



Washington Aviation System Plan

AIRPORT SITE SELECTION STUDY



Commercial Aviation Coordinating Commission (CACC) WASP Consultant Presentation

March 30, 2023

Agenda

- Introductions
- Greenfield Airport – Secondary Screening Analysis
- Greenfield Airport – Airspace Review
- Preliminary Air Cargo Forecasts



Introductions

Introductions

Kimley»Horn

 **RICONDO**



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Air Cargo/Forecasting

A teal-tinted photograph of an airport control tower and surrounding landscape. The tower is a tall, dark structure with a glass-enclosed top section. In the background, there are rolling hills and a line of trees. The overall scene is dimly lit, suggesting dusk or dawn.

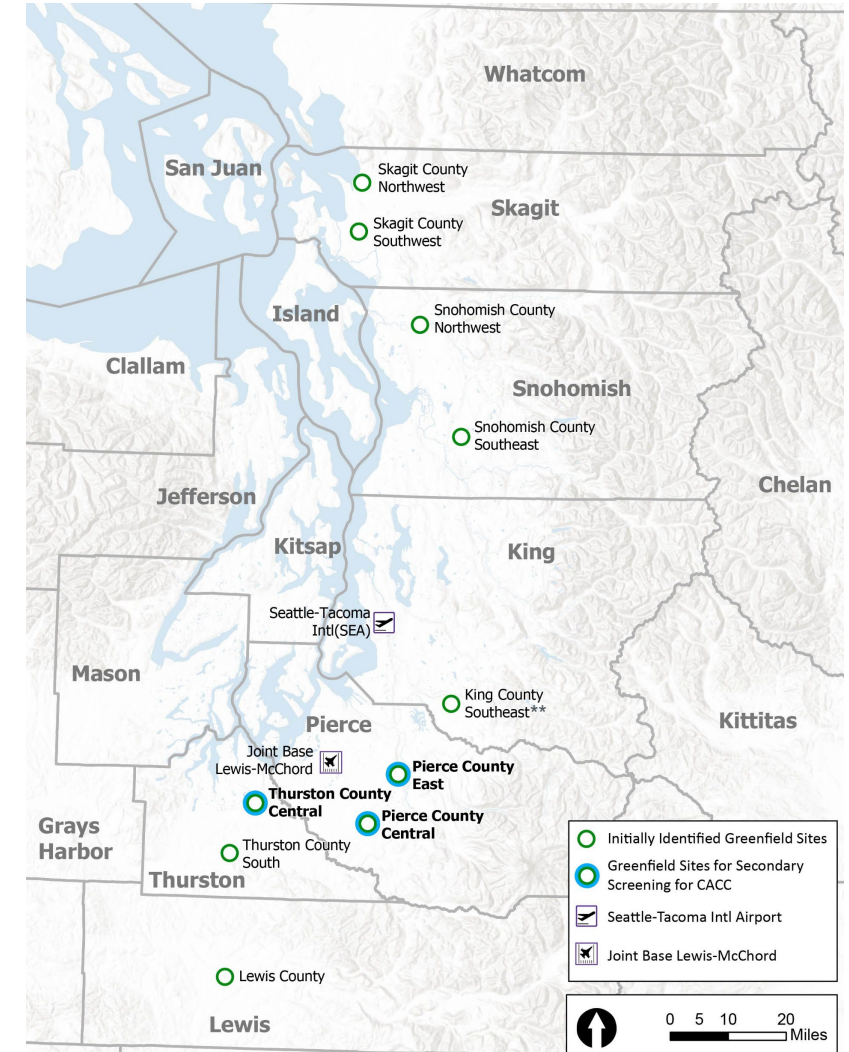
Greenfield Airport – Secondary Screening Analysis

Greenfield Sites – Secondary Screening Analysis





- Environmental factors
- Transportation/access analysis
- Infrastructure analysis
- *Airspace review**

* Airspace Review is covered separately from all other secondary screening criteria

** King County Southeast site is not included in the options for the CACC but is reviewed in the WASP



Secondary Screening Evaluation Elements

Criterion Category		Evaluation Element	Measure
 Operational Capability and Capacity Potential	Airspace Impacts and Constraints	Airspace Complexity	
		Airspace Terrain Penetrations	
		Impacts to Military Operations	
		Runway Procedure Opportunity	
 Ground Access	Ground Transportation Connectivity	Highway Connectivity	
	Transit Connectivity	Passenger Rail Connectivity	
 Development Costs	Utilities Access	Power Utilities	
		Water Utilities	
		Fiber Internet	
 Potential Environmental Impacts	Farmlands Impacts	Farmlands Impact	
	Aquifers and Water Supply Impacts	Critical Aquifer Recharge Areas	
		Wellhead Protection Areas	
	Tribal Interests Impacts	Tribal Fishing Rights	
	Essential Public Facilities Impacts	Landfills	
		High Voltage Power Lines	

Market Factors Criterion Category not evaluated in secondary analysis

Secondary Measure Descriptions

Measure	Description
Airspace Complexity	Complexity of shelving/cutouts required to accommodate airspace
Airspace Terrain Penetrations	Amount of terrain penetrating greenfield airspace
Impacts to Military Operations	Impacts of greenfield airspace on existing military airspace/operations
Runway Procedure Opportunity	Ability to accommodate greenfield arrival and departure procedures
Highway Connectivity	Average distance of new highway required to connect to nearest divided highway (miles)
Passenger Rail Connectivity	Distance to nearest passenger rail station/new rail required to connect to existing line (miles)
Power Utilities	Distance to nearest operational power station/high-voltage substation (miles)
Water Utilities	Distance to nearest water main (miles)
Fiber Internet	Distance to nearest fiber internet connection (miles)
Farmlands Impact	Amount of farmlands within site (acres)
Critical Aquifer Recharge Areas	Amount of Critical Aquifer Recharge Areas (CARAs) within site (acres)
Wellhead Protection Areas	Amount of 10-year Wellhead Protection Areas (WHPAs) within site (acres)
Tribal Fishing Rights	Length of rivers with SWIFD documented or presumed fish presence within site (miles)
Landfills	Distance to nearest active landfill (miles)
High Voltage Power Lines	Length of high voltage powerlines intersecting site (miles)

Pierce County East – Key Considerations

Compatible Features

- 0.4 miles of rivers with documented or presumed SWIFD* fish presence within site, second least of any finalist site
- Requires 1.7 miles of new rail to be constructed to connected to existing rail corridor, least of any site



Impediments to Implementation

- Impacts 6.1 miles of high voltage transmission lines, most of any site
- 528 acres of farmlands are within site, most of any site

*SWIFD: Statewide Integrated Fish Distribution data set – used to analyze tribal fishing rights



Pierce County East – All Results

Criterion	Evaluation Element	Measure	Result
A	Ground Transportation Connectivity	Highway Connectivity – Distance to nearest 4-lane divided highway (miles)	14.5
	Transit Connectivity	Passenger Rail Connectivity – Distance to nearest Amtrak/commuter rail line (miles)	22.4
		Passenger Rail Connectivity – Distance of new rail required (miles)	1.7
	Utilities Access	Electrical Utilities – Distance to nearest power station (miles)	5.2
		Electrical Utilities – Distance to nearest substation (miles)	2.5
		Water Utilities – Distance to nearest water main (miles)	3.1
		Telecommunications – Distance to nearest fiber connection (miles)	2.7
	Farmlands Impacts	Farmlands – Amount of farmlands in site (acres)	528.5
	Aquifers and Water Supply Impacts	Critical Aquifer Recharge Areas – Amount of CARAs within site (acres)	0.0
		Wellhead Protection Areas – Amount of 10-year WHPAs within site (acres)	238.8
	Tribal Interests Impacts	Tribal Fishing Rights – Length of rivers with SWIFD documented or presumed fish presence within site (miles)	0.4
	Essential Public Facilities Impacts	Landfills – Distance to nearest active landfill (miles)	2.7
		High Voltage Transmission Lines – Length of high voltage powerlines intersecting site (miles)	6.1

