

Seattle-Tacoma International Airport



Service Directive #7: Ground Transportation Access Plan (GTAP) Study Final Report

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Port of Seattle



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FINAL

Ricondo & Associates, Inc. (R&A) prepared this document for the stated purposes as expressly set forth herein and for the sole use of the Port of Seattle and its intended recipients. The techniques and methodologies used in preparing this document are consistent with industry practices at the time of preparation.

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Table of Acronyms

ACRONYM/ABBREVIATION	DEFINITION	SECTION FIRST NOTED
AV	autonomous vehicle	3.1
BOS	Boston Logan International Airport	3.2.1
BRT	Bus Rapid Transit	5.1.2
CPH	Copenhagen Airport	3.3
DUB	Dublin Airport	3.3
E-KPI	Environmental Key Performance Indicator	6.1.7.1
EPS	Enplaning Passenger Survey	1.1
ESFH	Eastside for Hire	6.1.7.2
FAA	Federal Aviation Administration	6.1.4
GHG	greenhouse gas	3.2.1
GIS	geographic information system	7.3.3
GT	ground transportation	1.2
GTAP	Ground Transportation Access Plan	1.1
HOV	high-occupancy vehicle	3.1
KCM	King County Metro	1.2
LAX	Los Angeles International Airport	4.3.1
LGW	Gatwick Airport	3.3
LHR	Heathrow Airport	3.3
LOS	level of service	1.2
MAP	million annual passengers	3.3
PMT	passenger miles traveled	4.4.1
Port	Port of Seattle	1.2
PRR	PRR Biz	2
SAMP	Sustainable Airport Master Plan	1.1
SEA or the Airport	Seattle-Tacoma International Airport	1.1
SD	Service Directive	1.2
SFO	San Francisco International Airport	6.1.7.1
ST	Sound Transit	1.2
TMA	Transportation Management Association	3.1
TMS	taxi management system	3.3.1.6
TNC	transportation network company	1.1
TSA	Transportation Security Administration	2.3
VMT	vehicle miles traveled	4.4.1

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Executive Summary

Seattle-Tacoma International Airport (SEA or Airport) is one of the busiest airports in the United States, serving almost 47 million annual passengers (MAP) in 2017. This activity is projected to increase to more than 60 MAP¹ in the next 10 years.² The Airport has a major economic impact on King County and the Puget Sound region, supporting \$22.5 billion in total economic activity in 2017, according to the *Sea-Tac International Airport Economic Impacts* study (January 2018).

To accommodate this projected increase in passenger traffic, the *Sustainable Airport Master Plan (SAMP)* includes an ambitious capital improvement program centered around a major terminal expansion program and associated landside improvements. It sets the stage for future development to accommodate increased demand, but doing so in a way that ensures long-term sustainability of this critical element of the Puget Sound economic fabric.

In 2017, the Port of Seattle commissioned this Ground Transportation Access Plan (GTAP) to advance efficient and sustainable transportation modes, including consideration of equity while also addressing traffic congestion on the airport curbs and roadways. It is a key objective of the Port to foster equity, both from a consumer-options perspective and a desire to support quality "living wage" jobs perspective. The underlying purpose of the GTAP Study is to assist the Airport and the Puget Sound region identify strategies that foster shifts in the way Airport customers and the workforce think about Airport access; strategies that will affect a person's mode choice in favor of longer-term sustainable options, while being sensitive to established equity and producing measurable benefits at a reasonable cost.

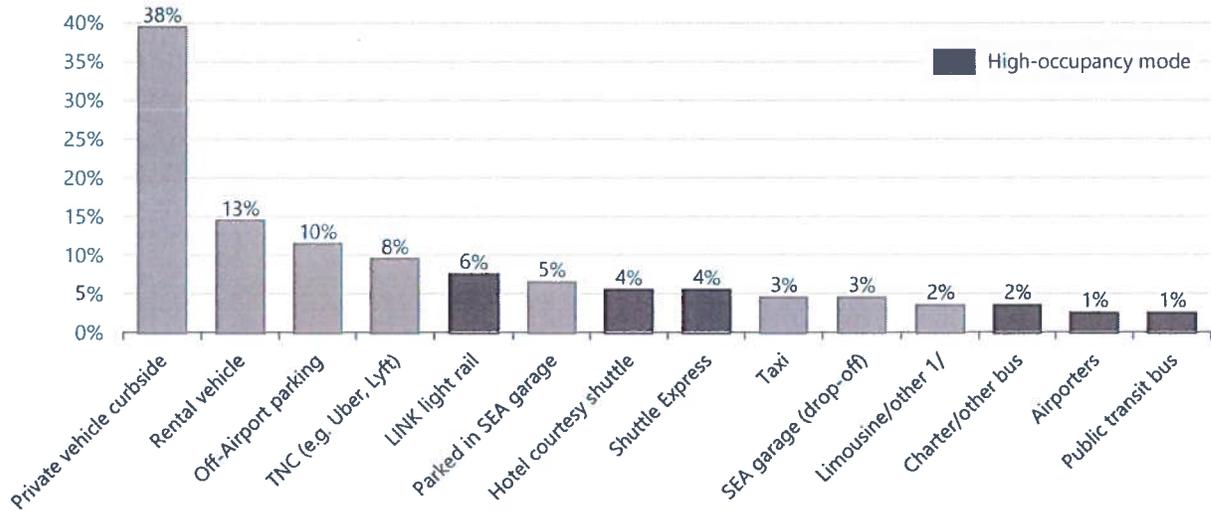
A major contributor to traffic congestion is a heavy reliance on low-occupancy modes of transportation to access the airport. According to the most recent passenger survey (conducted quarterly by Port staff) and as reflected on **Exhibit ES-1**, almost 80% of originating passengers arrive at the Airport via low-occupancy modes, including private vehicles, rental cars, taxis, limousines, and vehicles associated with transportation network companies (TNCs) such as Uber or Lyft. This ongoing reliance on single- or low-occupancy modes of transportation to the Airport perpetuates several burdens, ranging from Airport Expressway congestion to Airport curbside congestion and environmental pollution. Addressing this congestion in a constrained environment by simply building more roadway facilities becomes financially and environmentally unsustainable.

