BFI

MASTER PLAN UPDATE

King County International Airport/ Boeing Field

Mead & Hunt

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Acronyms

AAC	Aircraft Approach Category
AAF	Army Air Field
AASF	Army Aviation Support Facility
AAQS	Ambient Air Quality Standards
AC	Advisory Circular
ACAIS	Air Carrier Activity Information System
ACRP	Airport Cooperative Research Program
ADG	Airplane Design Group
ADO	Airports District Office
AEDT	Aviation Environmental Design Tool
AG	Agricultural District
AGL	Above Ground Level
AGIS	Advanced Ground Informational Systems
AIP	Airport Improvement Program
AIRS	Aerometric Information Retrieval System
ALP	Airport Layout Plan
ALS	Approach Lighting System
ALSF	Approach Lighting System with Sequenced Flashers
AMSL	Above Mean Sea Level
AOA	Airport Operations Area
AOC	Airport Operating Certificate
AOE	Airport of Entry
AOPA	Aircraft Owners and Pilots Association
APM	Airport Planning Manual
APP-400	National Airport Planning and Environmental Division
APV	Approach Procedure with Vertical Guidance
AQP	Aquifer Protection Area
ARC	Airport Reference Code
ARFF	Aircraft Rescue and Firefighting Facility
ARP	FAA Office of Airports
ARTCC	Air Route Traffic Control Center
ASDA	Accelerate Stop Distance Available
ASDI	Aircraft Situation Display to Industry
ASLF-1	Approach Light System with Sequenced Flashing lights
ASO	Aviation Service Operator
ASOS	Automated Surface Observing System
ASV	Annual Service Volume

ATC	Air Traffic Control
ATCT	Airport Traffic Control Tower
ATIS	Automated Terminal Information System
AVGAS	Aviation Gasoline
AWACS	Airborne Warning and Control System
AWG	Airport Work Group
BAR	Boeing Access Road
BCA	Benefit Cost Analysis
BCT	Brigade Combat Team
BFI	King County International Airport/Boeing Field
BLF	Boarding Load Factor
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe
BTS	Bureau of Transportation Statistics
CAGR	Compound Annual Growth Rate
CAP	Civil Air Patrol
CatEx	Categorical Exclusion
CBD	Central Business District
CDP	Conceptual Development Plan
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
CG	General Commercial District
CH	Commercial High Intensity District
CH_4	Methane
CIP	Capital Improvement Program
CL	Centerline Lights
CMG	Cockpit to Main Gear
CO/CO_2	Carbon Monoxide/Dioxide
COL	Non-Recyclable Construction, Demolition, and Land Clearing Waste
CS	Commercial Shopping Center District
CSSN	Capacity/Safety/Security/Noise
CTAF	Common Traffic Advisory Frequency
CZMA	Coastal Zone Management Act
dB	Decibel
DER	Decision End of Runway
DME	Distance Measuring Equipment
DNL	Day-Night Noise Level
DNS	Determination of Non-Significance
DOD	Department of Defense
DOT	Department of Transportation

EA	Environmental Assessment
EDDA	Environmental Due Diligence Audit
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMB	Embraer Regional Jet
(US)EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FAS	Final Approach Segment
FATO	Final Approach and Takeoff Area
FBO	Fixed Base Operator
FCT	FAA Contract Tower
FEMA	Federal Emergency Management Agency
FIS	Federal Inspection Services
FMD	Facilities Management Division
FPPA	Farmland Protection Policy Act
FSS	Flight Service Station
GA	General Aviation
GAMA	General Aviation Manufacturers Association
GAO	U.S. General Accounting Office
GDP	Gross Domestic Product
GEG	Spokane International Airport
GMA	Growth Management Act
GPS	Global Positioning System
GQS	Glidepath Qualification Surface
GS	Glide Slope
HCM	Highway Capacity Manual
HFCs	Hydrofluorocarbons
HIRL	High Intensity Runway Lights
I-5	Interstate Highway 5
IAP	Instrument Approach Procedure
ICAO	International Civil Aviation Organization
ICE	Immigration and Customs Enforcement
IFR	Instrument Flight Rules
IH	Industrial Heavy District
IL	Industrial Light District
ILS	Instrument Landing System
IM	Industrial Moderate District
IMC	Instrument Meteorological Conditions

INM	Integrated Noise Model
INS	Immigrations and Naturalization Service
ISGP	Industrial Stormwater General Permit
JPATS	Justice Prisoner & Alien Transportation System
KCIA	King County International Airport
LATS	Long-Term Air Transportation Study
LDA	Landing Distance Available
LIRL	Low Intensity Runway Lights
LITL	Low Intensity Taxiway Lights
LOC	Localizer
LOI	Letter of Intent
LOS	Level of Service or Line of Sight
LPV	Localizer Performance with Vertical Guidance
LWCF	Land and Water Conservation Fund Act
MALS	Medium Intensity Approach Lighting System
MALSF	Medium Intensity Approach Lighting System with Sequenced Flashers
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MAS	Missed Approach Segment
MGW	Main Gear Width
MHHW	Mean Higher High Water
MIC	Manufacturing Industrial Center
MIRL	Medium Intensity Runway Lights
MITL	Medium Intensity Taxiway Lights
MNMT	Mean Normal Maximum daily Temperature
MOA	Military Operations Area
MOF	Museum of Flight
MOS	Modification of Standard(s)
MP	Master Plan
MSA	Metropolitan Statistical Area
MTOW	Maximum Takeoff Weight
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NACD	Native American Consultation Database
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NBAA	National Business Aviation Association
NCDC	National Climatic Data Center
NCP	Noise Compatibility Program
NDB	Non-Directional Beacon

NDPES	National Pollutant Discharge Elimination System
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPE	Non-Primary Airports Entitlement
NPIAS	National Plan of Integrated Airport Systems
NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	Ozone
O&D	Origin and Destination
OCS	Obstacle Clearance Surface
ODALS	Omnidirectional Approach Lighting System
OE/AAA	Obstruction Evaluation/Airport Airspace Analysis
OFA	Object Free Area
OL	Office Low Intensity Districts
OPBA	Operation per Based Aircraft
PAE	Snohomish County Airport/Paine Field
PAPI	Precision Approach Path Indicator
Pb	Lead
PCA	Permit Compliance System
PFC	Passenger Facility Charge
PFCs	Perfluorocarbons
PHS	Priority Habitats and Species
PLU	Pierce County Airport/Thun Field
PM_x	Particulate Matter
POFZ	Precision Obstacle Free Zone
PPRP	Prior Permission Required Pavement
PSRC	Puget Sound Regional Council
PVC	Poor Visibility and Ceiling
PWT	Bremerton National Airport
RCL	Runway Centerline Lighting
RDC	Runway Design Code
REIL	Runway End Identifier Lights
RM	Residential Multifamily District

RMH	Residential Manufactured Home District
RNAV	Area Navigation
RNP	Required Navigation Procedure
RNT	Renton Municipal Airport
RO	ARP Regional Office
ROFA	Runway Object Free Area
ROW	Right of Way
RPZ	Runway Protection Zone
RS	Residential Single-Family District
RSA	Runway Safety Area
RTR	Remote Transmitter/Receiver
RTM	Revenue Ton Mile
RVR	Runway Visual Range
S36	Crest Airpark (Kent)
S43	Harvey Field
S50	Auburn Municipal Airport
SEA	Seattle-Tacoma International Airport
SEL	Sound Exposure Level
SEPA	State Environmental Policy Act
SF_6	Sulfur Hexafluoride
SHPO	State Historic Preservation Office
SID	Standard Instrument Departures
SIP	State Implementation Plan
SKOL	Southern Kansas Oklahoma Line Railroad
SM	Statute Miles
SO/SO_2	Sulfur Oxide/Dioxide
SPCC	Spill Prevention, Control, and Countermeasures
SPPP	Stormwater Pollution Prevention Plan
SRE	Snow Removal Equipment
SSALR	Short Simplified Approach Lighting System with Runway Alignment Indicator Lights
SSALS	Simplified Short Approach Lighting System
STAR	Standard Terminal Arrival Routes
TACAN	Tactical Air Navigation
TAF	Terminal Area Forecasts
TCH	Threshold Crossing Height
TDG	Taxiway Design Group
TDZ	Touchdown Zone
TDZL	Touchdown Zone Lights
TERPS	United States Standard for Terminal Instrument Approach Procedures
TFSSP	Twelve-Five Standard Security Program

THPO	Tribal Historic Preservation Office
TIA	Turn Initiation Area
TIW	Tacoma Narrows Airport
TLOF	Touchdown and Liftoff Area
TODA	Takeoff Distance Available
TOFA	Taxiway Object Free Area
TORA	Takeoff Run Available
TRACON	Terminal Radar Approach Control
TSA	Transportation Security Administration
TSA	Taxiway Safety Area
TSS	Threshold Siting Surface
UNICOM	Universal Communications
UP	Union Pacific
UPS	United Parcel Service
URARPAPA	Uniform Relocation Assistance and Real Property Acquisition Policies Act
USACE	U.S. Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VCOA	Visual Climb Over the Airport
VFR	Visual Flight Rules
VGS	Vertical Guidance System
VHF	Very High Frequency
VLJ	Very Light Jet
VMC	Visual Meteorological Conditions
VOC	Volatile Organic Compounds
VOR	Very High Frequency Omnidirectional Range
VOR/DME	Very High Frequency Omnidirectional Range with Distance Measuring Equipment
VORTAC	Very High Frequency Omnidirectional Range/Tactical Air Navigation
WAAS	Wide Area Augmentation System
WANG	Washington National Guard
WDFW	Washington State Department of Fish and Wildlife
WHPA	Wellhead Protection Area
WHR	Washington Heritage Register
WSDOE	Washington State Department of Ecology

Glossary

Above Mean Sea Level. The elevation of an object above the average sea level.

Air Carrier. A commercial airline with published schedules operating at least five round trips per week.

Aircraft Operation. An aircraft arrival (landing) or an aircraft departure (takeoff) represents one aircraft operation.

Aircraft Rescue and Firefighting Facility. A facility housing specifically trained personnel and equipment in response, firefighting, hazard mitigation, evacuation, and rescue of passengers and crew of an aircraft involved in a ground emergency.

Airport Layout Plan. The official, FAA approved drawing of an airport's existing and proposed facilities.

Airport Reference Code. An FAA design criteria based upon the approach speed (represented by a capital letter) and wingspan (represented by a roman numeral) of an aircraft that produces a minimum annual itinerant operations per year at an airport.

Airport Traffic Control Tower. A central operations tower in the terminal air traffic control system with an associated IFR room if radar equipped, using air to ground communications and/or radar, visual signaling, and other devices to provide the safe and expeditious movement of air traffic.

Air Route Traffic Control Center. A facility providing air traffic control to aircraft on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

Air Traffic Control. The control of aircraft traffic in the vicinity of airports from control towers, and in the airways between airports from control centers.

Annual Service Volume. A reasonable estimated of an airport's annual capacity (i.e., the level of annual aircraft operations that will result in an average annual aircraft delay of approximately one to four minutes).

Anthropogenic. Of human cause or origin.