Pierce County Central – Key Considerations

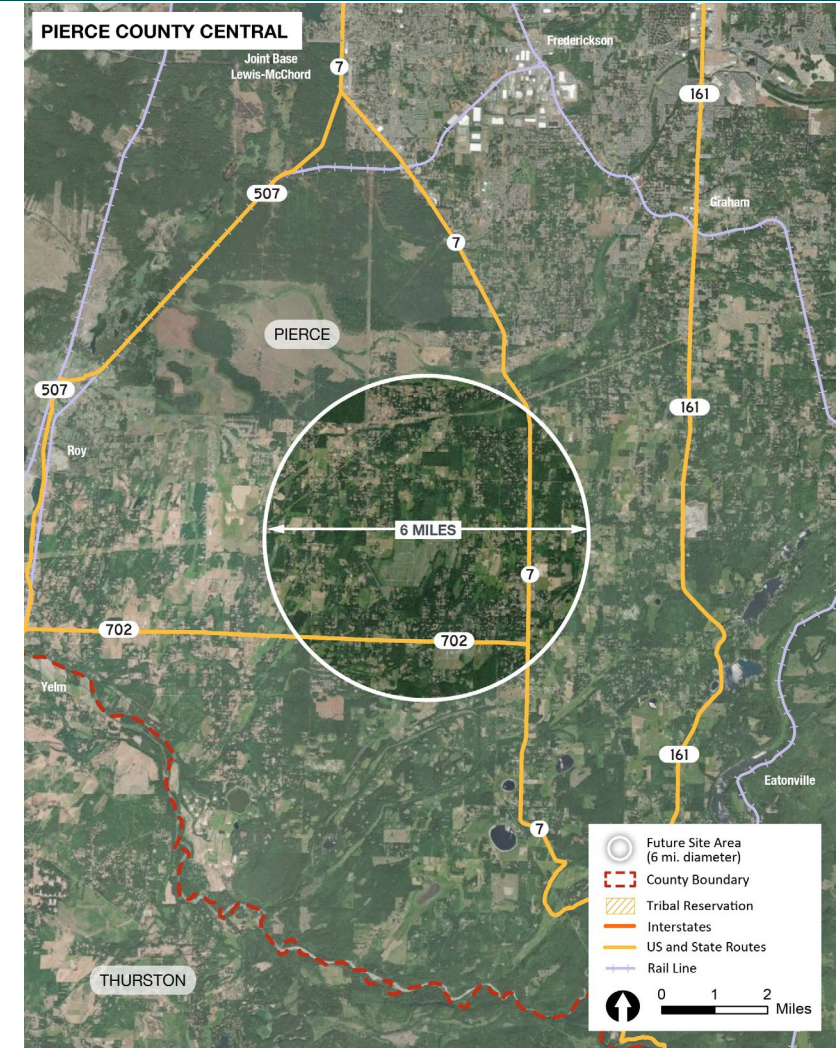
Compatible Features

- No rivers with documented or presumed SWIFD* fish presence within site, only site with no presence
- 1.2 miles from center of site area to nearest high-voltage substation, closest of any site



Impediments to Implementation

- 17.0 miles from nearest divided highway connection, furthest of any site
- 6.0 miles from nearest potential water utility connection, furthest of any site

*SWIFD: Statewide Integrated Fish Distribution data set – used to analyze tribal fishing rights



Pierce County Central – All Results

Criterion	Evaluation Element	Measure	Result
A	Ground Transportation Connectivity	Highway Connectivity – Distance to nearest 4-lane divided highway (miles)	17.0
	Transit Connectivity	Passenger Rail Connectivity – Distance to nearest Amtrak/commuter rail line (miles)	22.5
		Passenger Rail Connectivity – Distance of new rail required (miles)	6.7
	Utilities Access	Electrical Utilities – Distance to nearest power station (miles)	8.0
		Electrical Utilities – Distance to nearest substation (miles)	1.2
		Water Utilities – Distance to nearest water main (miles)	6.0
		Telecommunications – Distance to nearest fiber connection (miles)	1.5
	Farmlands Impacts	Farmlands – Amount of farmlands in site (acres)	329.3
	Aquifers and Water Supply Impacts	Critical Aquifer Recharge Areas – Amount of CARAs within site (acres)	0.0
		Wellhead Protection Areas – Amount of 10-year WHPAs within site (acres)	215.3
	Tribal Interests Impacts	Tribal Fishing Rights – Length of rivers with SWIFD documented or presumed fish presence within site (miles)	0.0
	Essential Public Facilities Impacts	Landfills – Distance to nearest active landfill (miles)	5.1
		High Voltage Transmission Lines – Length of high voltage powerlines intersecting site (miles)	6.0

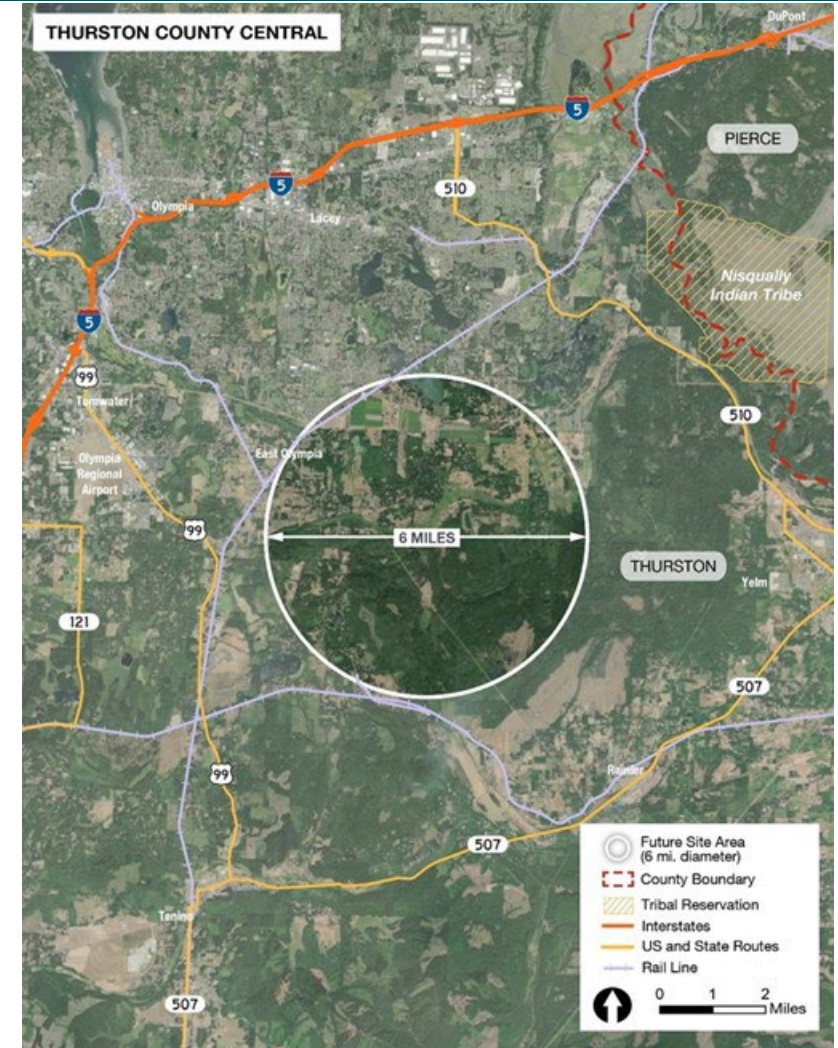
Thurston County Central – Key Considerations

Compatible Features



- 2.7 miles from nearest Amtrak/commuter rail line, closest of any finalist site
- 123.7 acres of farmlands within site area, fewest of any site

Impediments to Implementation




- 1,935.2 acres of Critical Aquifer Recharge Areas (CARAs) in site area, most of any site
- 749.2 acres of Wellhead Protection Areas (WHPAs) in site area, most of any site