¹ MAP – million annual passengers.

² FAA Terminal Area Forecast (TAF), https://www.faa.gov/data_research/aviation/taf (accessed January 24, 2018).

This is a significant issue that challenges most major metropolitan areas in the United States, even if the airport has been adequately served by higher-occupancy forms of transportation for decades.

Exhibit ES-1: Explaining Passenger Survey Results: Travel Mode (2017)



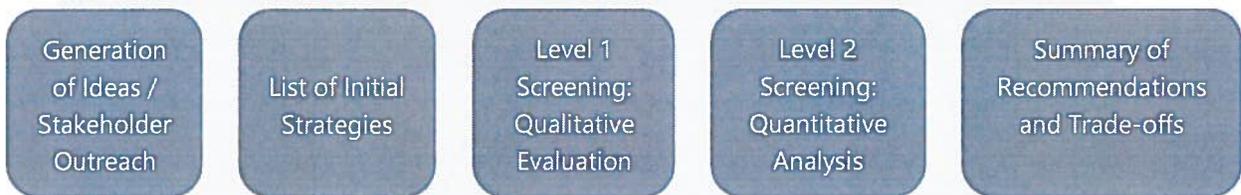
NOTE: 1/ Other includes bicycle.

SOURCES: Business Intelligence, *Explaining Passenger Survey*, January 2018, Ricondo & Associates, Inc., February 2018 (Analysis).

Overview of GTAP Study Methodology

The GTAP Study process included five general components, as illustrated on **Exhibit ES-2** and described in the following paragraphs.

Exhibit ES-2: Overall Strategy Evaluation Process

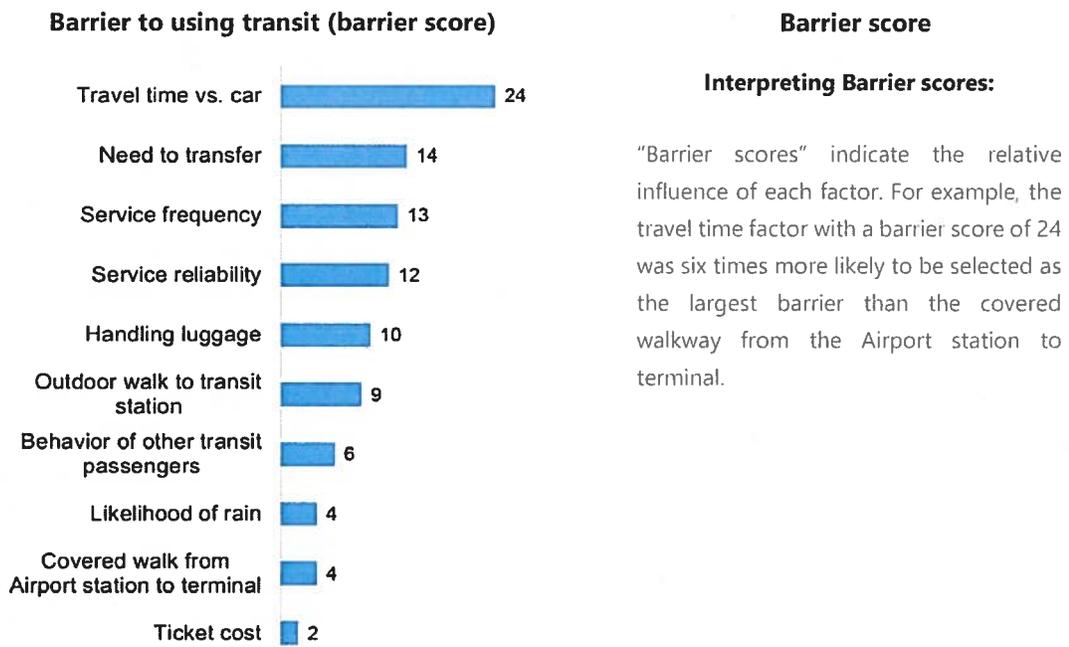


SOURCE: Ricondo & Associates, Inc, March 2018 (Analysis).

