessment. Also, past analysis used square feet per ton, rather than the more conventional ton/sq. ft. used in this assessment.

Figure 5-1
North End Air Cargo Facilities
Seattle-Tacoma International Airport





AIR CARGO FACILITIES LEGEND

I. CARGO AREA 1
1. AMB CARGO 1 (MULTI-TENANT)

II. CARGO AREA 2
2. AMB CARGO 2 (MULTI-TENANT)
3. TRANISPLEX BUILDING A
4. TRANISPLEX BUILDING E
5. TRANISPLEX BUILDING F
6. TRANISPLEX BUILDING G

III. CARGO AREA 3
7. FEDEX
8. AFCO

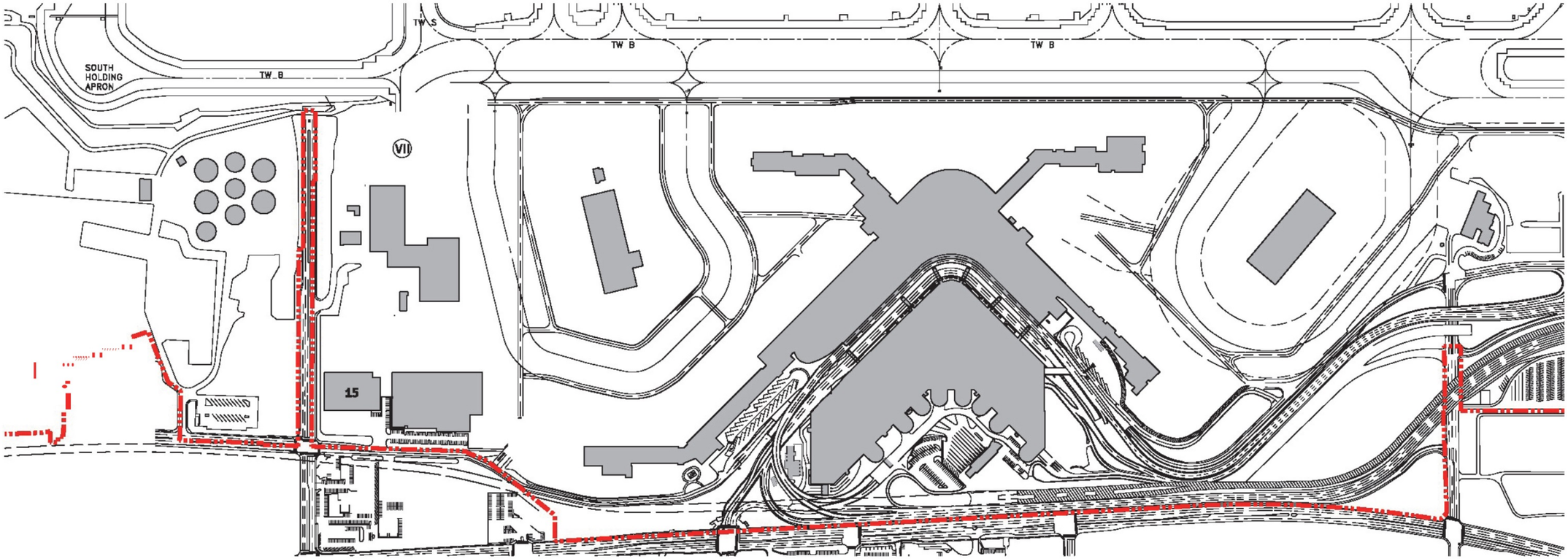
IV. CARGO AREA 4
9. AMB CARGO 4 (MENZIES)
10. UPS/BT PROPERTIES
11. AMB CARGO 4 (SOUTHWEST AIRLINES)
12. ALASKA AIR CARGO
13. UNITED AIRLINES CARGO