Approach Lighting System. Radiating light beams guiding pilots to the extended runway centerline on final approach and landing.

Area Navigation. A method of navigation that permits aircraft operation on any desired course within the coverage of station-referenced navigation signals or within the limits of a self-contained system capability, or a combination of these.

Boarding Load Factor. The ratio of aircraft seats available for passenger boarding compared to the number of passengers actually boarding.

Common Traffic Advisory Frequency. The name given to a VHF radio frequency used at U.S., Canadian, and Australian airports that do not have an active or on-site control tower.

Compound Annual Growth Rate. A calculation frequently used in business forecasting that provides a constant rate of return over a specified time period, and is it is often useful to compare data from similar data sets such as year-on-year growth in sectors of the aviation industry.

Criteria Pollutants. The six most common air pollutants as identified by the United States Environmental Protection Agency through the National Ambient Air Quality Standards (NAAQS). They are ozone (O_3), carbon monoxide (CO), sulfur oxide (SO), nitrogen dioxide (NO_2), particulate matter (coarse particles PM_{10} and fine particles $PM_{2.5}$), and lead (Pb).

Day-Night Noise Level. The daily average noise metric in which noise occurring between 10:00 p.m. and 7:00 a.m. is penalized by 10 db. DNL is often expressed as annual average noise levels.

Decibel. A measurement used to quantify sound levels referencing a scale from the threshold of human hearing, 0 dB, upward toward the threshold of pain, about 120-140 dB.

Distance Measuring Equipment. Equipment used to measure, in nautical miles, the distance of an aircraft from the broadcasting facility.

Facilities Management Division. The governing body for King County that oversees and maintains the County's real estate assets. BFI is included among these assets.

Federal Aviation Regulations. The rules and regulations that govern the operation of aircraft, airways, airmen, and airports.

Fixed Based Operator. A facility on an airport providing various services for aircraft such as maintenance, fuel, storage, etc.

Fleet Mix. The mix or differing aircraft types operated at a particular airport or by an airline.

Flight Plan. Specific information related to the intended flight of an aircraft, filed with a Flight Service Station or Air Traffic Control facility.

General Aviation. Civil aviation excluding air carriers, commercial operations, and military aircraft.

Glide Slope. An angle of approach to a runway established by means of airborne instruments during instrument approaches, or visual ground aids for the visual portion of an instrument approach and landing.

Global Positioning System. A satellite-based radio positioning, navigation, and time-transfer system.

High Intensity Runway Lights. High intensity light fixtures delineating the limits of a runway served by a precision instrument approach procedure.

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

Instrument Flight Procedure. Procedures developed by the FAA to guide aircraft to airports including distance, topography, elevation, coordinates, angle of approach, and missed approach procedures.

Instrument Flight Rules. Rules specified by the FAA for the flight under weather conditions in which visual reference cannot be made to the ground and the pilot must rely on instruments to fly and navigate.

Instrument Landing System. A precision instrument approach system that normally consists of a localizer antenna, glide slope antenna, outer marker, middle marker, and ad approach lighting system.

Instrument Meteorological Conditions. Weather conditions that require that pilots rely primarily on instrumentation for navigation under IFR, rather than by visual reference and VFR.

Itinerant Operation. An aircraft landing or takeoff that originates at one airport and terminates at another (place-to-place).

Knots. A measure of speed used in navigation. One knot is equal to one nautical mile per hour (1.15 knots – 1 mile per hour).

Landing Minimums. Prescribed altitudes and visibility distances that the pilot uses to make a decision as to whether or not it is safe to land on a particular runway.

Local Operation. An aircraft landing or takeoff that remains in the local traffic pattern (i.e. training or touch-and-go operation).

Level of Service. A measure that determines the quality of service provided by transportation devices, or transportation infrastructure, and is generally linked to time and speed of the vehicles.

Low Intensity Runway Lights. Low intensity light fixtures delineating the limits of a runway having no instrument approach procedures.

Load Factor. The percentage of seats occupied on an aircraft by passengers.

Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights. A medium intensity approach lighting system providing a visual lighting path for landing pilots, consisting of nine light bars with five steady burning white fixtures, five sequential flashing white fixtures, and a threshold bar of 18 steady burning green fixtures.

Medium Intensity Runway Lights. Medium intensity light fixtures delineating the limits of a runway supplied with a non-precision instrument approach procedure.

Metropolitan Statistical Area. A geographical region with a central core typically associated with significant population density and economic connectivity between local municipalities. The most common use of the term relates to a city and its suburbs as one unified MSA.

Middle Marker. A beacon that defines a point along the glide slope of an Instrument Landing System, normally located at or near the point of decision height.

Missed Approach. An instrument approach not completed by a landing. This may be due to visual contact not established at authorized minimums or instructions from air traffic control, or other reasons.

National Ambient Air Quality Standards. Standards established by the United States Environmental Protection Agency for six outdoor air pollutants considered harmful to the public health and the environment.

National Airspace System. The common network of U.S. airspace, air navigation facilities, equipment and services, airports or landing areas, aeronautical charts, information and services, rules, regulations and procedures, technical information, manpower, and material.

National Plan of Integrated Airport Systems. Established by the Airport and Airway Improvement Act of 1982, it is the identification of national airport system needs including short- and long-term development costs.

Nautical Mile. A measure of distance used in air and sea navigation. One nautical mile is equal to the length of one minute of latitude along the Earth's equator, officially set as 6,076.115 feet.

Navaid. Any facility providing assistance or aid to pilots for navigating through the air.

Noise Contour. The "map" of noise exposure around an airport, computed by the Integrated Noise Model. The FAA defines significant noise exposure as any area within the 65 DNL contour, which is the area within an annual average noise exposure of 65 decibels or higher.

Non-Directional Beacon. A navaid providing signals that can be read by pilots of aircraft equipped with direction finding equipment, used to determine bearing and can "home" in or track to or from the desired point.

Non-Precision Approach. A standard instrument approach procedure in which no vertical guidance is provided.

Omnidirectional Approach Lighting System. An approach lighting system consisting of five sequential flashing omnidirectional lights extended along the runway centerline and two located on either side of the runway threshold.

Outer Marker. A navigational facility within the terminal area navigational system located four to seven miles from the runway threshold on the extended centerline indicating the beginning of the final approach.

Passur. An aeronautics data collection database and predictive analysis firm.

Precision Approach Path Indicator. A visual navigational aid providing guidance information to help pilots acquire and maintain the correct approach (in the vertical plane) to a runway.

Puget Sound Regional Council. The metropolitan planning organization (MPO) that manages the transportation planning, economic development, and growth management of the Puget Sound Region, which include in the PSRC are King, Kitsap, Pierce, and Snohomish Counties.

Runway. A strip of pavement, land, or water used by aircraft for takeoff or landing.

Runway Object Free Area. A defined two-dimensional surface centered on a runway providing enhanced safety for aircraft operations by having the area free of objects protruding above the runway safety area edge elevation, except for objects that need to be located within the area for air navigation or aircraft ground maneuvering purposes.

Runway Safety Area. A defined surface surrounding a runway prepared or suitable for reducing the risk or damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway.

Runway Visual Range. Facilities providing a measurement of horizontal visibility located adjacent to instrument runways.

Section 4(f). A subsection of the Department of Transportation Act of 1966 that provides consideration for park and recreation lands, wildlife and waterfowl refuges, and historic sites during transportation project development.

Section 6(f). Similar to Section 4(f) that instead prevents the conversion of lands purchased or developed with Land and Water Conservation Fund Act funds to non-recreation uses unless otherwise approved through the National Park Service.

Single Event. Noise generated by a single aircraft overflight.

Tactical Air Navigation. An enroute navaid combining azimuth and distance measuring equipment into one unit and operated in the ultra-high frequency band.

Taxiway. A designated area that connects runways with aprons, providing the ability to move aircraft on the ground so they will not interfere with takeoffs or landings.

Terminal Airspace. The airspace controlled by a terminal radar approach control facility.

Terminal Area. A general term used to describe airspace in which approach control service or airport traffic control service is provided.

Terminal Radar Approach Control. An FAA air traffic control service to aircraft arriving, departing, or transiting airspace controlled the facility.

"Through the Fence" Agreement. An agreement that allows full airport access to users with land outside of an airport's official property line.

Transient Aircraft. An aircraft that is not based at the airport in which it is currently located.

Very High Frequency Omnidirectional Range. A ground based electronic navigation aid transmitting navigation signals for 360° oriented from magnetic north.

Very High Frequency Omnidirectional Range/Tactical Air Navigation. A ground based electronic navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment at a single site.

Visual Approach. An aircraft approach conducted under IFR, which authorizes the pilot to proceed visually and clear of clouds to the airport. The pilot must, at all times, have either the airport or the preceding aircraft in sight.

Visual Flight Rules. Rules that govern the procedures for conducting flight under visual meteorological conditions.

Visual Meteorological Conditions. Weather conditions under which pilots have the ability to visually see and avoid stationary objects and other aircraft and fly without the use of instrumentation, under VFR.

ES Executive Summary & Planning Addendum

Based upon comments received during the review of the MP Update Revised Draft Final Report, King County has decided to defer adoption of the King County International Airport/Boeing Field Master Plan Update. King County also decided that changes to the Airport Layout Plan (ALP) would be made, resulting in the need to resubmit to the FAA for approval. Additionally, a commitment was made to revisit the Airport's planning issues through the initiation of a new Airport Master Plan in the near future. This Executive Summary and Planning Addendum encapsulates these decisions and reflects the revisions on the ALP Drawing Set illustrations located at the end of this summary document (see Figures ES1 – ES22).

INTRODUCTION. Following approval for construction in 1928 as the region's first municipal airport, King County International Airport/Boeing Field (BFI or Airport) has grown to be one of the busiest primary non-hub airports in the nation and the primary general aviation reliever airport to Seattle-Tacoma International Airport (SEA). BFI also ranks among the most successful public investments in state history and is a major contributor to the region's economic stability and sustainability. According to the recently completed *High-Level Economic Impact of King County International Airport* study, BFI's economic impact for 2019 was $2.97 billion in terms of local business sales that support 18,412 jobs and generates $1.2 billion in labor income to King County. The Airport's 150 tenant businesses, which include the Boeing Company's various civilian and military aircraft Flight Test and Delivery Center operations, directly support 6,705 jobs in the local economy.

BFI serves a wide variety of aviation users that include small commercial passenger airlines, large and small air cargo carriers, commercial general aviation Fixed Base Operators (FBOs), corporate general aviation flight departments, private aircraft owners, helicopters, and military aircraft. In 2015, BFI recorded 20,214 enplanements, 165,571 aircraft takeoffs/landings, and 390 based aircraft. For 2019 enplanements increased to 30,568, with total operations increasing to 186,228. Also, in 2015 BFI ranked as the 27th busiest cargo airport in the country, recording a cargo landed weight of 416,737 tons. This compares to a slight decline of the recorded landed weight of 377,034 tons for 2019, which ranks 38th in the country.