The GTAP Study began with a series of meetings with Port staff, stakeholders, and regional transportation agencies to gain a contextual understanding of transportation issues and trends in the Puget Sound region, and how they impact the Airport. This component of the study also included data collection to quantify regional transportation trends, information gathering about ongoing Airport development programs, research of regional transportation programs and initiatives (existing services as well as future planned improvements), and benchmarking airports with comparable activity levels and service offerings to identify trends and best practices as they relate to airport access.

Simultaneous to this information gathering phase, the GTAP Study team was assessing mode choice and mode shift trends as they relate to the Airport and the entire Puget Sound region. While it may be possible to reliably predict if a certain strategy or policy will affect mode choice in a “positive” or “negative” way, it is very challenging to predict or quantify “how positive” or “how negative” the impact of a strategy will be in terms of how many passengers will change behavior. This challenge is increased when considering rapidly emerging trends where there is very little historical data to assess consumer preferences. [For example, Transportation Network Companies (TNCs) like Uber or Lyft emerged only 2-3 years ago and grew from escorting zero passengers to the Airport to almost 1.3 million passengers in 2017 according to the Port of Seattle’s Ground Transportation Monthly Activity Report. Similarly, it is difficult to predict what impact driverless vehicles may have in the coming years.] **Exhibit ES-3** illustrates many of the perceived barriers that passengers face when making decisions about mode choice, particularly as they relate to the option of using transit.

Exhibit ES-3: Results and Interpretation of Barriers to Light Rail Survey

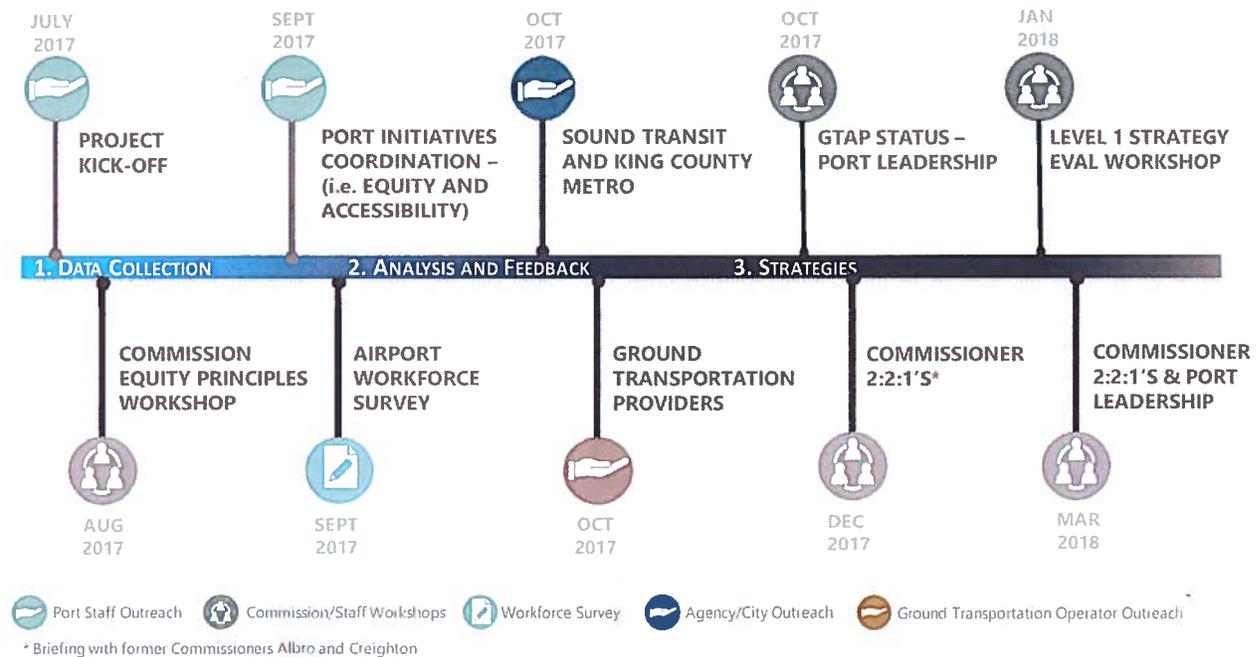


SOURCE: Business Intelligence, *Light Rail Barrier Survey*, Port of Seattle, November 2016.

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As the GTAP Study progressed, the GTAP Study Team and Port leadership conducted a series of meetings and workshops with Airport staff and tenant employees, local and regional transportation agencies, and key airport users/stakeholders (e.g., TNC, taxi and commercial ground transportation operators). The purpose and timeline of these meetings are summarized on **Exhibit ES-4**. Detailed results of the meetings, workshops, and surveys are presented in appendices of this document.