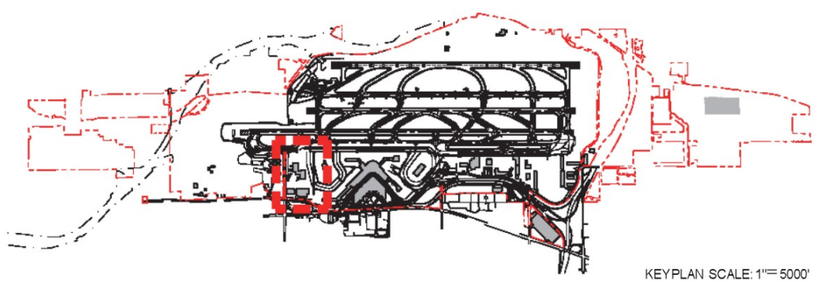
VI. CARGO AREA 6
14. AMB CARGO 6 (SWISSPORT)

500 1000ft.
Port of Seattle Aviation Property Line

Source: Webber Air Cargo, Inc. assessment of Seattle-Tacoma International Airport records.

Figure 5-2
South End Air Cargo Facilities
Seattle-Tacoma International Airport





AIR CARGO FACILITIES LEGEND

VII. CARGO AREA 7
15. DELTA CARGO

0 500 1000ft.

Port of Seattle Aviation Property Line

Source: Port of Seattle

Source: Webber Air Cargo, Inc. assessment of Seattle-Tacoma International Airport records.

SEA also hosts three facilities anchored by third party cargo handlers. The largest is the mostly vacant Transiplex Building A (Building #3) in Cargo Area 2. **Hanjin** only utilizes about one-third of the 84,015 SF building to handle Korean Airlines and Lufthansa. Hanjin's utilized space and the 2013 tonnage for the two carriers produces a utilization rate of about 0.70 tonne/sf. Symptomatic of underutilization found in multiple cargo buildings at SEA, the building's entire warehouse utilization would only be 0.23 tonne/sf. Compared with other handlers at SEA, Hanjin's space at the airport's far north end has virtually no landside congestion. The facility is adjacent to adequate airside ramp to accommodate two or more B747-400 aircraft but must utilize the ramp's stub extension when Korean Air uses its B747-8 freighter. Hanjin comfortably handles both carriers because schedules do not overlap significantly and only Korean Air utilizes freighter aircraft. The only perceived disadvantage of the facility is a longer tug trip to/from the passenger terminal for Lufthansa and Korean Air's belly cargo.

In 2009, **Swissport** moved to the former Delta Air Lines Cargo Building (Building #14) from a former AMB-owned building (#2) that has since been demolished. Listed as 31,560 SF, the building offers only 26,000 SF of warehouse. In such a small location, Swissport had a relatively high utilization rate of 1.64 tonnes/sf in 2013, serving China Airlines, EVA Airways, All Nippon Airways, Air Canada, Condor, Hawaiian Airlines, and United Airlines. Swissport's recent success in winning United's handling contract caused Worldwide Flight Services (WFS) to significantly reduce its presence in the SEA cargo market. Previously WFS had handled United, USAirways, and Hawaiian Airlines at the former United Airlines Cargo Building #13. While Swissport's warehouse space is cramped, it has relatively superior roadway access for commercial trucks, compared with the facility occupied by CAS.

Cargo Airport Services (CAS) was also located in Building #2, owned by Prologis as a successor to AMB, until moved to create future space for aircraft parking following building demolition. Subsequently, CAS moved into Prologis-owned Building #9 formerly operated by Menzies. CAS retained Cargolux and Emirates from its former location and incorporated former Menzies customers Asiana (operating both passenger and freighter flights), British Airways, Hainan, Icelandair, Sun Country, and Jetblue. In spite of a clientele that includes two freighter operators, CAS must serve its clients by tug because this location has no dedicated or contiguous common-use ramp. The airside concerns are made more challenging by the overlapping schedules of CAS's two freighter clients, Cargolux and Asiana. While the handler attempts to spread its buildup and breakdown of containers through the day, it still must accommodate up to five simultaneous flights. CAS also has the most problematic landside and roadway access of any cargo facility currently used at SEA. Like Swissport, CAS may not be able to accommodate even one more significant year-round airline customer without adding facility capacity. Based on its clients' 2013 tonnage, the CAS facility had a utilization rate of only 0.66 but the late-year addition of an Asiana freighter should increase tonnage noticeably in 2014.