The previous Airport Master Plan was completed/adopted in 2004, and significant changes in the local, regional, and national aviation industry have occurred since that time. This Master Plan Update (MP Update) will assist in documenting the current state of the aviation industry at BFI, and ultimately supports the modernization and improvement of existing Airport facilities. In addition, the findings of the MP Update can serve as the strategic guide for overall economic development opportunities and sustainability

recommendations over a 20-year planning horizon, as well as enhance the Airport as a major regional economic and employment center.

Public Outreach/Communication Plan

The MP Update includes a Public Involvement Plan that defines the proposed communication and community engagement process for the project including overall goals, key community audiences, information needs and messages, and proposed community engagement activities.

Communication and Outreach Goals. Throughout the MP Update process, King County and the project team strived to:

- Consult with BFI partners, stakeholders, and the broader community about the master planning process. This helps establish the purpose of the work, as well as the schedule and process by which the plan will be developed.
- Ensure that the public knows how they can be involved and understand how their input will be considered.
- Collaborate with Airport partners and a stakeholder working group to identify feedback for consideration in the master planning process.
- Solicit substantive and meaningful public input at appropriate milestones and incorporate these ideas into the plan to the greatest extent possible.
- Conduct a public outreach process that is transparent, accessible, and reflective of the County's commitment to equity and social justice.

Development Considerations and Assumptions

The Development Plan alternatives for BFI were evaluated in combination with the facility requirements of the airport users, as well as the strategic vision established by King County. Therefore, several basic assumptions have been identified with the intent to direct the future development and maintenance of the Airport. These assumptions, which have been formulated from input provided by stakeholders, Airport Staff, and the FAA, are supported by the aviation activity forecasts and include a commitment for continued airport development that supports the economic and sustainable planning objectives of the region.

The aircraft types projected to be used at BFI during the next 20 years are for the most part the same types that presently use the Airport. They include the narrow-body commercial service aircraft associated with Boeing's 737 Delivery Center, both widebody (e.g., the B-767, MD-11, & A-300) and narrow body aircraft (e.g., B-737, B-757) that are operated by the air cargo providers, and the various military aircraft (e.g., the Boeing P-8 Poseidon, Boeing E-3 Sentry - AWACS, and the new Boeing KC-46 Pegasus) associated with Boeing's existing Military Flight Center and Test Facility. In addition, BFI is home to numerous corporate general aviation flight departments that operate all sizes of business-use aircraft (including the very large business jets such as the Gulfstream V and the Canadair Global Express).

From an aircraft operational standpoint, the number of annual aircraft operations (landings and takeoffs) at BFI is forecasted to increase from approximately 165,571 in 2015 (the base year for the forecasting effort) to

170,956 by the end of the 20-year planning period encompassed in this Master Plan. Also, commercial passenger activity at the Airport is forecasted to increase by approximately 30 percent over the next two decades (an average 1.3 percent annual increase), from 18,945 enplaned passengers in calendar year 2015 to 24,541 in 2035.

Development Assumptions

Assumption One. Existing non-standard dimensional criteria that have been identified for Runway 14R/32L will be evaluated separately for mitigation options and integrated into the airside alternatives formulated for this Master Plan Update.

Assumption Two. Future development of the Airport will continue to safely accommodate the existing variety of aviation users and activities, ranging from air cargo, commercial service passenger operations, commercial service aircraft deliveries, all sectors of the existing general aviation users, and military aircraft test operations with facilities properly sized to accommodate the projected forecast demand.

Assumption Three. Future land acquisition priorities (i.e., fee simple and/or easement, as necessary) will be identified as they relate to airport safety, future airport development, and land use compatibility.

Assumption Four. Encourage the protection of existing public and private investment in land and facilities and advocate the resolution of any potential land use conflicts, both on and off airport property.

Assumption Five. Provide effective direction for the future development of the Airport through the preparation of a rational plan and adherence to the adopted development program that incorporates the defined air transportation planning goals and objectives of King County.

Development Recommendations

The plan for the future development of BFI has evolved from an analysis of many considerations. Among these are: aviation demand forecasts, facility requirements, aircraft operational characteristics, environmental considerations, and the general direction of future airport development, as expressed by King County. The various airside and landside development options that are presented in the **Alternatives Analysis and Development Concepts** chapter provided the Airport Work Group (AWG) and the management staff of the Airport with a variety of options for future facility development. Following a careful assessment of the potential impacts for each development option, the airport sponsor selected components that formed the basis for an overall long-term development concept for the Airport.

Runway System (Planning Addendum)

There are several development recommendations for the Airport runway system.

Runway 14R/32L (Planning Addendum)

Runway Design Code (RDC) Dimensional Criteria. As the Airport's primary runway, Runway 14R/32L is currently designed to accommodate the "Design Aircraft" in consideration of approach speed and wingspan. This translates to design standards associated with RDC D-IV-4000 criteria, as specified by the FAA. The design criteria also include the Runway Visual Range (RVR) visibility minimums of 4000 feet (or not less than ¾ statute mile) published for the runway. The existing design criteria are to be maintained in the future.

Dimensions. This runway is currently 200 feet wide with an existing length of 10,007 feet [10,880 feet with the Runway 14R Prior Permission Required Pavement (PPRP)]. The proposal to convert 300 feet of the Runway 14R PPRP and extend the runway length to 10,307 feet has been removed from consideration at this time, as has been the proposed removal of the remaining Runway 14R PPRP. The Runway 32L threshold displacement of 880 feet is to remain. As provided on the ALP, the proposed declared distance lengths are shown in **Table ES1**. **Table ES2** provides the declared distance runway lengths using the PPRP.

Table ES1 **RUNWAY 14R/32L RUNWAY SYSTEM**

Runway	TORA	TODA	ASDA	LDA
Runway 14R	10,000'	10,000'	9,120'	9,120'
Runway 32L	10,000'	10,000'	10,000'	9,120'

Notes: **TORA:** Takeoff Run Available. **TODA:** Takeoff Distance Available.
ASDA: Accelerate Stope Distance Available. **LDA:** Landing Distance Available.

Table ES2 **RUNWAY 14R/32L RUNWAY SYSTEM WITH PPRP**

Runway	TORA	TODA	ASDA	LDA
Runway 14R	10,880'	10,880'	10,000'	9,120'
Runway 32L	10,000'	10,000'	10,000'	9,120'

Notes: **TORA:** Takeoff Run Available. **TODA:** Takeoff Distance Available.
ASDA: Accelerate Stope Distance Available. **LDA:** Landing Distance Available.

Pavement. The existing published gross weight bearing capacity of 100,000 pounds single wheel, 200,000 pounds dual wheel, and 500,000 pounds dual tandem wheel main landing gear configuration will be maintained.

Instrument Approach Criteria. The existing four instrument approach procedures (ILS or LOC, RNAV (RNP) and RNAV (GPS) approaches to Runway 14R and ILS or LOC approach to Runway 32L) will be maintained. However, the FAA and BFI are in the early stages of developing new GPS-based procedures that can be utilized independent of SEA operations.

Runway Protection Zones (RPZs). The size of both the approach and departure RPZs for Runway 14R are to be maintained at 1,000 feet x 1,510 feet x 1,700 feet and 500 feet x 1,010 feet x 1700 feet, respectively. The proposed future location of both the approach and departure RPZs for Runway 14R has been removed from consideration at this time. The Runway 32L approach and departure RPZs will be maintained at 500 feet x 1,010 feet x 1,700 feet.

Runway Lighting and Navigational Aids. The Airport plans to maintain the runway's existing High Intensity Runway Lights (HIRLs) and Precision Approach Path Indicators (PAPIs) at both runway ends. The proposal to relocate the existing Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF) serving Runway 14R has been removed from consideration at this time. The existing Runway End Indicator Lights (REILs) serving Runway 32L will be upgraded to High Intensity Approach Light System with Sequenced Flashing lights (ASLF-1).

Future in-pavement runway Centerline Lights (CL) and Touchdown Zone Lights (TDZL) are planned for each runway end, including the install of in-pavement runway guard lights at each taxiway connector. Additionally, the ground-based Navigation Aids (NAVAIDS) associated with the ILS approaches will be maintained (i.e., the Localizer and glide slope antennas for Runway 14R; the Localizer antenna for Runway 32L).

Runway 14L/32R

Runway Design Code (RDC) Dimensional Criteria. As the Airport's secondary runway, Runway 14L/32R is currently designed to RDC B-I (Small Aircraft)-Visual criteria, as specified by the FAA. It is recommended that this runway will be maintained to these criteria.

Dimensions. This runway is currently 100 feet wide and 3,710 feet long. The Runway 14L threshold displacement of 250 feet and the Runway 32R threshold displacement of 375 feet are to remain. As provided on the ALP, the existing and future declared distance lengths are shown in **Table ES3**.

Table ES3 **RUNWAY 14L/32R RUNWAY SYSTEM**

Runway	TORA	TODA	ASDA	LDA
Runway 14L	3,709'	3,709'	3,709'	3,459'
Runway 32R	3,709'	3,709'	3,709'	3,334'

Notes: **TORA:** Takeoff Run Available. **TODA:** Takeoff Distance Available.
ASDA: Accelerate Stope Distance Available. **LDA:** Landing Distance Available.

Pavement. The existing published gross weight bearing capacity of 120,000 pounds single wheel, 250,00 pounds dual wheel, and 550,000 pounds dual tandem wheel main landing gear configuration will eventually be reduced to greater than 100,000 pounds single wheel main landing gear configuration.

Instrument Approach Criteria. The existing visual approaches will be maintained with no implementation of future approaches planned.

Runway Protection Zones (RPZs). The size of both the approach and departure RPZs for this runway are to be maintained at 250 feet x 450 feet x 1,000 feet.

Runway Lighting and Navigational Aids. The existing Medium Intensity Runway Lights (MIRLs), PAPIs, and REILs are to be maintained.

Taxiway System (Planning Addendum)

BFI has historically been planned and designed with an efficient taxiway system that serves both runways. The recommendations for the Airport's taxiway system design and geometry improvements are presented below.

Runway 14R/32L Taxiway System (Planning Addendum)

Taxiway Dimensional Criteria. Taxiway B, the parallel taxiway serving the west side of Runway 14R/32L, is designed in accordance with Airplane Design Group (ADG) IV and (Taxiway Design Group (TDG) 5 design criteria, as specified by the FAA. These criteria are to be maintained and upgrades to exit and connector taxiways are planned as depicted on **Figure ES1** at the end of this summary document. Exit and connector taxiways providing access to the east of Runway 14R/32L are designed in accordance with ADG II, III, or IV and TDG 2, 3, or 5 design criteria, as specified by the FAA. These criteria are also to be maintained or upgrades provided as shown on **Figure ES1**.

Dimensions. TDG 5 standards specify a taxiway width of 75 feet and shoulder width of 30 feet.

Pavement. The proposed taxiway improvements will be designed, engineered, and constructed commensurate with the existing Runway 14R/32L pavement strength.

Taxiway Lighting. The existing system of Medium Intensity Taxiway Lights (MITLs) will be maintained. Installation of in-pavement taxiway centerline lights is planned for Taxiways serving Runway 14L/32R.

Recommended Taxiway Improvements.