Exhibit ES-4: Flowchart of Stakeholder Outreach Process

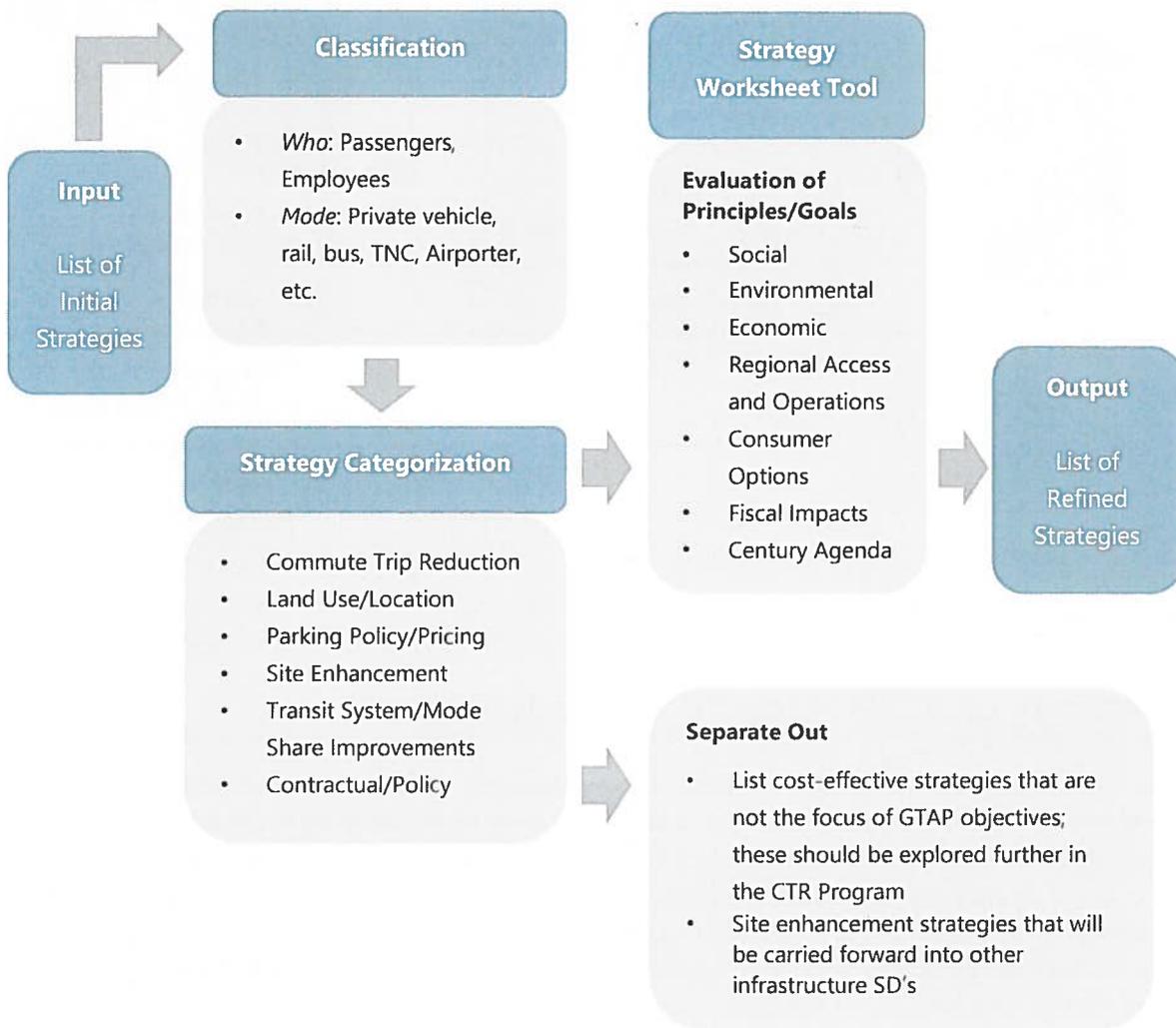
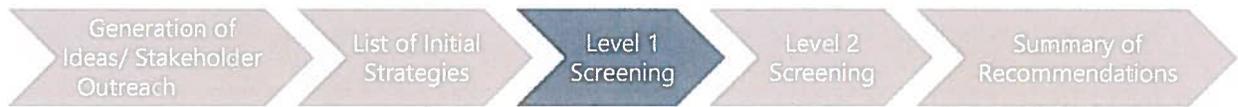


SOURCE: PRR Biz, February 2018 (Analysis); Ricondo & Associates, Inc., March 2018 (Analysis).