Thurston County Central – All Results

Criterion	Evaluation Element	Measure	Result
A	Ground Transportation Connectivity	Highway Connectivity – Distance to nearest 4-lane divided highway (miles)	9.3
	Transit Connectivity	Passenger Rail Connectivity – Distance to nearest Amtrak/commuter rail line (miles)	2.7
		Passenger Rail Connectivity – Distance of new rail required (miles)	2.7
	Utilities Access	Electrical Utilities – Distance to nearest power station (miles)	6.9
		Electrical Utilities – Distance to nearest substation (miles)	4.3
		Water Utilities – Distance to nearest water main (miles)	3.0
		Telecommunications – Distance to nearest fiber connection (miles)	2.4
	Farmlands Impacts	Farmlands – Amount of farmlands in site (acres)	123.7
	Aquifers and Water Supply Impacts	Critical Aquifer Recharge Areas – Amount of CARAs within site (acres)	1,935.2
		Wellhead Protection Areas – Amount of 10-year WHPAs within site (acres)	749.2
	Tribal Interests Impacts	Tribal Fishing Rights – Length of rivers with SWIFD documented or presumed fish presence within site (miles)	2.2
	Essential Public Facilities Impacts	Landfills – Distance to nearest active landfill (miles)	7.9
High Voltage Transmission Lines – Length of high voltage powerlines intersecting site (miles)		3.7	

Summary of Results – All Finalist Sites

Criterion	Evaluation Element	Measure	Pierce E	Pierce C	Thurston C
	Ground Transportation Connectivity	Highway Connectivity – Distance to nearest 4-lane divided highway (miles)	14.5	17.0	9.3
	Transit Connectivity	Passenger Rail Connectivity – Distance to nearest Amtrak/commuter rail line (miles)	22.4	22.5	2.7
		Passenger Rail Connectivity – Distance of new rail required (miles)	1.7	6.7	2.7
	Utilities Access	Electrical Utilities – Distance to nearest power station (miles)	5.2	8.0	6.9
		Electrical Utilities – Distance to nearest substation (miles)	2.5	1.2	4.3
		Water Utilities – Distance to nearest water main (miles)	3.1	6.0	3.0
		Telecommunications – Distance to nearest fiber connection (miles)	2.7	1.5	2.4
	Farmlands Impacts	Farmlands – Amount of farmlands in site (acres)	528.5	329.3	123.7
	Aquifers and Water Supply Impacts	Critical Aquifer Recharge Areas – Amount of CARAs within site (acres)	0.0	0.0	1,935.2
		Wellhead Protection Areas – Amount of 10-year WHPAs within site (acres)	238.8	215.3	749.2
	Tribal Interests Impacts	Tribal Fishing Rights – Length of rivers with SWIFD documented or presumed fish presence within site (miles)	0.4	0.0	2.2
	Essential Public Facilities Impacts	Landfills – Distance to nearest active landfill (miles)	2.7	5.1	7.9
High Voltage Transmission Lines – Length of high voltage powerlines intersecting site (miles)		6.1	6.0	3.7	

The background of the slide is a dark teal color with a semi-transparent image of an airport control tower and a mountain range. The text is white and centered on the left side of the image.

Greenfield Airport – Airspace Review

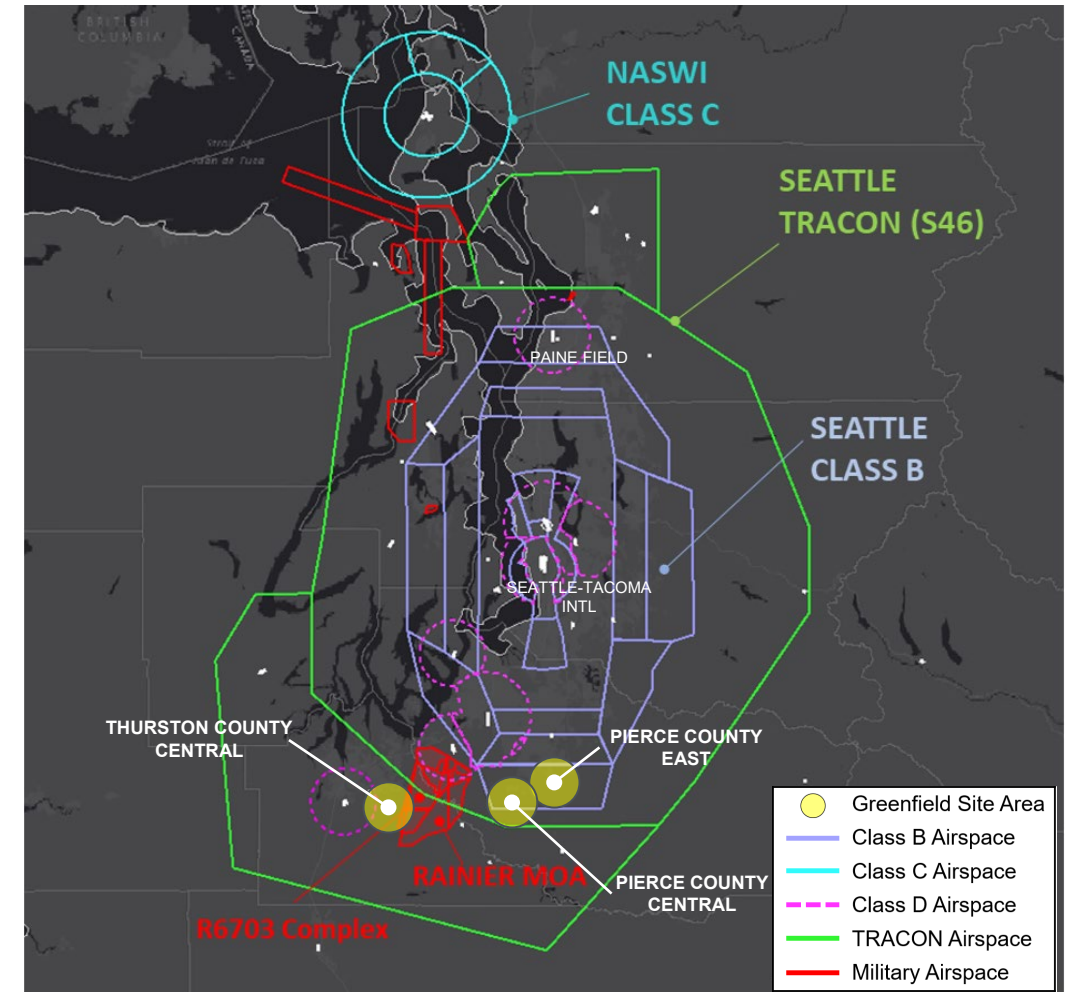
Approach to Airspace Analysis

- No changes to existing airspace were analyzed or proposed
- New greenfield airport assumed to require Class C airspace
- Developed airspace model for greenfield airport within existing airspace using FAA TARGETS tool
- Evaluated each site based on four measures

Measure	Description
Airspace Complexity	Evaluates the complexity of Class C airspace for each site due to cutouts and shelving.
Airspace Terrain Penetration	Greenfield Class C airspace volumes were evaluated for terrain penetration in TARGETS tool to determine amount of airspace unavailable due to terrain compared to standard Class C dimensions.
Military Operations	Considers military stakeholder feedback and existing airspace to determine relative impacts of greenfield on regional military operations.
Runway Procedure Access	Conceptual Standard Instrument Departure (SID) and Standard Instrument Arrivals Routes (STAR) were overlaid with TARGETS model to understand if routes could be designed into the existing system with minimal impact to operations and terrain.