- Widen Taxiway B2 to 90 feet
- Widen Taxiway A2 from 45 to 75 feet
- Construct future Taxiway A3 and remove existing Taxiway A4 to eliminate acute-angled taxiway
- Remove existing Taxiway A8 (between the runways)

Runway 14L/32R Taxiway System

Taxiway Dimensional Criteria. Taxiway A, the parallel taxiway serving the east side of Runway 14L/32R, is designed in accordance with ADG II, III, or IV and TDG 2, 3, or 5 design criteria, as specified by the FAA. These criteria are also to be maintained or upgrades provided as shown on **Figure ES1**.

Dimensions. TDG 2 standards specify a taxiway width of 35 feet and shoulder width of 15 feet. TDG 3 standards specify a taxiway width of 50 feet and shoulder width of 20 feet. TDG 5 standards specify a taxiway width of 75 feet and shoulder width of 30 feet.

Pavement. Existing Taxiways A7, A9, and A10 pavement strengths will be maintained and the proposed improvements to Taxiways A2 and A3 will be designed, engineered, and constructed commensurate with the existing Runway 14R/32L pavement strengths. Future Taxiway A4 and existing Taxiway A8 pavement strengths are anticipated to be commensurate with the existing Runway 14L/32R pavement strengths.

Taxiway Lighting. The existing system of Medium Intensity Taxiway Lights (MITLs) will be maintained. Installation of in-pavement taxiway CL lights are planned for future Taxiways A2 and A3, and existing Taxiways A1, A10, and A11.

Recommended Taxiway Improvements.

- Design and realign segment of Taxiway A between Taxiways A1 and A2
- Widen Taxiway A2 from 45 to 75 feet
- Construct future Taxiway A3 and remove existing Taxiways A3 and A4 to eliminate acute-angled taxiways
- Construct future Taxiway A4 and remove existing Taxiway A5 to eliminate acute-angled taxiway
- Remove existing Taxiway A8 west of the Runway 32R end

Property/Easement Acquisition (Planning Addendum)

King County presently owns the property associated with the existing runway/taxiway system and inner approach areas, including most of the Runway Protection Zones (RPZs) at each end of the runways. However, additional property acquisition is needed to control the balance of the existing Runway 14R departure RPZ (south of the Runway 32L end), for additional aviation development within the southwest quadrant of the Airport, and for additional aviation support development west of the Airport. The specified property acquisition projects are summarized in the following text.

Future Property Acquisition:

- Runway 14R departure RPZ – 7.4 acres
- Airside/Landside Development – 3.6 acres
- Airport Support Facilities – 20.58 acres

Future RPZ Use Agreement:

- Runway 14R approach RPZ – 1.3 acres

Landside Development Area Plans

Based on input received from the AWG, airport stakeholders, the FAA and Airport Staff, an overall landside development concept for BFI was formulated from the alternatives presented in the *Alternatives Analysis and Development Concepts* chapter. The key components of this landside conceptual plan, as well as the site-specific area plans, are described in the following narrative and identified on the ALP illustration, at the end of this Executive Summary.

Terminal Area Plan

The major improvements identified in the vicinity of the passenger terminal building (east side of the Airport) are summarized here:

- Expands Terminal Area Courtyard Apron to approximately 6.0 acres to accommodate larger passenger charter aircraft and provide flex space for overflow cargo aircraft parking
- Realigns outbound segment of the Terminal looped roadway with Othello Street
- Removes the South Arrivals building and adjacent auto parking
- Widens Orchard Street to accommodate two-way auto traffic
- Relocates the existing traffic light at the Othello Street/Airport Way South intersection to the existing Orchard Street
- Reserves approximately 10.4 acres of landside development area improvements for UPS cargo processing, storage, and auto parking
- Closes a segment of Perimeter Road South to public access

Terminal Area Plan – Area Plan South

The major improvements identified at the south end of the Airport (both east and west sides) are summarized here:

- Removes the existing T-hangars and tie-down apron in the southeast corner of the Airport and develops Modern Aviation Fixed Based Office (FBO) facilities (this project has been completed)
- Redevelops the Kenmore Aero Services FBO facilities in the southeast corner of the Airport
- Maintains the existing Museum of Flight "Through-the-Fence" agreement with access corridor and aircraft tiedowns
- Proposes acquiring approximately 3.6 acres of the Woods Meadows property located west of Taxiway B and south of the corporate hangars, and if combined with the removal of the existing T-hangars and tie-down apron, reserves approximately 10.25 acres of property for future aviation redevelopment
- Proposes acquiring approximately 20.58 acres west of East Marginal Way S. for potential relocation of the ATCT, among other facilities
- Designates approximately 2.96 acres located south of the existing ATCT for future General Aviation Redevelopment to accommodate aircraft tiedowns
- Provides additional Boeing aircraft parking apron to the north of the existing ATCT

Terminal Area Plan – Area Plan North

The major improvements identified at the north end of the Airport (both east and west sides) are summarized here:

- Decommissions the existing northeast GA apron tiedown area and relocates the impacted tiedowns to the Lot 13 area on the west side of airport property
- Relocates the existing fuel storage facility
- Relocates the existing Airport maintenance building
- Refurbishes previous FAA building for Airport Offices

- Constructs new Steam Plant access road
- Modifies approximately 9.3 acres of existing National Guard leasehold property and redevelops with airport maintenance and administration facilities

Aviation Support Development

Support facilities provide those services and functions that are necessary for an airport to operate safely and efficiently but are not part of the runway/taxiway system and are not related to the passenger terminal building, air cargo facilities, aircraft storage, or aircraft maintenance. The aviation support facilities at BFI that require development recommendations include the Airport's maintenance facilities, fuel storage facility, and Airport Traffic Control Tower (ATCT).

Airport Maintenance Facility Development Area. Due to the proposed RPZ development restrictions, future plans for the site include renovation of the existing FAA Flight Service Station for Airport Offices, including relocation of the Airport's Maintenance Building and construction of a Snow Removal Equipment (SRE) Building to a new Airport Maintenance Development Area located west of the Steam Plant. In addition, construction of a new access road is planned to serve the existing Steam Plant facility.

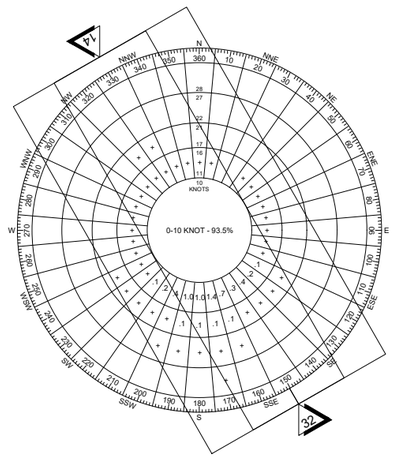
Fuel Storage Facility. Due to BFI's existing fuel storage facility being partially located within the existing Runway 14R RPZ, which is considered an incompatible land use, and the fact that the existing Jet A fuel storage facility is potentially undersized, a future site is required. The selected redevelopment site is still under evaluation, but it is estimated that the future fuel storage facility will require a development footprint of approximately two acres.

Airport Traffic Control Tower (ATCT). The Airport's existing ATCT is located at midfield, on the west side of the Airport, adjacent to the ARFF facility. Due to the age and condition of the existing ATCT, it has been determined that a facility upgrade may be necessary during the timeframe of this Master Plan Update. Airport Staff have identified a potential new development site, located west of East Marginal Way South, on the former Jorgensen Forge property. King County would have the option to construct a new ATCT at this new location with conventional facilities or evaluate an upgrade/replacement of existing ATC facilities with new remote/virtual Air Traffic Control (ATC) technology.

Conceptual Development Plan (Planning Addendum)

The major improvement considerations described above for BFI have been organized and graphically represented in the following illustrations, which constitute each sheet of the Airport's ALP Drawing Set to be submitted to the FAA. In short, the development concept as illustrated by the ALP provides King County with a long-term development plan for BFI that will continue to accommodate a wide range of aviation user groups and operational activities. As with any airport planning document, the ultimate build-out of the various aviation development areas will be demand driven and will be influenced by financial and environmental considerations.

ALL WEATHER WINDROSE

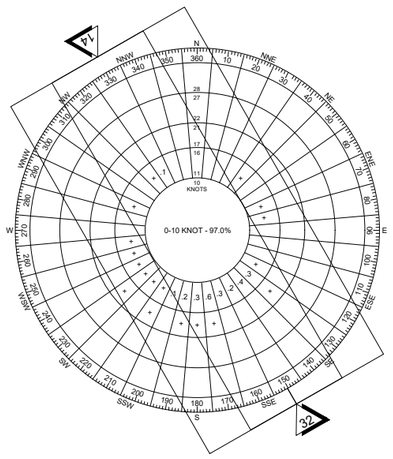


ALL-WEATHER WIND COVERAGE SUMMARY

Runway	10.5-Knot	20-Knot
Runways 14R & 14L	93.55%	94.35%
Runways 32L & 32R	72.54%	72.72%
Combined Runways	99.20%	100.00%

Source: Wind analysis tabulation provided by Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from NOAA, NCDC Station 727935/BFI. Period of Record: 2006-2015.
NOTE: A 5-knot tailwind component was used for the individual runway end analysis.

IFR WEATHER WINDROSE



IFR WEATHER WIND COVERAGE SUMMARY

Runway	10.5-Knot	20-Knot
Runways 14R & 32L	99.65%	100.00%
Runway 14R	96.86%	97.19%
Runway 32L	78.81%	79.01%

Source: Wind analysis tabulation provided by Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from NOAA, NCDC Station 727935/BFI. Period of Record: 2006-2015.
NOTE: A 5-knot tailwind component was used for the individual runway end analysis.

NOTES

1. This drawing reflects planning standards applicable to KCIA/Boeing Field to the greatest extent possible.
2. Coordinate data is NAD83. Elevation data is NAVD88. Survey dated 02/02/15.
3. Existing Runway 14R/32L Prior Permission Required Pavement (PPRP) only available for south departures with Airport Staff approval.
4. Runway elevations from Woolpert, Inc. survey dated 02/02/15.