SEA also has on-airport cargo facilities entirely outside the AOA. The Transiplex development includes three additional buildings (Buildings 4, 5 and 6 with 23,000 SF each) used for cargo handling (WFS), airline provisioning and for mail sorting. A Container Freight Station (CFS) is operated by Summit NW in Building #8, a 30,000 SF facility formerly owned by AFCO.* The forwarder-oriented UPS Supply Chain

*Aviation Facilities Corporation (AFCO) is a third party cargo facilities development that sold many of its properties to AMB, which in turn was acquired by Prologis. Building 8 reverted to a former owner, Bolanos.

Solutions has occupied a 23,000 SF building (#10) formerly owned by Emery Worldwide since acquiring that carrier. Together, these five facilities comprise an additional 122,000 SF of on-airport capacity.

The cargo area also includes the Airport's own maintenance facility west of building #9, which formerly served as an Eastern Airlines cargo building. The 65,000 SF facility is located immediately next to the cramped CAS cargo handling facility. In the same area is a 40,000 SF United Airlines maintenance facility also serving as a pilots lounge. Parking for the United facility currently blocks facilities expansion by SEA's largest cargo carrier, FedEx. Another United legacy facility became available when the carrier's cargo operation moved into Swissport's handling facility. Although strategically located and designed for cargo, the 40,000 SF facility (#13) has a truck parking yard with only a 90' depth, inadequate for industry standard cargo trucks with 53' trailers.

While U.S. Customs and Border Protection (CBP) and the Transportation Security Administration (TSA) are critical at all international airports, the commodity composition of the SEA market also involves the Department of Agriculture and the U.S. Fish & Wildlife Service. Ideally, these regulators should be co-located in a centralized on-airport facility with easy access to one another and to dependent commercial operators. At SEA, some agencies are located off-airport. While forwarders conceded that the off-airport location is effective under ideal circumstances, when conditions require hard copies of documents and in-person appearances by shippers (usually importers), the off-airport location complicates their operations.

While the Airport has identified nearby land for potential non-aeronautical logistics tenants, interviews with local off-airport forwarders revealed they are more likely to move further from the Airport to access larger, more affordable development sites than to relocate near or on-airport.

5.2 Cargo Handling Services at SEA

SEA's two hub carriers Alaska Airlines and Delta Air Lines, as well as Southwest Airlines, perform their own cargo handling operations in facilities dedicated for their own use. Typical of integrated carriers, SEA's dominant domestic cargo carrier FedEx also performs its own handling.

Most of the remaining cargo carriers at SEA are handled by one of the three third party service providers: CAS, Swissport and Hanjin, with WFS handling American and USAirways cargo. As it has nationally, the third party cargo handling market has reduced competitors as rival handlers have been acquired and/or competitively forced from the market. The former Menzies operation was taken over by CAS, while Worldwide Flight Services (WFS) lost significant market share after losing key account United Airlines to Swissport.

The principal complaints of carriers and forwarders utilizing SEA pertain to the concentration of airlines and clashing schedules at the CAS and Swissport buildings. Some carriers suggested they would welcome more vendor competition for their handling business but the criticisms were not about the quality of existing handlers, as much as congestion issues arising from their success in winning customers. Carriers observed and the handlers (CAS and Swissport, at least) confirmed that either of the two main third party handlers would find it very difficult to accommodate even one more regularly scheduled client airline, especially if that carrier operated within a similar window to existing clients.

As Hanjin is owned by the same corporate parent as Korean Air, it is not likely to service competing Asian carriers but does also handle Lufthansa. CAS presently handles all-cargo airline Cargolux, Asiana (belly cargo and freighter), British Airways, Hainan, Emirates, Icelandair, Sun Country, and Jetblue. Swissport handles China Airlines, EVA Air, All Nippon Airways, United Airlines, Hawaiian Airlines, Air Canada, and Condor. In addition to its own cargo, Delta formerly handled both Air France and Martinair (owned by Air France & KLM) before the carriers agreed to unify behind Delta's service to CDG.