Existing Regional Airspace

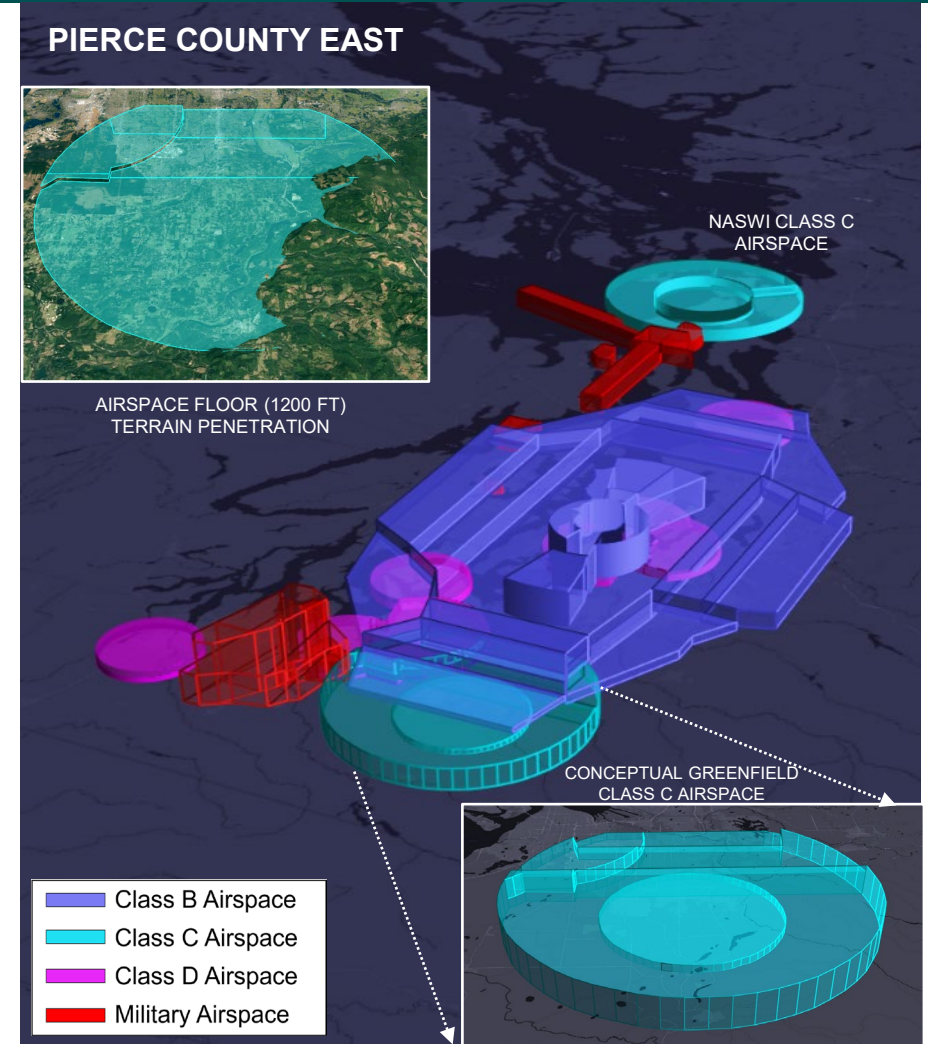
- Seattle TRACON (S46): Provides aircraft guidance and control in the region
- Seattle Class B: Controls aircraft arriving and departing from Seattle-Tacoma Int'l Airport (SEA)
- Naval Air Station Whidbey Island (NASWI) Class C: Controls military and civilian aircraft north of Seattle
- Class D: Supports smaller towered airports in the region
- Military Operations Areas (MOA): Supports training routes, parachute jump zones, and flight testing



Airspace Analysis – Pierce County East

Site airspace faces challenges due to terrain, Class B shelving, JBLM Class D, and conflicts with military routes

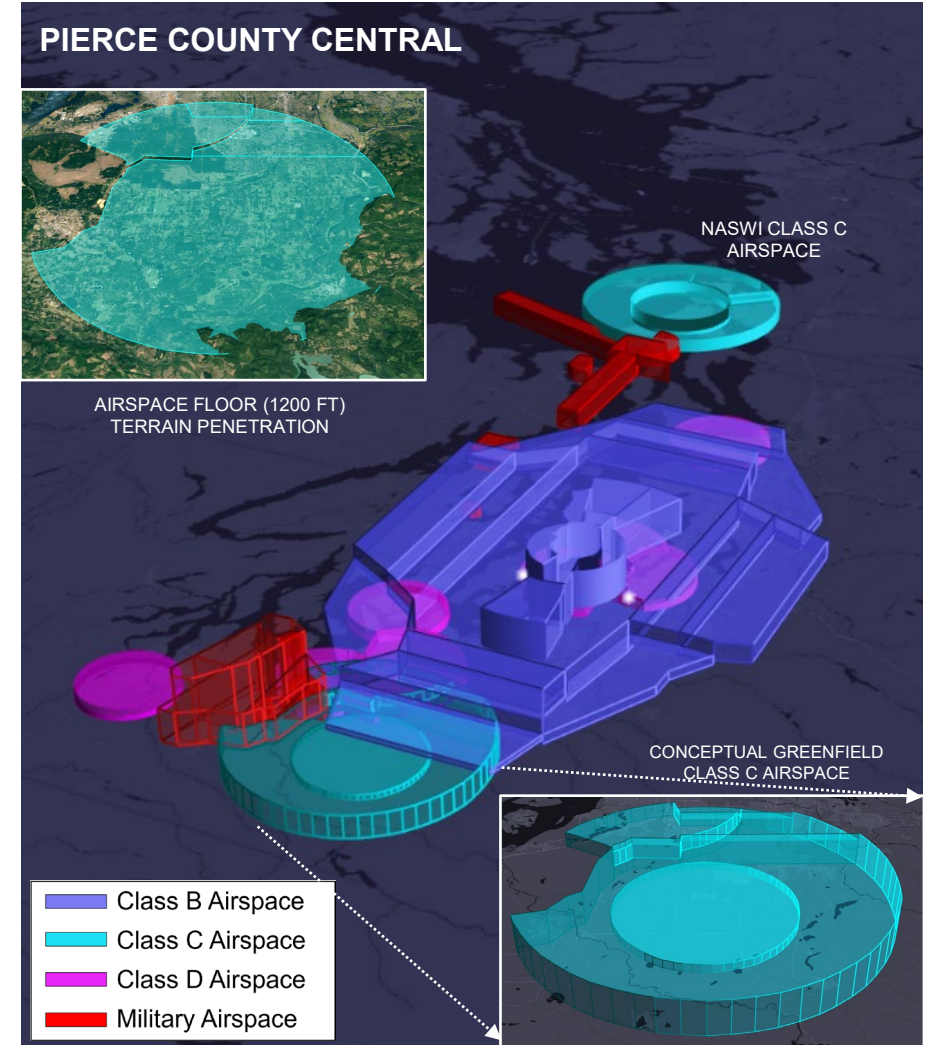
Measure	Pierce County East Results
Airspace Complexity	Significant Impacts
Airspace Terrain Penetration	Significant Impacts
Military Operations	Significant Impacts
Runway Procedure Access	Significant Impacts



Airspace Analysis – Pierce County Central

Site airspace impacted by Class B shelving, JBLM Class D airspace, and conflicts with military airspace and routes