REVISIONS

NO.	DATE	BY	DESCRIPTION

SEE SHEETS 14 AND 15 FOR ADDITIONAL TAXIWAY DIMENSIONAL CRITERIA

TAXIWAY DATA

MAINTAIN EXISTING EXTRA TAXIWAY WIDTH TO ACCOMMODATE POTENTIAL COCKPIT OVER CENTERLINE STEERING REQUIREMENTS OF LARGE AIRCRAFT

	T/W 'A' (A-1 TO A-3)		T/W 'A' (A-3 TO A-10)		T/W 'A' (A-10 TO A-11)		T/W 'A' (NORTH OF A-1)		T/W 'B'		T/W 'Z' *PPRP					
	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	TAXIWAY	WIDTH	TAXIWAY	WIDTH
TAXIWAY DESIGN GROUP (TDG)	3	3	5	5	2	2	1B	1B	5	5	5	5	A-1	70'	B-1	75'
WIDTH IN FEET (STANDARD)	50' (50')	50' (50')	75' (75')	75' (75')	35' (35')	35' (35')	30' (25')	30' (25')	75' (75')	75' (75')	75' (75')	75' (75')	A-2	40'-135'	B-2	30'
SAFETY AREA WIDTH (IN FEET)	118'	118'	171'	171'	79'	79'	49'	49'	171'	171'	171'	171'	A-3	35'	B-3	90'
OBJECT FREE AREA WIDTH (IN FEET)	162'	162'	259'	259'	131'	131'	89'	89'	259'	259'	259'	259'	A-4	135'	B-4	90'
SEPARATION (IN FEET) T/W TO T/W	152'	152'	215'	215'	105'	105'	70'	70'	215'	215'	215'	215'	A-5	60'	B-5	365'
T/W TO OBJECT	93'	80'	129.5'	129.5'	28'	65.5'	30'	30'	129.5	129.5	112.5'	112.5'	A-7	130'	B-7	100'
T/W TO R/W	400'	400'	400'	400'	400'	400'	400'	400'	400'	400'	400'	400'	A-8	40'	B-9	125'
LIGHTING	MITL, CL	MITL	MITL, CL	MITL	MITL	MITL, CL	MITL	MITL	MITL	MITL, CL	MITL	MITL	A-9	200'	B-10	75'
TAXIWAY EDGE SAFETY MARGIN	10'	10'	15'	15'	10'	10'	5'	5'	15'	15'	15'	15'	A-10	430'		
TAXIWAY SHOULDER WIDTH	20'	20'	30'	30'	20'	20'	10'	10'	30'	30'	30'	30'	A-11	35'		

RUNWAY DATA

	RUNWAY 14R		RUNWAY 32L		RUNWAY 14L		RUNWAY 32R	
	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
RUNWAY DESIGN CODE (RDC)	D-IV-4000	D-IV-4000	D-IV-5000	D-IV-5000	B-I(S)-VISUAL	B-I(S)-VISUAL	B-I(S)-VISUAL	B-I(S)-VISUAL
APPROACH REFERENCE CODE (APRC)	B/III/4000 D/II/4000	B/III/4000 D/II/4000	B/III/5000 D/II/5000	B/III/5000 D/II/5000	B/I(S)/VIS	B/I(S)/VIS	B/I(S)/VIS	B/I(S)/VIS
DEPARTURE REFERENCE CODE (DPRC)	B/III, D/II	B/III, D/II	B/III, D/II	B/III, D/II	B-I(S)	B-I(S)	B-I(S)	B-I(S)
RUNWAY PAVEMENT TYPE	ASPHALT	ASPHALT	ASPHALT	ASPHALT	ASPHALT	ASPHALT	ASPHALT	ASPHALT
RUNWAY PAVEMENT STRENGTH (IN 1000 LBS.)	100S,200D,500DT	100S,200D,500DT	100S,200D,500DT	100S,200D,500DT	120S,250D,550DT	35S, 60D	120S,250D,550DT	35S, 60D
RUNWAY PAVEMENT STRENGTH (PCN)	90/F/B/W/T		90/F/B/W/T		71/F/A/X/T		71/F/A/X/T	
RUNWAY SURFACE TREATMENT	GROOVED	GROOVED	GROOVED	GROOVED	GROOVED	GROOVED	GROOVED	GROOVED
EFFECTIVE RUNWAY GRADIENT %	0.03%	0.03%	0.03%	0.03%	0.00%	0.00%	0.00%	0.00%
PERCENT WIND COVERAGE (20KT COMBINED)	94.35/100.0	94.35/100.0	72.72/100.0	72.72/100.0	N/A	N/A	N/A	N/A
PERCENT WIND COVERAGE (10.5KT COMBINED)	N/A	N/A	N/A	N/A	93.55/99.2	93.55/99.2	93.55/99.2	93.55/99.2
RUNWAY WIDTH X LENGTH	200' X 10,007'	200' X 10,007'	200' X 10,007'	200' X 10,007'	100' X 3,709'	100' X 3,709'	100' X 3,709'	100' X 3,709'
DISPLACED THRESHOLD LENGTH	N/A	N/A	887'	887'	250'	250'	375'	375'
RUNWAY SAFETY AREA (RSA) WIDTH	500'	500'	500'	500'	120'	120'	120'	120'
RSA LENGTH BEYOND END	1000'	1000'	1000'	1000'	240'	240'	240'	240'
RUNWAY LIGHTING	HIRL	HIRL	HIRL	HIRL	MIRL	MIRL	MIRL	MIRL
APPROACH PROTECTION ZONE (RPZ)	1,000' X 1,510' X 1,700'	1,000' X 1,510' X 1,700'	500' X 1,010' X 1,700'	500' X 1,010' X 1,700'	250' X 450' X 1,000'	250' X 450' X 1,000'	250' X 450' X 1,000'	250' X 450' X 1,000'
DEPARTURE PROTECTION ZONE (RPZ)	500' X 1,010' X 1,700'	500' X 1,010' X 1,700'	500' X 1,010' X 1,700'	500' X 1,010' X 1,700'	250' X 450' X 1,000'	250' X 450' X 1,000'	250' X 450' X 1,000'	250' X 450' X 1,000'
RUNWAY MARKING	PRECISION	PRECISION	PRECISION	PRECISION	BASIC	BASIC	BASIC	BASIC
FAR PART 77 APPROACH SLOPE	50:1	50:1	50:1	50:1	20:1	20:1	20:1	20:1
FAR PART 77 APPROACH TYPE	PRECISION	PRECISION	PRECISION	PRECISION	VISUAL	VISUAL	VISUAL	VISUAL
APPROACH VISIBILITY MINIMUMS	NOT LOWER THAN 3/4-MILE	NOT LOWER THAN 3/4-MILE	NOT LOWER THAN 1-MILE	NOT LOWER THAN 1-MILE	VISUAL	VISUAL	VISUAL	VISUAL
AERONAUTICAL SURVEY REQUIRED	VERT. GUIDED	VERT. GUIDED	VERT. GUIDED	VERT. GUIDED	NON-VERT. GUIDED	NON-VERT. GUIDED	NON-VERT. GUIDED	NON-VERT. GUIDED
DEPARTURE SURFACE	TYPE 7	TYPE 7	TYPE 7	TYPE 7	NOT REQD	NOT REQD	NOT REQD	NOT REQD
RUNWAY OBJECT FREE AREA (ROFA) WIDTH	800'	800'	800'	800'	250'	250'	250'	250'
ROFA LENGTH BEYOND RUNWAY END	1000'	1000'	120'	120'	240'	240'	240'	240'
RUNWAY OBSTACLE FREE ZONE (ROFZ) WIDTH	400'	400'	400'	400'	250'	250'	250'	250'
ROFZ LENGTH	200'	200'	200'	200'	200'	200'	200'	200'
INNER APPROACH OFZ (IAOFZ) WIDTH	400'	400'	N/A	400'	N/A	N/A	N/A	N/A
INNER APPROACH OFZ (IAOFZ) LENGTH	1,470'	1,470'	N/A	2,400'	N/A	N/A	N/A	N/A
INNER TRANSITIONAL OFZ (ITOFZ) WIDTH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PRECISION OBSTACLE FREE ZONE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
THRESHOLD SITING SURFACE (EB99)	TYPE 4 & 6 (CLEAR)	TYPE 4 & 6 (CLEAR)	TYPE 4 & 6 (CLEAR)	TYPE 4 & 6 (CLEAR)	TYPE 2 (CLEAR)	TYPE 2 (CLEAR)	TYPE 2 (CLEAR)	TYPE 2 (CLEAR)
VISUAL APPROACH AIDS	MALSF, PAPI	MALSF, PAPI, CL & TDZ LIGHTS	REIL, PAPI	ALSF-1, PAPI, CL & TDZ LIGHTS	REIL, PAPI	REIL, PAPI	REIL, PAPI	REIL, PAPI
INSTRUMENT APPROACH AIDS	ILS,LOC,DME,GPS	ILS,LOC,DME,GPS	ILS,LOC,DME,GPS	ILS,LOC,DME,GPS	NONE	NONE	NONE	NONE
TOUCHDOWN ZONE ELEVATION	17.8'	18.8'	21.6'	21.6'	17.6'	17.6'	17.5'	17.5'

DECLARED DISTANCES

ITEM	RUNWAY 14R/32L		RUNWAY 14L/32R	
	EXISTING (PPRP*)	FUTURE (PPRP*)	EXISTING	FUTURE
TAKEOFF RUN AVAILABLE (TORA)	10,000'(10,880')/10,000'	10,000'(10,880')/10,000'	3,709'/3,709'	3,709'/3,709'
TAKE OFF DISTANCE AVAILABLE (TODA)	10,000'(10,800')/10,000'	10,000'(10,800')/10,000'	3,709'/3,709'	3,709'/3,709'
ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)	9,120'(10,000')/10,000'	9,120'(10,000')/10,000'	3,709'/3,709'	3,709'/3,709'
LANDING DISTANCE AVAILABLE (LDA)	9,120'(9,120')/9,120'	9,120'(9,120')/9,120'	3,459'/3,334'	3,459'/3,334'

* PRIOR PERMISSION REQUIRED PAVEMENT (PPRP)