5.3 Summary and SEA Cargo Resources' Suitability for Future Growth

According to carriers, handlers and forwarders, SEA's facilities concerns are more attributable to layout-related congestion than to actual capacity deficits. Critically, two of SEA's third party cargo handlers indicated that they cannot accept new clients without expanding capacity. Yet, SEA's cargo area is interspersed with vacancies and non-cargo uses including a former cargo facility being used for the Airport's own maintenance resources. The airport's largest domestic cargo carrier, FedEx, is blocked from expanding its cargo facilities due to the presence of an auto parking lot for a United Airlines maintenance facility doubling as a pilots lounge. Other potentially usable cargo assets have low occupancy and/or low utilization. The latter is partially due to the common occurrence of non-cargo uses, such as catering, being performed alongside cargo operations in what should be strategically located cargo facilities.

While Hanjin has separation between its two clients' schedules, CAS and Swissport serve up to five different airlines simultaneously. While belly cargo is customarily loaded and unloaded at the passenger terminal, freighters require ramp, most usefully located near to the respective cargo warehouse. Depending upon the compatibility of flight schedules, as well as the dimensions of the freighter itself, the same aircraft parking position may be used by multiple flights per day. Because SEA's transpacific freighter operators typically dedicate only a portion of their payloads to the SEA market (often serving larger cargo markets such as MIA, ATL, DFW, ORD, and LAX before stopping in SEA westbound across the Pacific) they can minimize their time on SEA's ramp. SEA has a multi-ramp expansion program underway to expand and add dedicated aircraft parking ramp. Further complicating handling operations, CAS must tug to its customers' freighters because it has no contiguous ramp.

Forwarders confirm that SEA's roadway congestion issues (specifically cargo trucks accessing airside cargo facilities) have not caused diversions to other airports. Such routing decisions are largely attributable to air carrier options at other gateways, mostly LAX. However congestion already influences forwarders' choice of air carriers and sequencing of truck deliveries to limit their impact from chronically congested roadways at SEA.

Unanimously, carriers and forwarders discouraged potential development of additional temperature-controlled warehouse space on-airport. Trucking companies, forwarders and air carriers coordinate the chain of custody from farms and fisheries through the Airport to minimize the need for storage at the Airport. Moreover, the window - 90 days each year - when on-airport refrigerated facilities could be useful does not justify that investment.

SEA has numerous issues pertaining to its cargo facilities, including some with direct implications for its handling services. Part of the potential surplus of cargo facilities left by SEA's 29% decrease in annual cargo tonnage has been offset by the elimination, repurpose, and obsolescence of former cargo facilities. The patchwork layout of SEA's cargo complex compares unfavorably with the orderly cargo "village" of the Airport's most direct competitor, YVR. While a lack of capacity has the potential to cause cargo operators to favor other gateways, no indication exists that SEA's facilities have cost the Airport any opportunities to date.

Outlook and Recommendations

This chapter summarizes the outlook for the air cargo industry and presents specific recommendations related to marketing and facilities.

6.1 Outlook

The analysis included in the Air Cargo Market Assessment demonstrated that SEA's air cargo losses - primarily in domestic freight and mail - were consistent with the industry throughout North America, rather than indicating any specific local concerns. SEA made gains in international freight and has added international carriers. SEA's international hub carrier Delta Air Lines will add two more Asian destinations this summer, including Hong Kong which led all airports in air cargo tonnage in 2013.

The Hong Kong service should mitigate some recent losses of SEA-area cargo to nearby YVR and to the dominant transpacific gateway LAX. During a period when freighters have struggled with profitability due to fuel costs and trade imbalances, SEA is more likely to gain frequencies and destinations from Delta and other passenger carriers. As passenger carriers depend upon cargo revenues to sustain competitive routes, international gateway airports' management should recognize that liabilities in their cargo operations may potentially impact international passenger service development, as well.