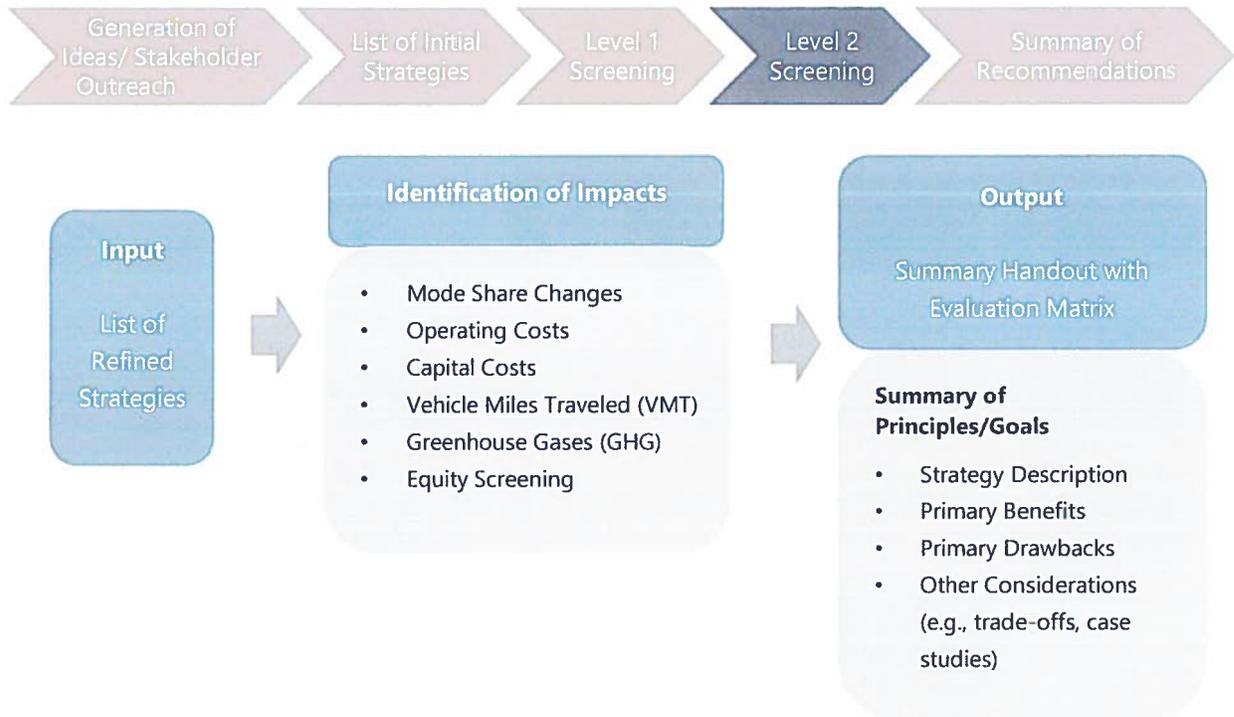
These workshops led to the identification of more than 60 potential strategies to fulfil/foster the user changes required to achieve the stated goals and objectives of the GTAP Study. These potential strategies are detailed in appendices of this report.

The Ricondo Team organized/condensed the strategies by classifying them into one of four target audiences that each would impact, as well as identifying the key mode(s) that would be affected. Further, the Team evaluated the strategies through a two-step screening process, illustrated on **Exhibit ES-5** and **Exhibit ES-6**. In the first level of screening (Exhibit ES-5), each strategy was scored using principles/goals that reflect the purpose of the GTAP Study and the Port Century Agenda goals. In the second level of screening (Exhibit ES-6), the team relied on industry research and professional judgement to quantitatively assess the strategy's potential impact on metrics such as mode shift, vehicle miles traveled, greenhouse gas emissions, capital investment requirements, and operating costs. Equity principles were also assessed, including economic equity, environmental equity, regional access and operational equity, and social equity.

Exhibit ES-5: Level 1 Strategy Screening Process



SOURCES: Ricondo & Associates, Inc., March 2018 (Analysis).

Exhibit ES-6: Level 2 Strategy Screening Process

SOURCES: Ricondo & Associates, Inc., March 2018 (Analysis).

Summary of GTAP Study Recommendations

From this two-level screening/evaluation process, several recommendations and feasible strategies emerged. (Note, some of these strategies combined multiple items identified in the ground access strategies workshops and stakeholder engagement process). The final recommendations and shortlisted strategies are categorized as either being a Business Strategy or a Ground Access Strategy. These are summarized below in **Table ES-1** and **Table ES-2**, and detailed in Section 8 of the study. The detailed qualitative and quantitative evaluation of the shortlisted (top 10) ground access strategies are provided in **Table ES-3**. In summary, should all of the top 10 ground access strategies be implemented, the planning-level estimated aggregate impact is a reduction of up to 10 percent of the Port-controlled greenhouse gas emissions (GHG) (with an estimated annual reduction of up to 100 million vehicle miles traveled (VMT) and 42,000 tons of GHG, and potentially 2 million single-occupancy vehicles off the road annually). It has been noted, however, that several of the strategies require further detailed study prior to implementation, and the estimated cumulative effects will be influenced by the ultimate combination of strategies actually implemented, and the success of those efforts.