NONSTANDARD CONDITIONS

ITEM	RUNWAY DESIGN CODE (RDC) AIRPLANE DESIGN GROUP (ADG) EXISTING	RUNWAY DESIGN CODE (RDC) AIRPLANE DESIGN GROUP (ADG) FUTURE	STANDARD EXISTING	STANDARD FUTURE	NONSTANDARD CONDITION EXISTING	NONSTANDARD CONDITION FUTURE	REMARKS
PARALLEL RUNWAY CENTERLINE SEPARATION	D-IV-4000	D-IV-4000	700' MIN.	SAME	375'	SAME	PREPARE UPDATE REQUEST FOR ATC OPERATIONAL WAIVER
RUNWAY 14R/32L OBJECT FREE AREA (ROFA) WIDTH	D-IV-4000	D-IV-4000	800'	SAME	ROFA WIDTH AT SOUTH END OF RUNWAY TAPERS FROM 800' TO 650'	SAME	MOS REQUEST WILL BE PREPARED TO SEEK FAA CONFIRMATION THAT "ACCEPTABLE LEVEL OF SAFETY" CAN BE PROVIDED.
RUNWAY 14R/32L CENTERLINE TO PARALLEL TAXIWAY A CENTERLINE SEPARATION (FULL LENGTH)	D-IV-4000	D-IV-4000	400'	SAME	335'-350'	SAME	MOS REQUEST WILL BE PREPARED TO SEEK FAA CONFIRMATION THAT "ACCEPTABLE LEVEL OF SAFETY" CAN BE PROVIDED.
RUNWAY 14R/32L CENTERLINE TO PARALLEL TAXIWAY B CENTERLINE SEPARATION (FULL LENGTH)	D-IV-4000	D-IV-4000	400'	SAME	325'-350'	SAME	MOS REQUEST WILL BE PREPARED TO SEEK FAA CONFIRMATION THAT "ACCEPTABLE LEVEL OF SAFETY" CAN BE PROVIDED.
RUNWAY 14R/32L CENTERLINE TO AIRCRAFT PARKING AREA SEPARATION	D-IV-4000	D-IV-4000	500'	SAME	SOME MARKED AIRCRAFT PARKING POSITIONS ARE LOCATED WITHIN THE REQUIRED 500-FOOT SETBACK FROM RUNWAY CENTERLINE (EAST OF TW A AND WEST OF TW B).	TO BE RELOCATED	AIRCRAFT PARKING POSITIONS THAT ENCROACH UPON THE 500-FOOT SETBACK WILL BE PROGRAMMED FOR RELOCATION.
RUNWAY 14R APPROACH RPZ LAND USES	D-IV-4000	D-IV-4000	RPZ BOUNDARY IS TO BE CLEAR OF INCOMPATIBLE LAND USES PER FAA'S INTERIM GUIDANCE ON LAND USES WITHIN A RUNWAY PROTECTION ZONE	SAME	GEORGETOWN STEAM PLANT, LOCATED OFF AIRPORT PROPERTY, AND FUEL FARM, LOCATED ON-AIRPORT, ARE POSITIONED WITHIN THE EXISTING BOUNDARY OF THE RPZ.	SAME	MAINTAIN EXISTING CONDITIONS. NO RESOLUTIONS ARE PLANNED.
RUNWAY 14R DEPARTURE RPZ LAND USES	D-IV-4000	D-IV-4000	RPZ BOUNDARY IS TO BE CLEAR OF INCOMPATIBLE LAND USES PER FAA'S INTERIM GUIDANCE ON LAND USES WITHIN A RUNWAY PROTECTION ZONE	SAME	LOCATION OF EXISTING TRANSPORTATION FACILITIES AND INDUSTRIAL BUILDINGS WITHIN RPZ.	PROPOSED REDEVELOPMENT OF EXISTING INDUSTRIAL DEVELOPMENT AREA WILL PROVIDE OPPORTUNITY TO RELOCATE SOME BUILDINGS WITHIN THE RPZ.	MAINTAIN EXISTING CONDITIONS. NO RESOLUTIONS ARE PLANNED.
RUNWAY 32L APPROACH RPZ LAND USES	D-IV-4000	D-IV-4000	RPZ BOUNDARY IS TO BE CLEAR OF INCOMPATIBLE LAND USES PER FAA'S INTERIM GUIDANCE ON LAND USES WITHIN A RUNWAY PROTECTION ZONE	SAME	LOCATION OF EXISTING TRANSPORTATION FACILITIES WITHIN RPZ (I.E., ROADWAY AND RAILWAY).	THERE ARE NO CURRENT PLANS TO RELOCATE EXISTING TRANSPORTATION FACILITIES WITHIN RPZ.	MAINTAIN LOCATION OF EXISTING OFF-AIRPORT TRANSPORTATION FACILITIES.
TAXIWAY A CENTERLINE SEPARATION (BETWEEN A1 & A2) TO FIXED OR MOVEABLE OBJECT	ADG-III (RESTRICTED)	ADG-III	93'	SAME	80'	93'	REALIGN SEGMENT OF TAXIWAY A, ADJACENT TO TAXIWAY A1 CONNECTOR, TO COMPLY WITH ADG III TOFA CRITERIA.
TAXIWAY A CENTERLINE SEPARATION (NORTH OF TAXIWAY A1) TO FIXED OR MOVEABLE OBJECT	ADG-I	ADG-I	44.5'	SAME	30'	SAME	MAINTAIN EXISTING CONDITIONS. NO RESOLUTIONS ARE PLANNED.
TAXIWAY B CENTERLINE SEPARATION TO FIXED OR MOVEABLE OBJECT	ADG-IV	ADG-IV	129.5'	SAME	103' TO 125'	129.5'	PROJECT IS BEING IMPLEMENTED TO NARROW AND REPOSITION THE EXISTING AIRPORT SERVICE ROAD (ASR) OUTSIDE OF THE TOFA BOUNDARY.

RUNWAY END DATA

	RUNWAY 14R/32L EXISTING	RUNWAY 14R/32L FUTURE	RUNWAY 14L/32R EXISTING	RUNWAY 14L/32R FUTURE
RUNWAY END COORDINATES	LAT. 47°32'25.95"N LON. 122°18'40.88"W / LAT. 47°31'00.25"N LON. 122°17'28.42"W	LAT. 47°32'25.95"N LON. 122°18'40.88"W / LAT. 47°31'00.25"N LON. 122°17'28.42"W	LAT. 47°32'16.87"N LON. 122°18'26.86"W / LAT. 47°31'45.10"N LON. 122°18'00.00"W	LAT. 47°32'16.87"N LON. 122°18'26.86"W / LAT. 47°31'45.10"N LON. 122°18'00.00"W
DISPLACED THRESHOLD COORDINATES	N/A / LAT. 47°31'07.84"N LON. 122°17'34.84"W	N/A / LAT. 47°31'07.84"N LON. 122°17'34.84"W	LAT. 47°32'14.73"N LON. 122°18'25.05"W / LAT. 47°31'48.31"N LON. 122°18'02.71"W	LAT. 47°32'14.73"N LON. 122°18'25.05"W / LAT. 47°31'48.31"N LON. 122°18'02.71"W
RUNWAY ELEVATIONS				
END	17.8'/21.0'	17.8'/21.0'	17.4'/17.1'	17.4'/17.1'
DISPLACED THRESHOLD ELEVATION	-/21.6'	-/21.6'	17.5'/17.3'	17.5/17.3'
HIGH POINT	21.6'	21.6'	17.6'	17.6'
LOW POINT	17.8'	17.8'	17.1'	17.1'
TOUCHDOWN ZONE ELEVATION	17.8'/21.6'	17.8'/21.6'	17.6'/17.5'	17.6'/17.5'

MONUMENT DATA

ID	NORTHING	EASTING	ELEVATION
MON A	200583.24490	1275193.96709	15.03'
MON B	199146.84255	1275980.90980	12.66'
MON C	196765.08879	1277284.97755	14.35'
MON D	195472.65682	1277992.66081	16.42'
MON E	193940.83455	1278831.39276	16.14'
MON F	191668.97132	1280075.33067	18.54'

NAD 83 STATE PLANE WASHINGTON NORTH, NAVD 88

AIRPORT DATA

	EXISTING	FUTURE
AIRPORT REFERENCE CODE	D-IV	D-IV
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	75.3°F	75.3°F
AIRPORT ELEVATION (AMSL) NGS 405 (NAVD 88)	21.6'	21.6'
AIRPORT & TERMINAL NAVAIDS	ILS,LOC/DME,GPS,LDA	ILS,LOC/DME,GPS,LDA
AIRPORT REFERENCE POINT (ARP) NGS 405 (NAD 83)	LAT. 47° 31' 47.9" N. LON. 122° 18' 07.0" W	LAT. 47° 31' 47.9" N. LON. 122° 18' 07.0" W
MISCELLANEOUS FACILITIES	ATCT,ASOS,ARFF,ROTATING BEACON,LIGHTED WIND CONE	ATCT,ASOS,ARFF,ROTATING BEACON,LIGHTED WIND CONE
CRITICAL AIRCRAFT	B-767 400	B-767 400
WINGSPAN	156.08'	156.08'
APPROACH SPEED	142 KTS	142 KTS
UNDERCARRIAGE WIDTH	35.75'	35.75'
MAGNETIC VARIATION (DATE)	15°35'E 10/11/18	0°6'W/YEAR
NPIAS CATEGORY	PRIMARY CS	PRIMARY CS
STATE SERVICE ROLE	MAJOR	MAJOR
COMBINED WIND COVERAGE (20KT & 10.5KT)	100% & 99.2%	100% & 99.2%

Mead & Hunt

Mead and Hunt, Inc.
Cherry Street Building
1616 East 15th Street
Tulsa, OK 74120
phone: 918-585-8844
meadhunt.com

KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

NOT FOR CONSTRUCTION

M&H NO.: 3231200-162066.01
DATE: OCTOBER 2021
DESIGNED BY: M&H
DRAWN BY: JWB
CHECKED BY: CDF
DO NOT SCALE DRAWINGS

Figure ES1

Airport Data Tables

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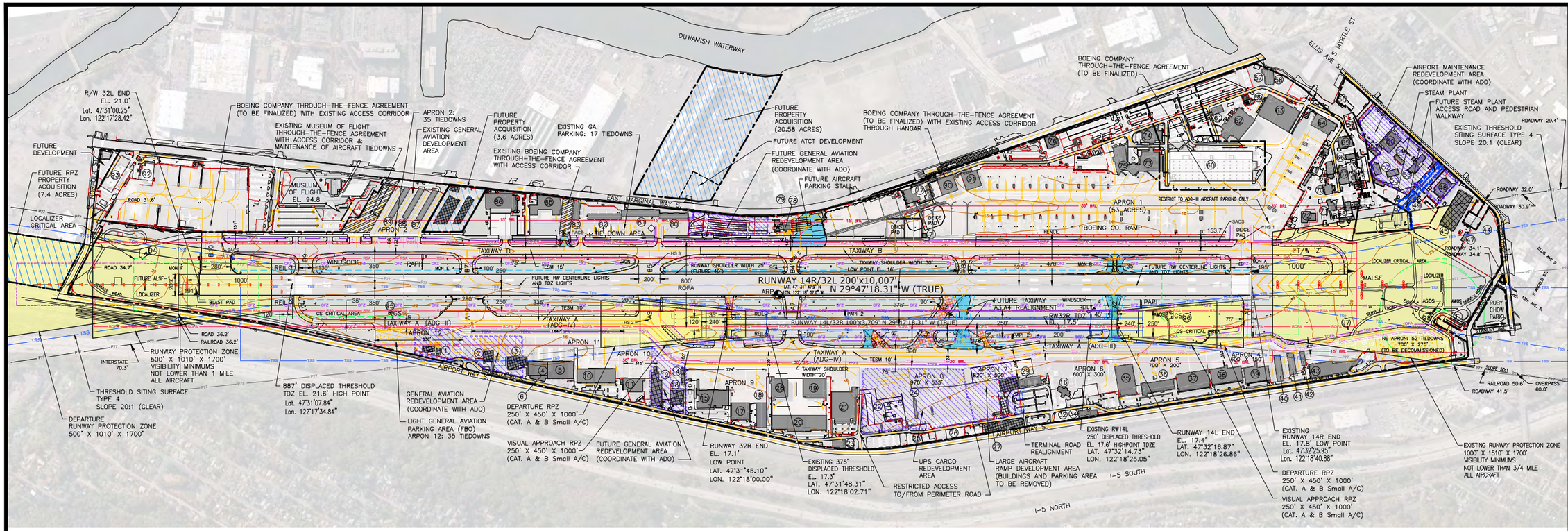


15°35' E
± 0°22'
CHANGING BY
0°9' W / YR
(OCT. 11, 2018)

0 500 1000

NOTES

1. This drawing reflects planning standards applicable to KCIA/Boeing Field to the greatest extent possible.
2. Coordinate data is NAD83. Elevation data is NAVD88. Survey dated 02/02/15.
3. Existing Runway 14R/32L Prior Permission Required Pavement (PPRP) only available for south departures with Airport Staff approval.
4. Runway elevations from Woolpert, Inc. survey dated 02/02/15.