While Delta still has cargo facilities capacity to accommodate near-term growth, any other new-entry international passenger carrier is likely to require third party cargo handling, and as noted previously both CAS and Swissport lack capacity for additional clients. SEA's third handler, Hanjin, has an equity relationship with Korean Air that makes it unlikely to handle Asian competitors. SEA's incumbent carriers indicated a desire for more cargo handling competition but concerns were uniformly related to congestion, rather than incumbent handlers' service. The obvious prospect for expansion would ordinarily be Worldwide Flight Services (WFS), except it has reduced its cargo facility footprint and capacity significantly after losing the United contract to Swissport. Consequently, a more productive strategy may be to accommodate facility and capacity expansion by the incumbent handlers.

While international passenger service expansions seem more likely, and the global freighter industry has been in decline lately, there is still a substantial enduring niche for all-cargo operations at SEA. Most major Asian passenger carriers either operate freighters or have all-cargo subsidiaries. Both Cathay Pacific Airways and China Southern Airlines operate passenger and all-cargo flights at YVR.

For freighters, SEA and YVR fill the same role as western gateways that allow carriers operating to ATL, DFW, and other markets to add to payloads prior to crossing the Pacific. Cargo gateways such as Atlanta and Dallas/Ft. Worth have even formalized cooperation in marketing to carriers for freighter service pairing their markets. Asiana's freighter stops in both ATL and DFW before SEA. Similarly, freighters of China Airlines, EVA, and Korean Air each stop in these and other East Coast and Mid-West cargo gateways before calling on SEA. By only dedicating partial payloads to the local market, these freighters typically require ramp space for a shorter window, allowing more aircraft turns on the same space. With

less dedicated payload, they also place less of a strain on handlers' labor. In an increasingly difficult economic environment for freighters, SEA is far more likely to gain similarly shared service going forward than to attract international freighters wholly dedicated to the SEA market.

Specifically in competition with YVR, SEA should emphasize the relatively favorable regulatory treatment of foreign flag carriers under U.S. "Open Skies" policy, contrasted with Canada's more limiting environment. Emirates indicated that the regulatory environment in Canada drove them to expand in the U.S. and Singapore Airlines cited its inability to gain permission for enough frequencies to become profitable in past decisions to leave Canadian markets. Singapore Cargo, Emirates, and Cargolux utilize fifth and seventh freedom rights to sustain freighter operations to multiple points that independently may not justify service. While SEA already has service from Emirates and Cargolux, Singapore Airlines serves LAX with both freighters and passenger flights, as well as SFO with passenger flights only.

Another prospect is all-cargo Nippon Cargo Airlines (NCA) which serves SFO and LAX direct from its Tokyo (NRT) hub. NCA also serves JFK, ORD, and DFW but operates these flights in conjunction with an Anchorage (ANC) technical stop. The ANC technical stop has long been a mainstay of transpacific freighter operations but with longer-range freighters, the ability to overfly ANC in favor of SEA that can contribute to payloads provides a specific platform to pursue additional "shared" freighters. Such an example is NCA's decision to add SEA onto its Monday ORD-NRT flight service to accommodate seasonal cherries from the market

SEA must be confident it can accommodate carriers it attempts to recruit and therefore must address its facilities constraints. SEA may use a commercial third party development partner or develop future facilities itself, rehabilitate an existing facility or develop new facilities. Cargo carriers and forwarders do not require state-of-the-art facilities. If adequate market demand exists, cargo carriers only need adequate - rather than optimal - accommodations but SEA cannot ignore that its principal competition YVR has a cargo "village" that carriers find appealing due to the concentration of carriers, handlers, forwarders and regulators in one dedicated site. Not one carrier or forwarder suggested that SEA's constrained cargo facilities had caused lost opportunities but they did indicate that SEA's capacity issues already affect their choice of carriers and truck routing decisions, negatively influencing some of SEA's tenants to the benefit of others. The preceding is not sustainable for a gateway with a competitor as close and ambitious as YVR.