Table ES-1: Shortlisted (Top 10) GTAP Study Strategies

STRATEGY	DESCRIPTION	NEXT STEPS	AFFECTED STAKEHOLDER(S)		
			Air Pax	Work-force	GT Oper.
Multiple Variations of Express Bus Service	<ul style="list-style-type: none"> Express service from park and ride lots in primary surrounding city locations; secure parking, 30 minute service (Port, KCM, ST TBD) 	<ul style="list-style-type: none"> Conduct Port sponsored feasibility study and Pilot program (scoping underway) 	✓	✓	
Form a Transportation Management Association	<ul style="list-style-type: none"> Member controlled, organizations that provide transportation services in a particular area. Dedicated staff to manage CTR programs for airport workforce including ride share matching, guaranteed ride home, transit subsidies 	<ul style="list-style-type: none"> Conduct Port sponsored feasibility study Recommend Port to incorporate in Commute Trip Reduction program 		✓	
Information Sharing and Promoting Transit	<ul style="list-style-type: none"> Distribute information about transit routes and integrate promotions/marketing during airline ticket purchase and check-in 	<ul style="list-style-type: none"> Recommend Port to pursue stakeholder partnerships and additional advertising/information sharing opportunities 	✓		
Public Private Partnerships for First/Last Mile Coverage	<ul style="list-style-type: none"> Develop partnerships with ride share companies and regional agencies to provide first and last mile coverage 	<ul style="list-style-type: none"> Conduct Port sponsored feasibility study with TNC companies and regional agencies 	✓	✓	✓
Increase/preserve King County Metro RapidRide and Sound Transit Express Bus Service	<ul style="list-style-type: none"> More frequent service (assuming regional agency sponsorship) Change pick up/drop off location 	<ul style="list-style-type: none"> Coordination with regional agencies (additional study and/or travel demand modeling may be necessary) 	✓	✓	✓
Ticket for Free Transit Ride/Ride Free Area	<ul style="list-style-type: none"> Passengers and employees ride free on trips from the Airport 	<ul style="list-style-type: none"> Coordination with regional agencies (additional study and/or travel demand modeling may be necessary) 	✓	✓	
Incentives for Ride Share and Transit Use	<ul style="list-style-type: none"> Provide discounts at airport concessionaires or access to airline club lounges for travelers with transit pass, transit receipt, or verification of participation in Ride Share program Implement a parking "cash out" program managed by Airport TMA 	<ul style="list-style-type: none"> Recommend Port to incorporate in CTR program 	✓	✓	
Revenue structures anticipating Autonomous Vehicles	<ul style="list-style-type: none"> Develop a financial model to estimate impacts of AV adoption Develop recommendations for Port policies and programs around AVs 	<ul style="list-style-type: none"> Further revenue/financial analysis 			✓
Airport Access Fees	<ul style="list-style-type: none"> Consider establishing fee structure for vehicles accessing terminal curbs, consider legislative implications Install gantries for electronic fee collection 	<ul style="list-style-type: none"> Further revenue/financial analysis 	✓		
Restructure Employee Parking	<ul style="list-style-type: none"> Restructure complimentary garage parking to incentivize Ride Share and transit Implement a parking "cash out" program managed by Airport TMA Subsidize ORCA passes (state CTR program influences benefit) 	<ul style="list-style-type: none"> Further revenue/financial analysis (paired with TMA and garage analyses findings) 		✓	

NOTE Strategies are not in order of priority

SOURCE Ricondo & Associates Inc. June 2018 (Analysis)

Table ES-2: Recommended Business Strategies Summary

CATEGORY	DESCRIPTION
Business Model	<ul style="list-style-type: none"> Continue with hybrid model approach, with agreements awarded to qualified concessionaire(s)
Fiscal/Revenue	<p>Develop a financial model to asses:</p> <ul style="list-style-type: none"> What sort of structures might adapt well to future C/AVs How changes to commercial GT rates may affect long-term SEA financial needs How changes will affect cost per enplaned passenger The extent to which a revised fee structure will affect the entire range of businesses: taxis, limos, TNCs, courtesy shuttles, rental cars, and airporters How changes to the rate structure will affect the Airport capital program and the ability to fund long-term needs, including SAMP Assess annual permit process for GT operators in lieu of per trip fees Consider impact of a market-based competitively bid rate Airport access fees Potential for offering first/last mile coverage incentives Employee parking – impact of potential restructuring
Technology	<ul style="list-style-type: none"> Consider future installation of communication infrastructure to support C/AVs and airport access mechanisms, including collecting data that supports incentivizing higher occupancies
Labor Harmony	<ul style="list-style-type: none"> Labor Relations and Office of Social Responsibility continue to develop Port-wide Labor Harmony Policy and community engagement plan
Number of Vehicles	<ul style="list-style-type: none"> Establish fleet to balance supply against demand, while minimizing wait time, and optimizing driver income
Environmental/Sustainability	<ul style="list-style-type: none"> Continue Re-match program for TNCs
Facilities and Operations	<ul style="list-style-type: none"> Use Bandwagon or comparable API to discount passenger fare while increasing driver receipts
Management	<ul style="list-style-type: none"> Conduct feasibility study for forming a Transportation Management Association

SOURCE: Ricondo & Associates, Inc., June 2018 (Analysis).