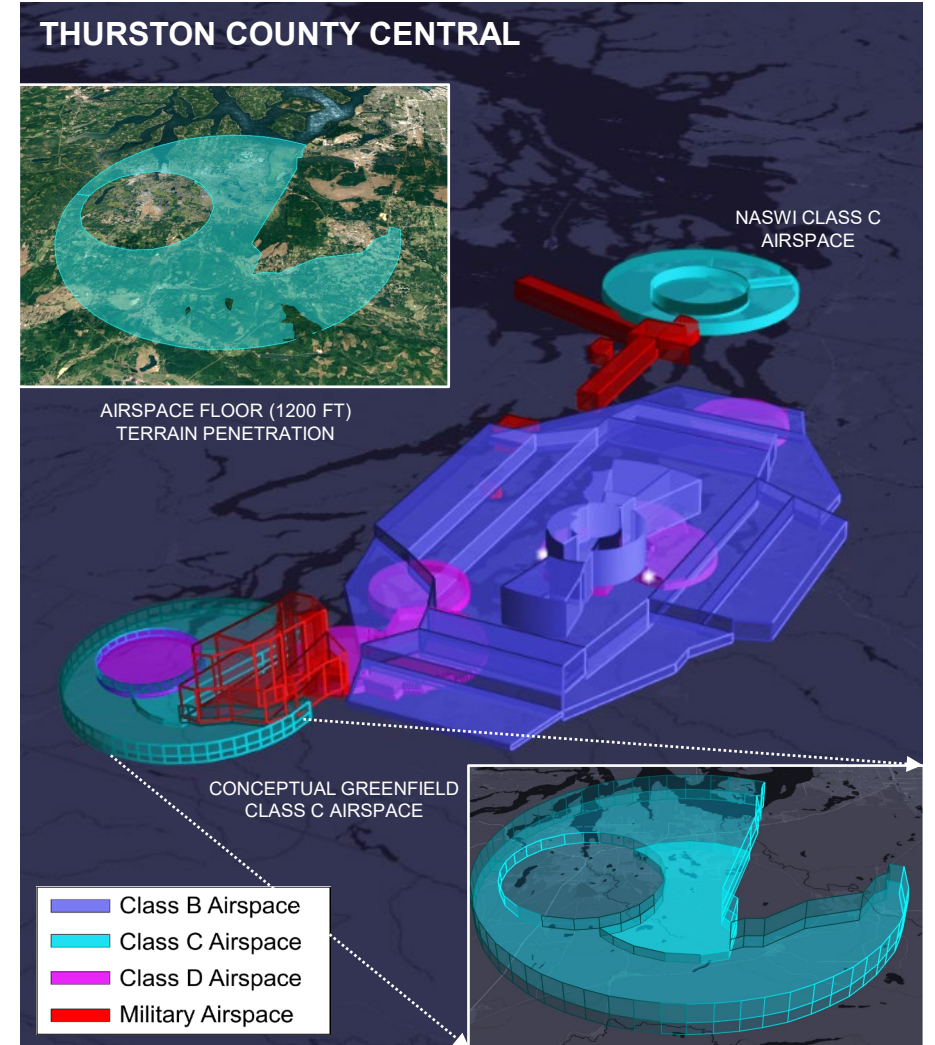
Measure	Pierce County Central Results
Airspace Complexity	Significant Impacts
Airspace Terrain Penetration	Minimal Impacts
Military Operations	Significant Impacts
Runway Procedure Access	Significant Impacts



Airspace Analysis – Thurston County Central

Site airspace is significantly constrained due to conflicts with existing OLM and military airspace

Measure	Thurston County Central Results
Airspace Complexity	Significant Impacts
Airspace Terrain Penetration	Minimal Impacts
Military Operations	Significant Impacts
Runway Procedure Access	Significant Impacts



Airspace Analysis – Summary of Results

- All sites present significant impacts to existing airspace structure
- Implementation would require substantial coordination with military and civilian stakeholders
- Airspace design is highly complex and will require further specialized study

Measure	Pierce East	Pierce Central	Thurston Central
Airspace Complexity	Significant Impacts	Significant Impacts	Significant Impacts
Airspace Terrain Penetration	Significant Impacts	Minimal Impacts	Minimal Impacts
Military Operations	Significant Impacts	Significant Impacts	Significant Impacts
Runway Procedure Access	Significant Impacts	Significant Impacts	Significant Impacts

A dark teal background image featuring a silhouette of an air traffic control tower on the left, a mountain range in the center, and trees on the right. The text 'Preliminary Air Cargo Forecasts' is overlaid in white.

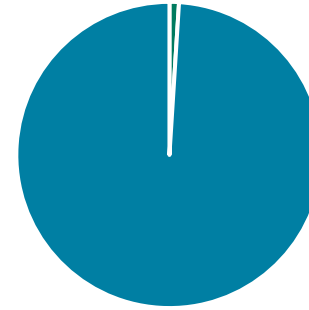
Preliminary Air Cargo Forecasts

Air Cargo Market Overview

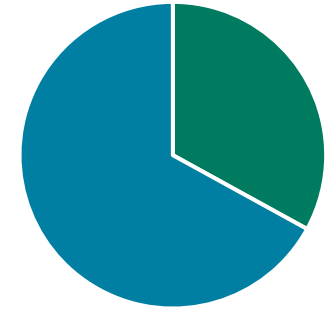
Industry Trends and Key Drivers

- Freight traffic growing at approximately 3-5% per year worldwide
- Air cargo revenue is big business
 - \$100.2 billion total air freight & express market
 - \$42.9 billion integrated carrier/express market
 - \$11.9 billion pax belly-only cargo market
- Integrated carrier/express carriers control large proportions of the U.S., European, and Asian markets
- Cargo share of total airline revenues
 - 15% for U.S. domestic majors
 - 15% for European majors
 - 20-50% for Asian majors

Historical Air Cargo Tonnage and Trade Value



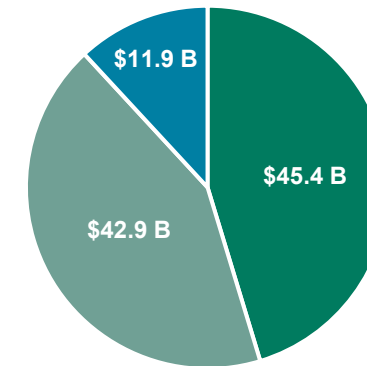
1% of World Trade Tonnage
■ Air ■ Sea, Rail, & Road



33% of World Trade Value
■ Air ■ Sea, Rail, & Road

SOURCE: Boeing World Air Cargo Forecast 2022-2041, October 2022.

Share of Air Cargo Revenue Operator Category



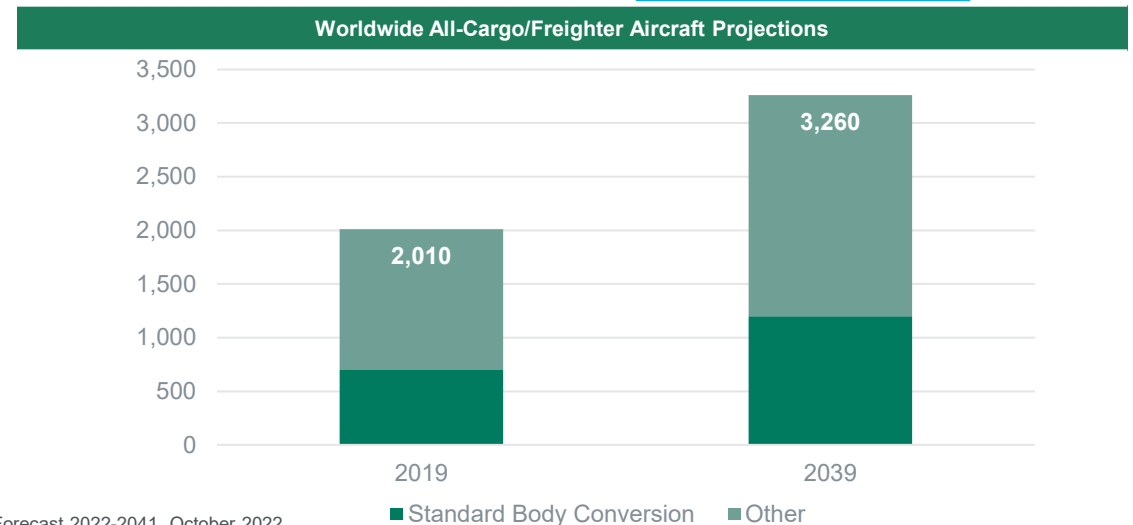
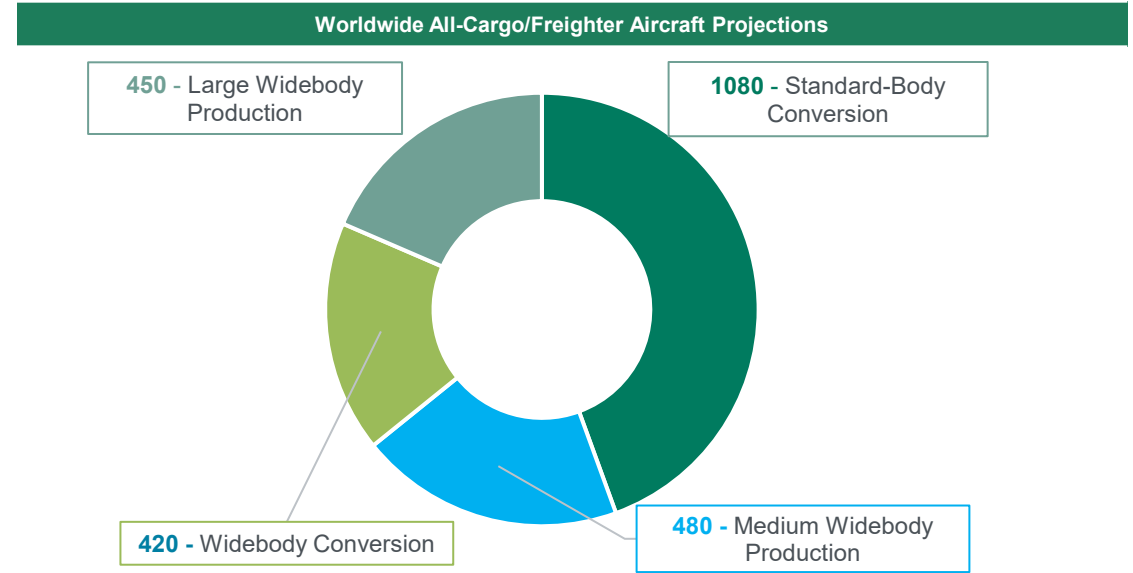
■ All-Cargo ■ Integrated Express ■ Passenger Belly