The competitive emphasis has not been on specific commodities, nor highly specialized facilities. When asked, none of the forwarders (including several specializing in perishables) supported the proposition of the airport developing its own cooler and/or freezer facilities. The seafood industry is intricately coordinated with forwarders and carriers to minimize reliance on airport facilities and the cherry and berry markets are too seasonal to justify year-round facilities. While commodity trade data will be of interest to new-entry carriers familiarizing themselves with the market, the forwarder community clearly and unanimously encouraged the airport to focus on promoting new destinations and additional frequencies by carriers, as well as managing localized roadway congestion and facilities issues.

With Delta expanding its SEA hub while belly carriers are taking market share from freighters on intercontinental routes, as well as SEA's advantageous location to participate in shared freighters, the Airport is poised to benefit from Asia-North America trade projected to outgrow the world average for the next twenty years. While the preceding is cause for optimism, SEA's reliance on belly capacity and shared freighters suggest international cargo growth will be incremental. Legacy hubs like LAX received the equivalent of another decade's capacity during the slowdown. SEA must ensure its cargo resources do not compel carriers to seek other alternatives like YVR. New or improved facilities will not typically influence cargo operators as much as demonstrable shipper demand, airport operating costs and a strategic location. However, in a competition as close as SEA's is with YVR, SEA cannot afford to hobble its efforts needlessly with avoidable liabilities.

6.2 Recommendations

The following are the key cargo marketing and services and facilities recommendations from the Assessment:

- Emphasize international passenger flights' belly capacity as the most likely means of near to mid-term cargo development opportunities but also recognize the need to maintain and enhance cargo resources to better serve cargo operators, including passenger carriers.
- Emphasize "shared" freighters on westbound transpacific routes, especially those currently making technical stops at ANC. Global trade does not favor the return of transatlantic freighter service, and the SEA market is inadequate to support year-round freighters dedicated solely to the SEA market, but can contribute to payloads more than ANC can. Nippon Cargo Airlines may be particularly promising.
- Emphasize superior access granted by U.S. "Open Skies" policy when competing directly with YVR for carrier service, especially for Singapore Cargo and Emirates Sky Cargo services.
- Emphasize expansion by incumbent air cargo handlers, rather than the recruitment of new handlers.
- Reestablish order to the development and utilization of the air cargo complex of facilities. Shippers, forwarders and carriers do not desire that the Airport develop specialized facilities such as temperature- controlled capacity, but rather that the Airport establish policies and plans that promote the optimum capacity and utilization of available cargo areas and facilities.

Appendix A
Participants in Workshops and Interviews

Company	Name
Cargo Facilities Developers	
ProLogis	Richard R. Kolpa
Transiplex	Scott J. Wilson
Cargo Handlers	
Cargo Airport Services (CAS)	Hector Ortiz
Hanjin Co., Ltd.	Ron Robillard
Swissport Cargo Services	Dutch Deutschman
Swissport Ground Services	Shawn Thibault
Freight Forwarders	
Airport Brokers Corp.	Agata Culic
Commodity Forwarders Inc. (CFI)	Don Ehrlich
Commodity Forwarders Inc. (CFI)	PJ Cranmer
Hellmann Worldwide Logistics	Colby Gardner
Hellmann Worldwide Logistics	John Sekulich
Panalpina	Patrick A. Haley
Sea & Air Transport	Peter J. Beckett
Specialty Cargo, Inc.	Scott Swett
Air Carriers	
Delta Cargo	Gene Raisanen
Emirates Sky Cargo	Torfin Stendahl
FedEx	Spencer Hansen
Hainan Airlines Co., LTD.	James Arlow
Hawaiian Airlines	Ken Galka
JetBlue	Mike Bonnett
Korean Air	Quin Buckman
Lufthansa Cargo	Al Schwanbeck
Lufthansa Cargo	Adel Ismail
United	Nancy Muramoto
General Sales Agent	
Airline Network Services (ANS)	Triana Aytch