Table ES-3: Summary of Qualitative and Quantitative Analysis of Shortlisted (Top 10) Strategies

STRATEGY	QUALITATIVE IMPACTS: EQUITY TRADE-OFFS				STRATEGY	QUANTITATIVE IMPACTS			
	ECONOMIC	ENVIRONMENT	REGIONAL ACCESS & OPERATIONS	SOCIAL		ESTIMATED CAPITAL COST	ESTIMATED OPERATING COST	ESTIMATED GREENHOUSE GASES (GHG) REDUCED	ANTICIPATED REVENUE IMPACTS
Multiple Variations of Express Bus Service	✓	✓	✓	○	Multiple Variations of Express Bus Service	○	X	X	○
Form a Transportation Management Association (TMA)	○	○	✓	○	Form a Transportation Management Association (TMA)	✓	✓	X	○
Information Sharing and Promoting Transit	✓	✓	✓	N/A	Information Sharing and Promoting Transit	✓	✓	X	X
Public-Private Partnerships for First/Last Mile Coverage	✓	✓	✓	○	Public-Private Partnerships for First/Last Mile Coverage	✓	✓	X	X
Increase/preserve King County Metro RapidRide and Sound Transit Express Bus Service	✓	✓	✓	○	Increase/preserve King County Metro RapidRide and Sound Transit Express Bus Service	○	○	X	○
Ticket for Free Transit Ride/Ride-Free Area	✓	✓	✓	○	Ticket for Free Transit Ride/Ride-Free Area	✓	✓	○	X
Incentives for Ride Share and Transit Use	✓	N/A	N/A	N/A	Incentives for Ride Share and Transit Use	✓	✓	○	X
Revenue structures anticipating Autonomous Vehicles (AVs)	○	○	○	○	Revenue structures anticipating Autonomous Vehicles (AVs)	✓	✓	○	✓
Airport Access Fees	X	✓	✓	○	Airport Access Fees	✓	✓	✓	✓
Restructure Employee Parking	N/A	○	○	X	Restructure Employee Parking	✓	✓	X	✓

LEGEND

SCORE	CAPITAL/OPERATING COST	GHG REDUCTION (TONNES/YR)	REVENUE IMPACT (MILLION \$ ANNUALLY)
✓	\$0 to \$2m	≥ 10,000	Source (+)
○	\$2 to \$10m	5,000 < 10,000	<\$1m Loss (-)
X	>\$10	<5,000	>\$1m Loss (-)

SOURCE: Ricardo & Associates, Inc., June 2018 (Analysis)

1. Introduction

1.1 Study Objectives

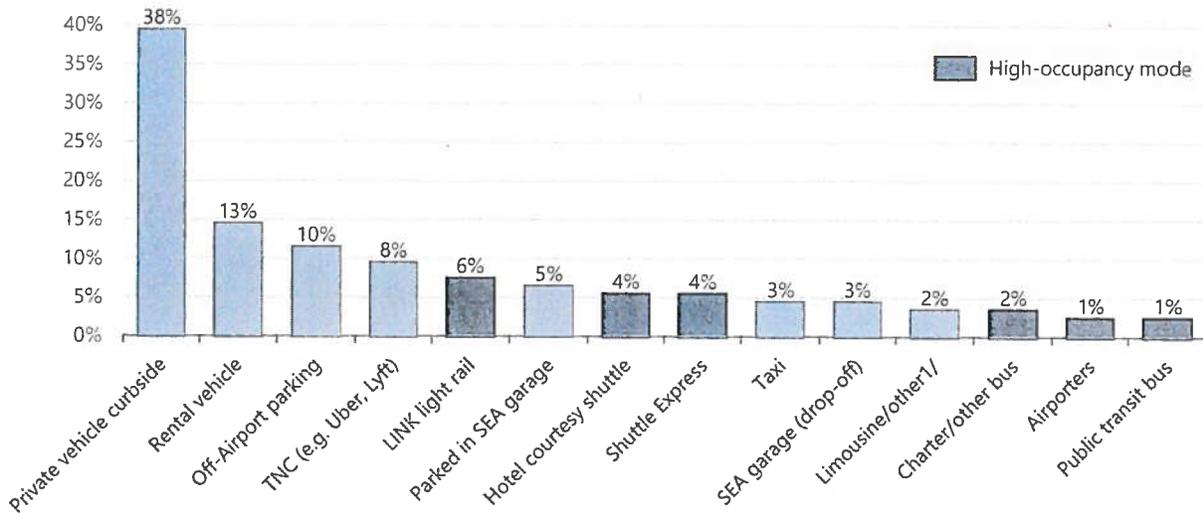
Seattle-Tacoma International Airport (SEA or the Airport) is one of the busiest airports in the United States; it served 46.9 million passengers in 2017. The Airport has a major economic impact on King County and the Puget Sound region, in which it supported \$22.5 billion in total economic activity in 2017.³ The Sustainable Airport Master Plan (SAMP) forecasts continued high passenger growth for the Airport. As a result, the Port of Seattle (the Port) is seeking ways to reduce traffic congestion and air pollution at SEA, which has resulted in the development of this Ground Transportation Access Plan (GTAP) Study.