SOURCE: Boeing World Air Cargo Forecast 2022-2041, October 2022

Air Cargo Market Overview

Increased Use of Freighter Aircraft

- Both Boeing and Airbus forecast strong growth in new production through 2041 with over 2,300 new freighter aircraft
- New freighter aircraft deliveries expected to outpace passenger aircraft conversions over next 20 years
 - 767F and 777F are leading aircraft
 - 747-8F production concluded in 2023



SOURCE: Boeing World Air Cargo Forecast 2022-2041, October 2022

Air Cargo Market Overview

Global Air Cargo Revenue – Pandemic Effects

- Air cargo share of airline revenue increased over past several years
 - Large increase as pandemic intensified; IATA estimated air cargo represented 40% of total global airline revenue in 2021, historic peak in relative share
- Predicted to continue to remain higher than in historic trends
 - Freighter share is higher than 2019 and projected to grow at faster pace than recent history
 - IATA projects 2023 share will account for approximately 19% of revenues, remaining above pre-pandemic share of 12%



SOURCE: IATA, January 2023

Washington State Airports' Historical Cargo Data

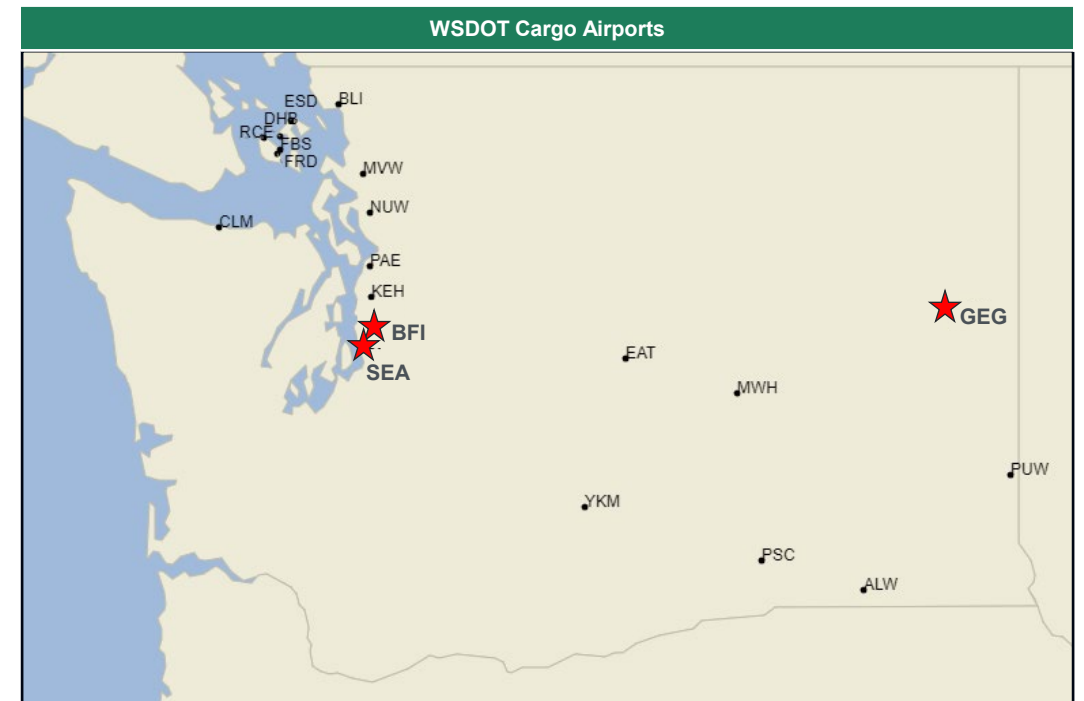
Air Cargo Tonnage 2017-2021

- Top three regional airports (SEA, BFI, and GEG) account for 98% of 2021 statewide total cargo tonnage
 - SEA total tonnage grew at 4.0% CAGR* from 2017-2021
 - BFI (King County) has experienced -3.7% CAGR from 2017-2021
 - PAE (Paine Field) experienced increasing tonnage totals (Atlas Air) through 2019 but is down significantly with 2021 totals just above 4,000 tons

* CAGR - Compound Annual Growth Rate

Historical Cargo Tonnage					
Unit	2017	2018	2019	2020	2021
SEA (Sea-Tac)	425,856	432,315	453,547	452,496	498,741
BFI (King County)	114,017	115,767	107,421	102,852	98,215
GEG (Spokane Intl)	80,646	77,557	73,900	68,795	74,804
PAE (Paine Field)	19,345	21,267	30,695	23,886	4,009
Other Airports	8,100	8,870	7,838	8,543	7,396
WSDOT Total	647,963	655,777	673,400	656,571	683,164

SOURCES: SEA Airport Data, January 2023, DOT T-100 All Other Airports, December 2022



WASP Air Cargo Forecast

Forecast Methodology

- Reviewed previous analyses and forecasts for each airport (2018 Joint Transportation Committee [JTC], Air Cargo Movement Study, 2021 PSRC Baseline Study, airport master plans [as available]), and cargo industry analysis that reflect market changes since 2019 including the effects of the COVID pandemic
- Several forecasting techniques used in WASP air cargo forecasts. Econometric modeling allows for establishing the significance of underlying economic factors such as GDP, industrial production, world trade and links WASP forecast to future expectations of those factors. This methodology is most useful for medium- and long-range forecasts in regional markets
- Methodologies employed for cargo forecast include both a bottom-up (breaking the overall market into its component carrier groups) and top-down approaches that use time-series extrapolation and market share analysis
 - Independent regression/data analyses were performed and generated several forecasts of air cargo tonnage
 - Cargo expert evaluation helps account for expected changes in non-econometric growth factors such as evolving supply chains and changes in trade patterns that could influence an airline's strategic plan, for example, an integrated carrier developing or expanding service for a regional hub airport