REVISIONS

NO.	DATE	BY	DESCRIPTION

MONUMENT DATA

ID	NORTHING	EASTING	ELEVATION
MON A	200583.24490	1275193.96709	15.03'
MON B	199146.84255	1275980.90980	12.66'
MON C	196765.08879	1277284.97755	14.35'
MON D	195472.65682	1277992.66081	16.42'
MON E	193940.83455	1278831.39276	16.14'
MON F	191668.97132	1280075.33067	18.54'

NAD 83 STATE PLANE WASHINGTON NORTH, NAVD 88

BUILDING LEGEND

#	DESCRIPTION	ADDRESS	ELEVATION*	#	DESCRIPTION	ADDRESS	ELEVATION*	#	DESCRIPTION	ADDRESS	ELEVATION*	#	DESCRIPTION	ADDRESS	ELEVATION*
1	VACANT (TBR)	8600 PERIMETER ROAD SOUTH	40.5'	26	UPS	7440 PERIMETER ROAD SOUTH		51	FUTURE AIRPORT MAINT. REDEV		37.5'	76	BOEING CO. – CREDIT UNION	7960 EAST MARGINAL WAY	50.9'
2	KENMORE AERO SERVICES (TBR)	8555 PERIMETER ROAD SOUTH	40.2'	27	K.C. AGENCIES (TBR)	7300 PERIMETER ROAD SOUTH	45.7'	52	FUTURE AIRPORT MAINT. REDEV		38.0'	77	BOEING CO. – 75 YEAR LEASE		45.4'
3	KENMORE AERO SERVICES (TBR)	8535 PERIMETER ROAD SOUTH	44.3'	28	QUAD 7 DEVELOPMENT, LLC	.	59.8'	53	FUTURE AIRPORT MAINT. REDEV		34.7'	78	ARFF BUILDING	8190 EAST MARGINAL WAY	38.3'
4	MODERN AVIATION HANGAR	8490 PERIMETER ROAD SOUTH	52' EST.	29	AIRPORT TERMINAL	7277 PERIMETER ROAD SOUTH	59.6'	54	FUTURE AIRPORT MAINT. REDEV		45.4'	79	ATCT (TO BE RELOCATED)	8200 EAST MARGINAL WAY	85.1'
5	MODERN AVIATION HANGAR	8473 PERIMETER ROAD SOUTH	52' EST.	30	REMOVED			55	FUTURE AIRPORT MAINT. REDEV		43.1'	80	T-HANGAR	8700 A EAST MARGINAL WAY	37.4'
6	MODERN AVIATION OFFICE	8500 PERIMETER ROAD SOUTH	34' EST.	31	REMOVED			56	FUTURE AIRPORT MAINT. REDEV			81	T-HANGAR	8700 B EAST MARGINAL WAY	41.5'
7	PUMP STATION		32' EST.	32	AVIATION STORE	7201 PERIMETER ROAD SOUTH	32.9'	57	BOEING CO. – MARKOV SITE		30.9'	82	T-HANGAR	8700 C EAST MARGINAL WAY	36.3'
8	REMOVED	8465 PERIMETER ROAD SOUTH	36.9'	33	REMOVED			58	BOEING CO. – MARKOV SITE		30.9'	83	T-HANGAR	8700 D EAST MARGINAL WAY	35.8'
9	REMOVED	8453 PERIMETER ROAD SOUTH	36.4'	34	AVIATION TRAINING CENTER	7170 PERIMETER ROAD SOUTH	32.9'	59	BOEING CO. – 75 YEAR LEASE		30.9'	84	REMOVED		
10	MODERN AVIATION	8403 PERIMETER ROAD SOUTH	60.7'	35	7023 PERIMETER ROAD, LLC	7023 PERIMETER ROAD SOUTH	56.6'	60	BOEING CO. – 75 YEAR LEASE (THROUGH THE FENCE AGREEMENT)		107.9'	85	GDH-I, LLC	8900 EAST MARGINAL WAY	48.2'
11	MODERN AVIATION	8285 PERIMETER ROAD SOUTH	47.7'	36	SIGNATURE	7001 PERIMETER ROAD SOUTH	49.7'	61	BOEING CO. – 75 YEAR LEASE		46.5'	86	CHARLESAIR, LLC	9010 EAST MARGINAL WAY	46.8'
12	VACANT (TBR)	8201 PERIMETER ROAD SOUTH	37.2'	37	SIGNATURE	6987 PERIMETER ROAD SOUTH	55.7'	62	BOEING CO. – 75 YEAR LEASE		79.8'	87	HANGAR "E"	9210 EAST MARGINAL WAY	36.3'
13	KENMORE AIR HARBOR (TBR)	8167 & 8187 PERIMETER ROAD SOUTH	39.6'	38	KING COUNTY JET CENTER, INC.	6801 B PERIMETER ROAD SOUTH	56.1'	63	BOEING CO. – 75 YEAR LEASE		99.8'	88	HANGAR "D"	9220 EAST MARGINAL WAY	35.7'
14	KENMORE AIR HARBOR (TBR)	8185 PERIMETER ROAD SOUTH	35.2'	39	KING COUNTY JET CENTER, INC.	6801 A PERIMETER ROAD SOUTH	58.1'	64	BOEING CO. – 75 YEAR LEASE		63.7'	89	HANGAR "C"	9230 EAST MARGINAL WAY	36.3'
15	MENTE	8075 PERIMETER ROAD SOUTH	52' EST.	40	T-HANGAR	6711 PERIMETER ROAD SOUTH	38.9'	65	BOEING CO. – 75 YEAR LEASE		55.5'	90	LARGE HANGAR		69.3'
16	SIGNATURE FBO	.	31' EST.	41	T-HANGAR	6691 PERIMETER ROAD SOUTH	38.3'	66	BOEING CO. – 75 YEAR LEASE		25.4'	91	LARGE HANGAR		67.7'
17	NORDSTROMS, INC.	7979 PERIMETER ROAD SOUTH	45.6'	42	T-HANGAR	6671 PERIMETER ROAD SOUTH	34.8'	67	BOEING CO. – 75 YEAR LEASE		49.9'	92	BOEING		72.8'
18	NORDSTROMS, INC.	7xxx PERIMETER ROAD SOUTH	49.8'	43	J & J AIRPORT PROPERTIES, LLC	6605 PERIMETER ROAD SOUTH	51.6'	68	BOEING CO. – 75 YEAR LEASE		33.3'	93	BOEING		54.7'
19	QUAD 7 DEVELOPMENT, LLC	7777 PERIMETER ROAD SOUTH	59.3'	44	VACANT	6404 ELLIS AVE.		69	BOEING CO. – 75 YEAR LEASE		35.9'	94	RW34L LOCALIZER EQUIP. BLDG.		28.9'
20	QUAD 7 DEVELOPMENT, LLC	7827 PERIMETER ROAD SOUTH	53.6'	45	AIRPORT MAINTENANCE (TO BE RELOCATED)			70	BOEING CO. – 75 YEAR LEASE		47.6'	95	RW34L GLIDE SLOPE EQUIP. BLDG.		26.5'
21	HANGAR HOLDINGS	7675 PERIMETER ROAD SOUTH	90.3'	46	REMOVED			71	BOEING CO. – 75 YEAR LEASE		47.4'	96	RW14R GLIDE SLOPE EQUIP. BLDG.		27.4'
22	VACANT	7607 PERIMETER ROAD SOUTH		47	NORTH EQUIPMENT SHED (TBR)		35.8'	72	BOEING CO. – 75 YEAR LEASE		32.9'	97	FAA EQUIP. BLDG.		32.0'
23	UPS	7585 PERIMETER ROAD SOUTH	38.3'	48	EXISTING FAA FLIGHT SERVICES STATION FUTURE AIRPORT ADMIN. OFFICES	6610 ELLIS AVE.	34.4'	73	BOEING CO. – 75 YEAR LEASE		105.0'	98	RW14R LOCALIZER EQUIP. BLDG.		32.9'
24	UPS SORT SHACK	75XX PERIMETER ROAD SOUTH	34.9'	49	KC DNR WASTEWATER	6640 ELLIS AVE.	39.9'	74	BOEING CO. – 75 YEAR LEASE		106.9'				
25	UPS	7500 PERIMETER ROAD SOUTH		50	FUTURE AIRPORT MAINT. REDEV	6736 ELLIS AVE.	42.4'	75	BOEING CO. – 75 YEAR LEASE		82.0'				

(TBR) TO BE REMOVED

* TOP ELEVATIONS FROM AGIS SURVEY BY WOOLPERT, INC. (AUGUST 2016)

SPONSOR APPROVAL

NAME/TITLE DATE

FAA APPROVAL

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA	RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA	ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	TSA
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
ILS CRITICAL AREAS		N/A
AIRPORT PROPERTY LINE		
FENCE (8')		
AIRFIELD PAVEMENT		
AIRFIELD SHOULDER PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE		
PART 77 APPROACH SURFACE		
THRESHOLD SITING SURFACE		
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
FUEL STORAGE	F	F
BEACON		N/A
WINDSOCK		N/A
PRECISION APPROACH PATH INDICATOR (PAPI)		N/A
TAXIWAY HOLDLINES AND SIGNS		
SURVEY MONUMENTS	MON. A	N/A
AIRPORT SUPPORT VEHICLE ACCESS LANES		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		
ACCESS CORRIDORS (THROUGH-THE-FENCE)		
FUTURE DEVELOPMENT AREAS		

Mead & Hunt

Mead and Hunt, Inc.
Cherry Street Building
1616 East 15th Street
Tulsa, OK 74120
phone: 918-585-8844
meadhunt.com

KING COUNTY INT'L/BOEING FIELD AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