The GTAP Study identifies several objectives, which include advancing transportation modes and programs that foster equity from the consumer options perspective, as well as supporting quality “living wage” jobs. Other key objectives include promoting Airport access via environmentally preferred modes and increasing the carrying capacity on the ground access system. The strategy development process included a consideration of changing technologies and trends in the transportation industry, as well as coordination efforts and partnerships with regional transit providers and nearby communities. The GTAP Study will inform the Airport’s ground transportation business model, with an emphasis on contractual relationships, support of the Airport workforce, and a focus on current and future ground access trends. These objectives guided the study and will help the Port advance toward its “Century Agenda” goals.

As shown on **Exhibit 1-1**, and based on the most recent quarterly Enplaning Passenger Survey (EPS), approximately 80 percent of all originating passengers arrive to the Airport via single-occupancy or low-occupancy mode (e.g. private vehicle, rental car, taxi, limousine). Shifting passengers from single-occupancy modes to higher occupancy modes, such as public transit and Airporters, should relieve some of the traffic congestion and delays that passengers experience accessing the Airport. **Exhibit 1-2** shows the travel mode trends, which are based on results from three previous EPSs compared with the current year. **Table 1-1** provides mode share category definitions for SEA and illustrates the change in data definition within the EPSs. Noticeable trends are the introduction and growth of transportation network companies (TNCs) and the decline of taxi share at the Airport.

³ Community Attributes, Inc., *Sea-Tac International Airport Economic Impacts*, January 2018.

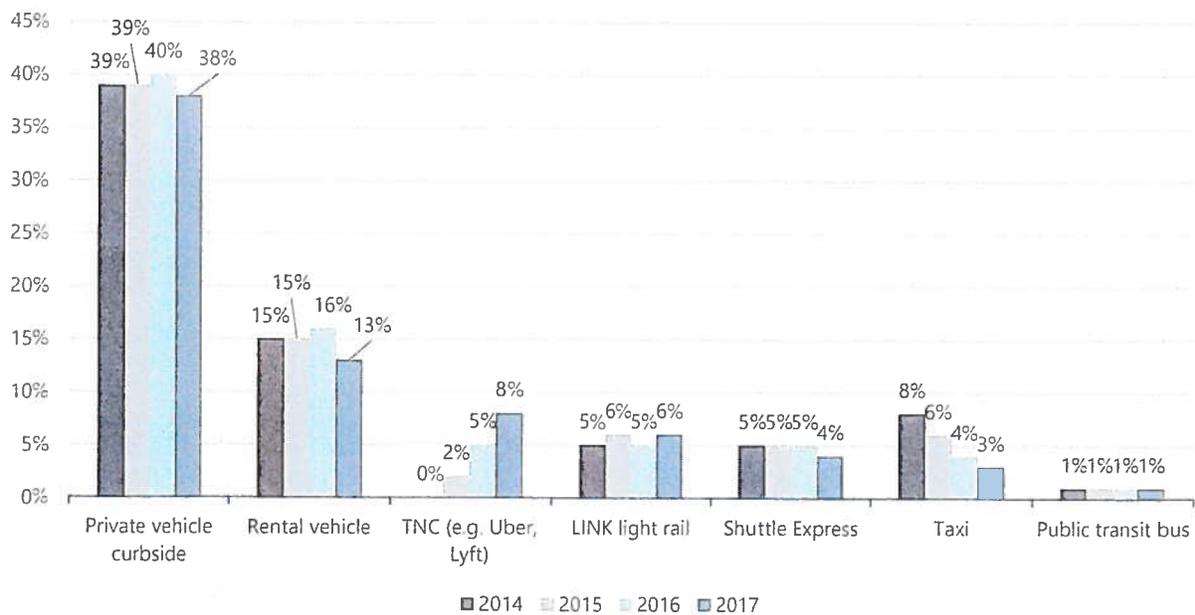
Exhibit 1-1: Enplaning Passenger Survey Results: Travel Mode (2017)



NOTE: 1/ Other includes bicycle.

SOURCES: Business Intelligence, *Enplaning Passenger Survey*, January 2018; Ricondo & Associates, Inc., February 2018 (Analysis).

Exhibit 1-2: Enplaning Passenger Survey Results: Travel Mode Trends (2014 to 2017)



NOTE: Selected travel modes are only shown for data collected in the same category definition. Categories have changed across analysis years; 100 percent of modes are therefore not reflected. See Table 1-1.

SOURCES: Business Intelligence, *Enplaning Passenger Survey*, January 2018; Ricondo & Associates, Inc., February 2018 (Analysis).