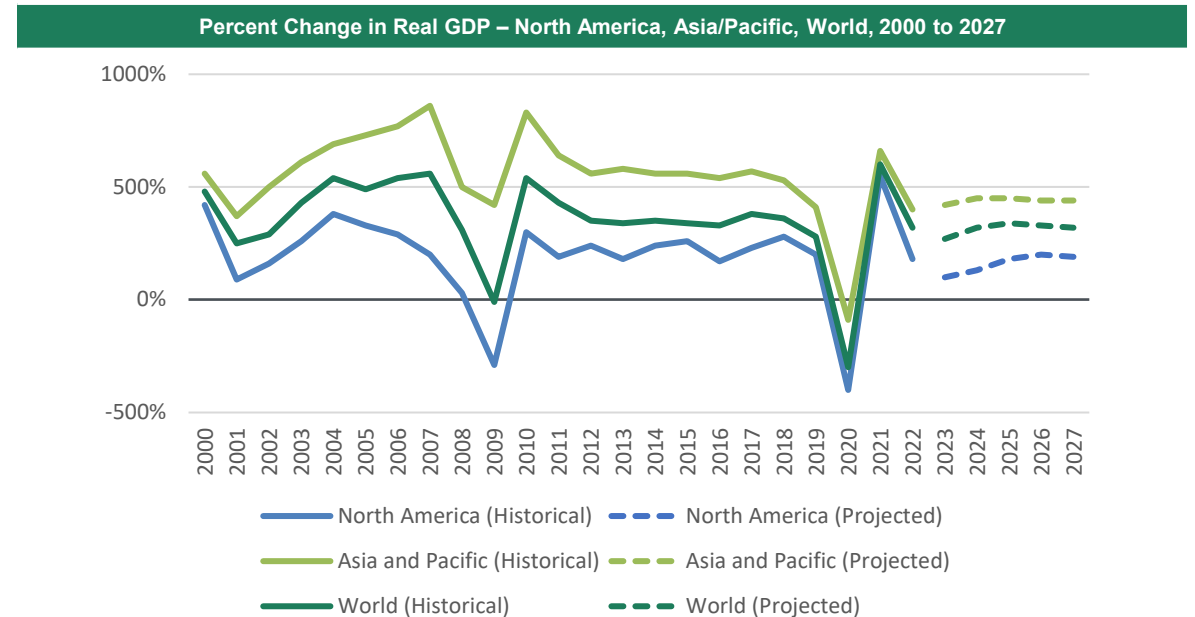
WASP Air Cargo Forecast

Independent Market Outlook

- Boeing and Airbus
 - Worldwide cargo tonnage growth at 4.1% and 3.2% respectively
- GDP
 - Annual GDP percentage change is good representation of region's propensity to purchase/consume products that require logistical and transportation resources
 - Historical: All regions experienced negative GDP growth in 2020 due to pandemic but also rebounded sharply in 2021/22
 - Projected: North America lags projected World GDP growth (1.6% CAGR vs 3.2% CAGR). Asia/Pacific is projected to grow an average 4.4% CAGR through 2027

Independent Air Cargo Forecasts				
	Forecast Period	World Air Traffic	North America Domestic	North America Asia
Airbus	2019-2040	3.2%	n/a	n/a
Boeing	2022-2041	4.1%	3.1%	4.4%

SOURCES: Airbus Global Market Forecast 2022-2041, July 2022; Boeing World Air Cargo Forecast 2022-2041, October 2022.
PREPARED BY: Ricondo & Associates, Inc., January 2023



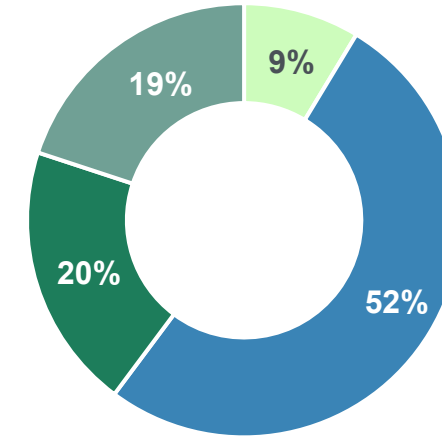
SOURCE: IMF DataMapper, January 2023

Air Cargo Forecast

SEA Market and Forecast 2023-2042

- Integrated carriers (predominately FedEx) account for 52% of 2021 total cargo at SEA
- Passenger and mixed carrier groups are 20% and 19% of total cargo tonnage at SEA in 2021 with Korean Air, Alaska, Delta, and China Airlines handling over 63%
- All-cargo airlines (freighter aircraft) grew from ~ 3% market share in 2015 to ~ 9% in 2021 largely due to Atlas Air/ATI/Kalitta and expansion of Amazon and e-commerce activity
- Total tonnage experienced -8.5% annual decline in 2022 (456,298 tonnes down from 498,741 in 2021) due to slowing demand, inflation, disrupted global supply chains, and depressed consumer spending
- SEA cargo tonnage is forecast to grow 2.9% CAGR through 2042, reaching a total of ~805,000 tonnes

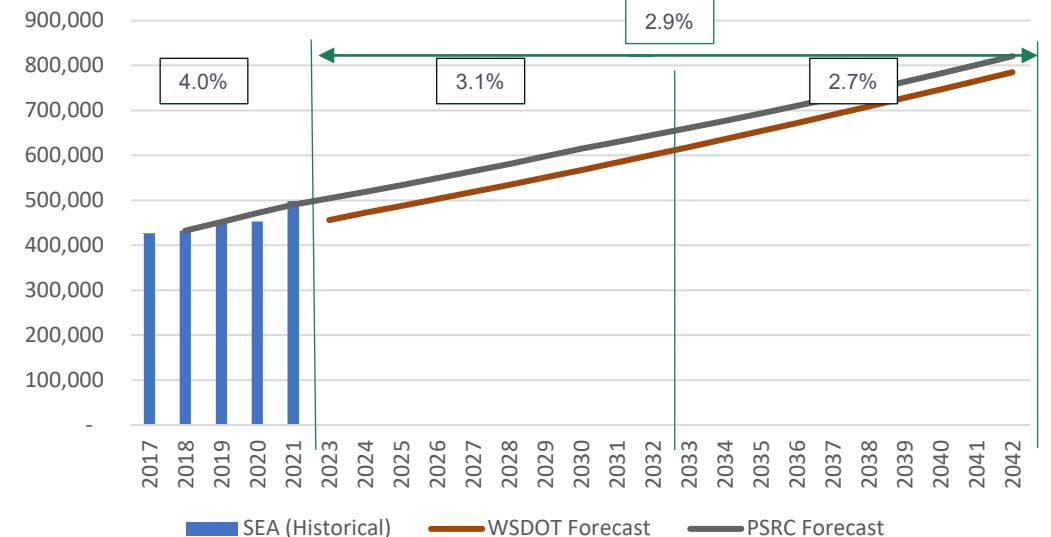
SEA Market Share by Airline Category



■ All-cargo ■ Integrated ■ Mixed ■ Passenger

SOURCE: SEA Airport Data, January 2023

SEA Air Cargo Tonnage Forecast



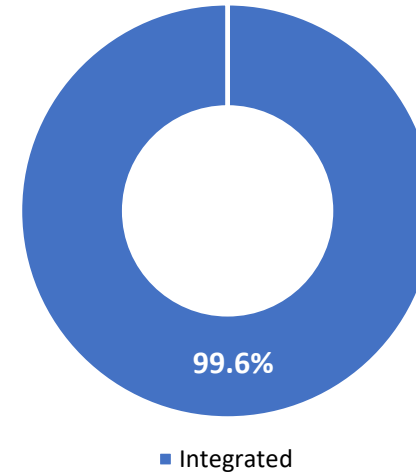
SOURCES: SEA Airport Data, January 2023, Ricondo and Associates, February 2023

Air Cargo Forecast

BFI Market and Forecast 2023-2042

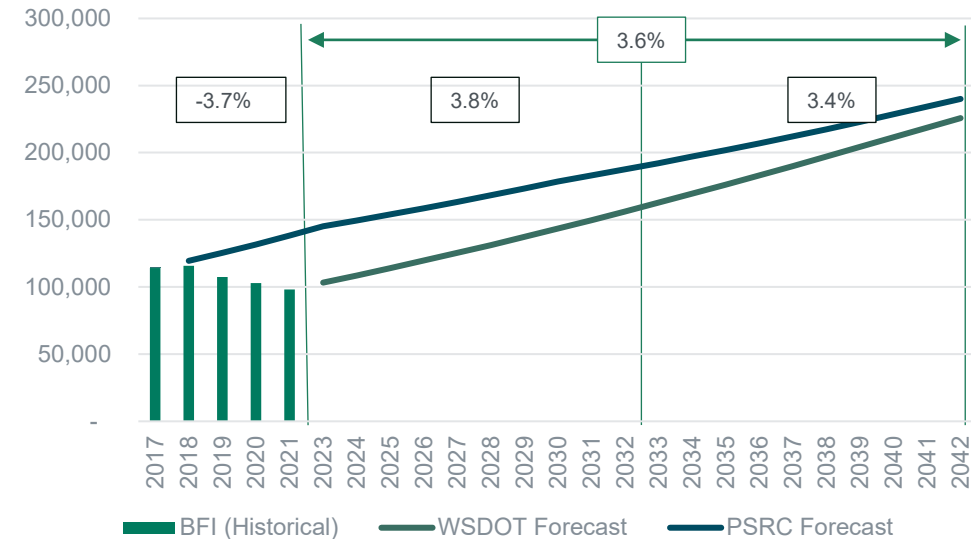
- UPS is the dominant cargo carrier at BFI
 - Integrated carriers carried 99.6% of 2022 total tonnage
 - BFI continues to be UPS' center of activity for greater Seattle cargo market with express and deferred services
- The WASP cargo forecast for BFI expects a 3.6% CAGR through 2042. Slightly higher 3.8% CAGR projected over next 10 years as cargo market rebounds from pandemic and supply chain issues with slower growth from 2033-2042
 - The last air cargo forecast from PSRC study had projected 5% CAGR from 2018-2022, 3% from 2023-2029, and then 2.5%

BFI Market Share by Airline Category



SOURCES: DOT T-100, December 2022.

BFI Air Cargo Tonnage Forecast



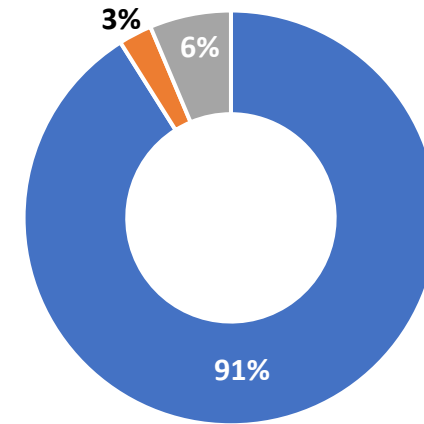
SOURCES: DOT T-100, December 2022, Ricondo and Associates, February 2023.

Air Cargo Forecast

GEG Market and Forecast 2023-2042

- Integrated carriers lead GEG in 2021 total cargo tonnage
 - FedEx and UPS (and their feeder aircraft activity) continue to dominate Spokane cargo market
- All-cargo carriers, namely ATI and Atlas, expanded in recent years due to growth in Amazon and e-commerce activity
- Passenger carriers are limited in their total cargo tonnage due to regional jet aircraft prevalent in GEG passenger market, but changes in future aircraft service could provide greater cargo growth opportunities

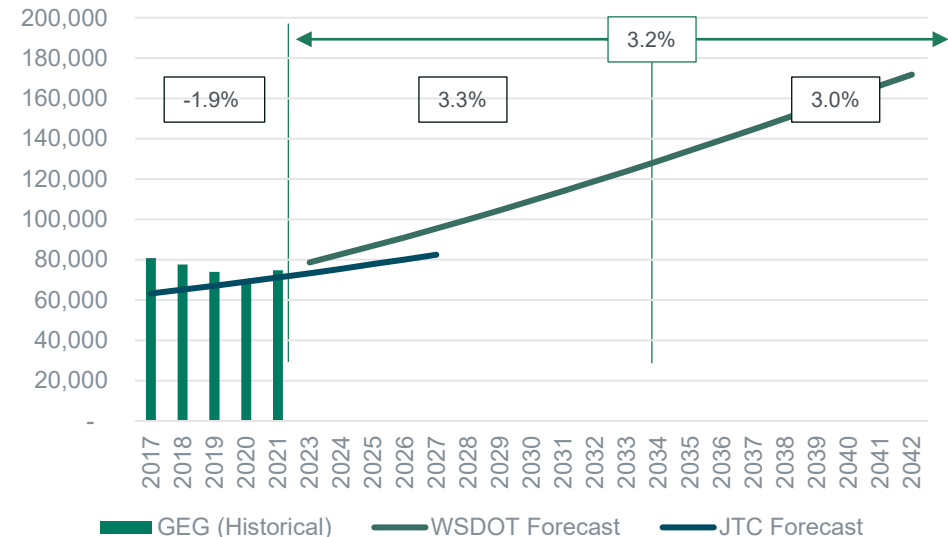
GEG Market Share by Airline Category



■ Integrated ■ Passenger ■ All-Cargo

SOURCE: DOT T-100, December 2022.

GEG Air Cargo Tonnage Forecast

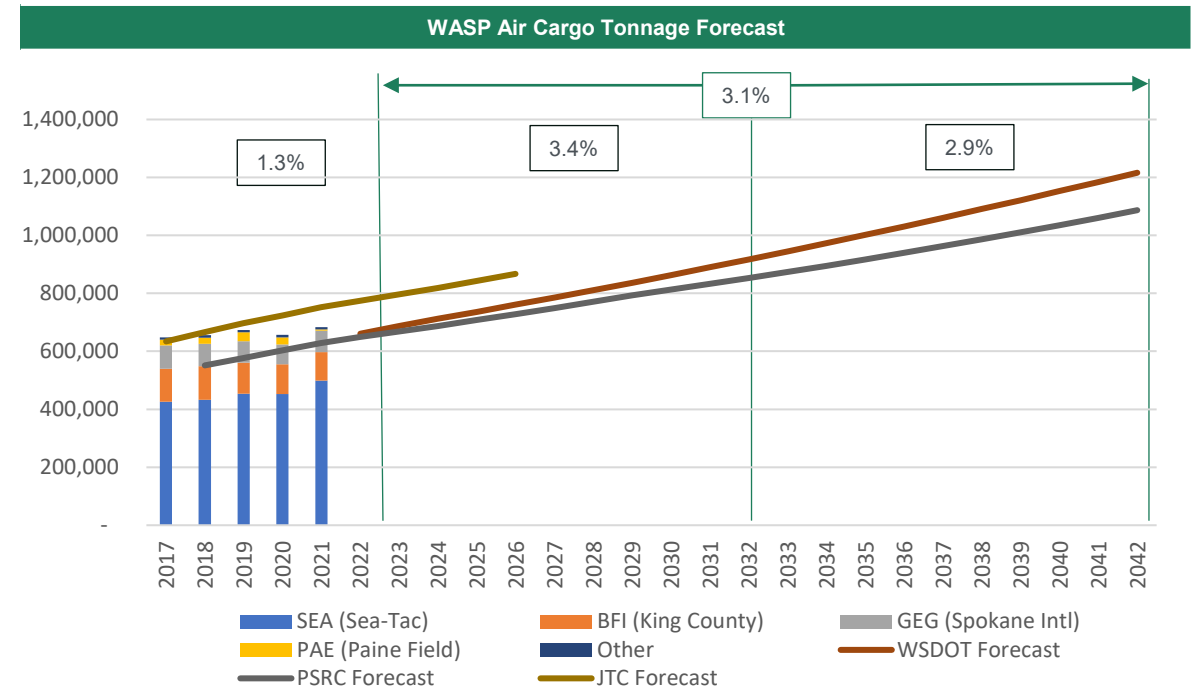


SOURCES: DOT T-100, December 2022, Ricondo and Associates, February 2023.

Washington State Air Cargo Forecast

WASP Forecast 2023-2042

- Total cargo tonnage from 2017-2021 grew at 1.3% CAGR
 - The pandemic significantly affected aviation industry and total cargo volume declined -2.1% in 2020
 - Total tonnage grew 4.1% in 2021 from 2020
- Total cargo is expected to experience steady growth over 20-year planning period at 3.1% CAGR
 - Boeing expects 4.1% worldwide and 3.0% in North American domestic cargo over next 20 years
- As point of comparison, PSRC forecast only included SEA and BFI and growth rates were 2.75% CAGR for 2017-2050
 - Automation is rapidly becoming a key success factor in e-commerce logistics by enabling increasingly quick fulfilment and distribution



SOURCES: DOT T-100, December 2022, Ricondo and Associates, February 2023.



Questions/Discussion
(Commission Members Only)

Wrap Up

- **Final Comments**
- **Adjourn**

For additional information regarding the
Commercial Aviation Coordinating Commission:

www.wsdot.wa.gov/aviation/commission/home.htm