NOT FOR CONSTRUCTION

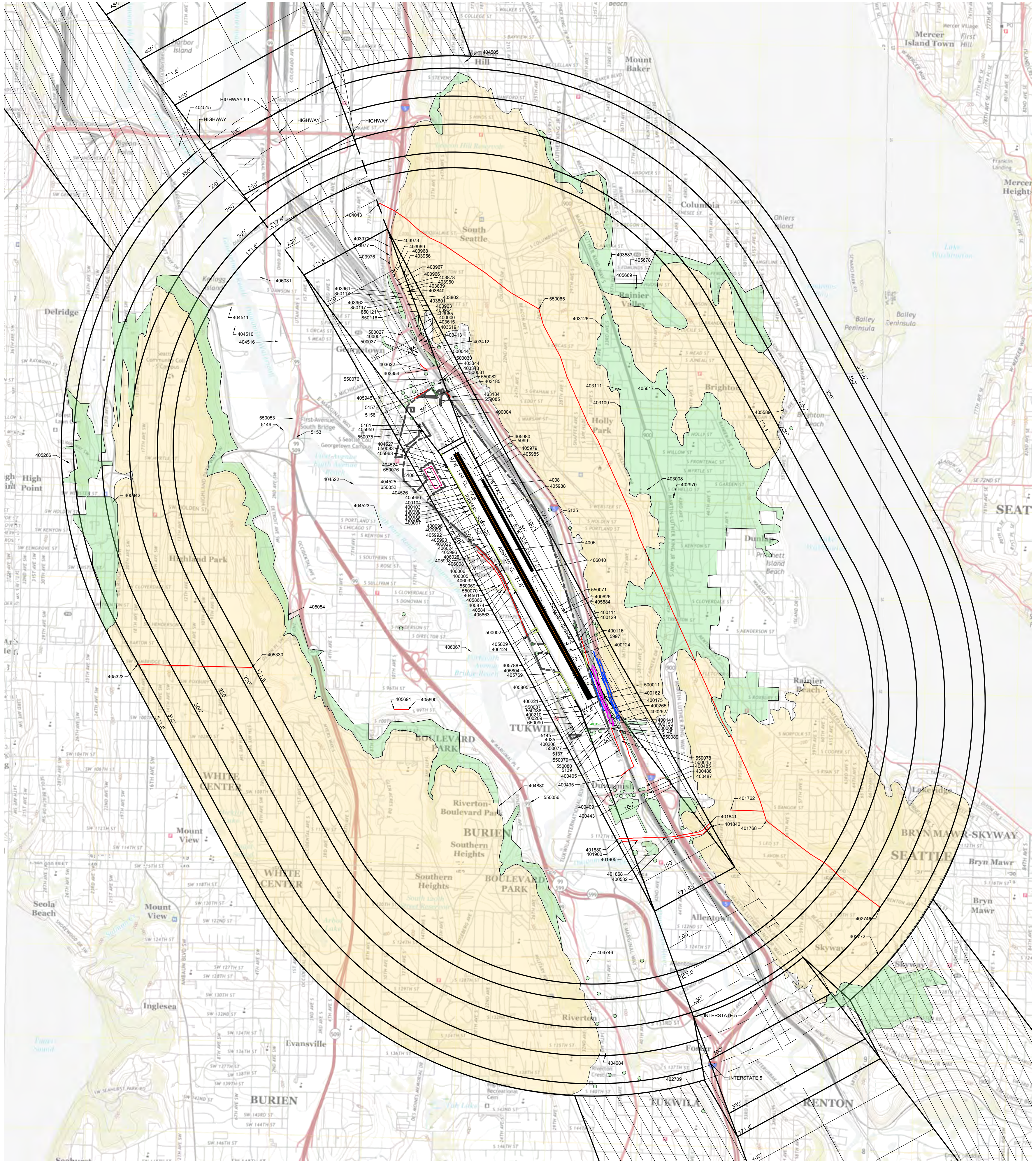
AIP NO.:	X-XX-XXXX-XX
M&H NO.:	3231200-162066.01
DATE:	OCTOBER 2021
DESIGNED BY:	M&H
DRAWN BY:	JWB
CHECKED BY:	CDF

DO NOT SCALE DRAWINGS

Figure ES2

Airport Layout Drawing

xlv



OBSTRUCTIONS

OB#	DESC	ELEV	SURFACE	PEN	DISP
4005	OL WSK	24.14	PRIMARY	6.97	OL
4008	OL WSK	25.39	PRIMARY	7.97	OL
4035	OL DME	36.90	RW32L APP	10.02	OL
5108	ANTENNA	141.82	TRANSITIONAL	42.56	TBS*
5135	ANTENNA	110.84	TRANSITIONAL	10.61	TBS*
5137	OL ON LP	63.01	TRANSITIONAL	27.96	OL
5139	OL ON BLDG	49.37	RW32L APP	4.50	OL
5145	ANTENNA	101.02	TRANSITIONAL	7.22	TBS*
5148	OL ON CELL TOWER	94.98	TRANSITIONAL	36.33	OL
5149	TWR	235.19	HORIZONTAL	63.59	TBS*
5153	DRAWBRIDGE WHEN OPEN	177.38	HORIZONTAL	5.78	TBS*
5156	PP	65.59	RW14R APP	2.71	TBS*
5157	PP	65.15	RW14R APP	2.27	TBS*
5161	OL	101.34	RW14R APP	59.28	OL
5997	GS 32L OL	62.83	PRIMARY	42.34	OL
5999	GS 14R OL	44.87	PRIMARY	27.28	OL
400000	ANTENNA	145.47	RW14R APP	38.91	TBS*
400001	SMOKESTACK	120.25	RW14R APP	30.92	TBS*
400095	LIGHT POLE	33.78	TRANSITIONAL	9.70	TBS*
400096	LIGHT POLE	34.95	TRANSITIONAL	10.80	TBS*
400097	LIGHT POLE	41.22	TRANSITIONAL	0.05	TBS*
400098	LIGHT POLE	41.59	TRANSITIONAL	0.36	TBS*
400099	LIGHT POLE	34.71	TRANSITIONAL	10.49	TBS*
400100	LIGHT POLE	34.87	TRANSITIONAL	10.65	TBS*
400103	LIGHT POLE	35.34	TRANSITIONAL	11.02	TBS*
400104	LIGHT POLE	34.73	TRANSITIONAL	10.53	TBS*
400111	BUILDING	39.20	TRANSITIONAL	2.36	TBS*
400116	LIGHT POLE	40.19	TRANSITIONAL	0.46	TBS*
400124	FENCE	31.91	TRANSITIONAL	1.90	TBS*
400129	UTILITY POLE	63.27	TRANSITIONAL	4.61	TBS*
400141	RAILROAD	45.72	RW32L APP	6.40	TBS*
400156	RAILROAD	47.73	RW32L APP	6.20	TBS*
400162	OVERHEAD SIGN	98.21	TRANSITIONAL	67.73	TBS*
400175	ROAD	36.02	RW32L APP	7.03	TBS*
400208	LIGHT POLE	64.21	TRANSITIONAL	31.67	TBS*
400209	LIGHT POLE	66.10	TRANSITIONAL	36.46	TBS*
400210	LIGHT POLE	64.13	TRANSITIONAL	37.43	TBS*
400221	LIGHT POLE	50.80	TRANSITIONAL	1.69	TBS*
400262	INTERSTATE	54.88	RW32L APP	14.23	TBS*
400265	INTERSTATE	62.38	TRANSITIONAL	19.16	TBS*
400405	UTILITY POLE	59.78	RW32L APP	0.74	TBS*
400409	UTILITY POLE	93.51	RW32L APP	18.93	TBS*
400435	UTILITY POLE	79.12	RW32L APP	3.64	TBS*
400485	LIGHT POLE	93.20	RW32L APP	2.51	TBS*
400486	LIGHT POLE	104.78	RW32L APP	10.77	TBS*
400487	LIGHT POLE	105.17	RW32L APP	9.05	TBS*
400532	UTILITY POLE	157.88	RW32L APP	24.67	TBS*
400626	BUILDING	34.90	TRANSITIONAL	0.21	TBS*
401762	UTILITY POLE	416.28	HORIZONTAL	244.68	TBS*
401768	UTILITY POLE	445.51	HORIZONTAL	273.91	TBS*
401841	POWER LINE	291.95	TRANSITIONAL	122.56	TBS*
401842	POWER LINE	281.29	TRANSITIONAL	116.14	TBS*
401868	POWER LINE	177.77	RW32L APP	48.43	TBS*
401880	POWER LINE	163.51	TRANSITIONAL	5.18	TBS*
401900	POWER LINE	153.54	TRANSITIONAL	4.34	TBS*
401905	POWER LINE	154.69	RW32L APP	32.79	TBS*
402709	BUILDING	261.76	CONICAL	94.97	TBS*
402746	UTILITY POLE	467.88	CONICAL	168.18	TBS*
402772	WATER TOWER	567.75	CONICAL	215.98	TBS*
402970	BUILDING	215.84	HORIZONTAL	44.24	TBS*
403008	BUILDING	196.62	HORIZONTAL	25.02	TBS*
403109	BUILDING	174.16	HORIZONTAL	2.56	TBS*
403111	UTILITY POLE	174.70	HORIZONTAL	3.10	TBS*
403126	UTILITY POLE	192.33	HORIZONTAL	20.73	TBS*
403184	UTILITY POLE	68.35	TRANSITIONAL	11.44	TBS*
403185	UTILITY POLE	69.42	RW14R APP	14.46	TBS*
403343	LIGHT POLE	84.23	RW14R APP	20.56	TBS*
403344	LIGHT POLE	83.45	RW14R APP	18.98	TBS*
403354	UTILITY POLE	99.20	RW14R APP	23.85	TBS*
403412	LIGHT POLE	124.30	RW14R APP	35.42	TBS*
403413	LIGHT POLE	127.69	RW14R APP	33.17	TBS*
403587	BUILDING	172.22	HORIZONTAL	0.62	TBS*
403615	LIGHT POLE	135.48	RW14R APP	35.09	TBS*
403619	OVERHEAD SIGN	108.08	RW14R APP	12.2	TBS*
403622	LIGHT POLE	80.98	RW14R APP	3.33	TBS*
403801	UTILITY POLE	158.94	RW14R APP	33.17	TBS*
403802	UTILITY POLE	179.23	RW14R APP	49.89	TBS*
403839	UTILITY POLE	185.71	RW14R APP	54.4	TBS*
403840	BUILDING	151.92	RW14R APP	20.35	TBS*
403878	NATURAL HIGH POINT	156.57	RW14R APP	20.63	TBS*
403956	BUILDING	192.77	RW14R APP	49.4	TBS*
403960	LIGHT POLE	183.80	RW14R APP	48.25	TBS*
403961	LIGHT POLE	172.22	RW14R APP	39.67	TBS*
403962	LIGHT POLE	174.97	RW14R APP	45.43	TBS*
403963	LIGHT POLE	169.57	RW14R APP	45.65	TBS*
403964	LIGHT POLE	162.72	RW14R APP	44.55	TBS*
403965	LIGHT POLE	154.06	RW14R APP	41.68	TBS*
403967	LIGHT POLE	191.24	RW14R APP	49.37	TBS*
403968	LIGHT POLE	174.17	RW14R APP	28.89	TBS*
403969	LIGHT POLE	196.79	RW14R APP	48.64	TBS*
403972	LIGHT POLE	200.11	RW14R APP	33.86	TBS*
403973	LIGHT POLE	190.08	RW14R APP	18.31	TBS*
403976	LIGHT POLE	203.63	RW14R APP	49.34	TBS*

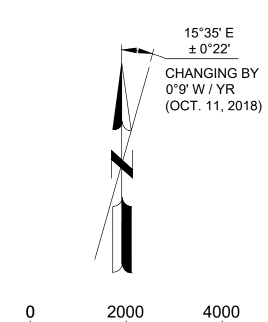
TBS* – TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE
OL – OBSTACLE LIGHT OR OBSTRUCTION LIGHTED

OB#	DESC	ELEV	SURFACE	PEN	DISP
403977	LIGHT POLE	206.04	RW14R APP	46.54	TBS*
404043	POWER LINE	215.43	HORIZONTAL	43.83	TBS*
404505	BUILDING	376.55	CONICAL	15.51	TBS*
404510	SMOKESTACK	269.09	HORIZONTAL	97.49	TBS*
404511	TANK	174.11	HORIZONTAL	2.51	TBS*
404515	LIFT BRIDGE	207.23	CONICAL	54.32	TBS*
404516	SMOKESTACK	181.03	HORIZONTAL	9.43	TBS*
404522	CRANE	182.12	HORIZONTAL	10.52	TBS*
404523	CRANE	180.44	HORIZONTAL	8.84	TBS*
404524	LIGHT POLE	51.05	PRIMARY	33.38	TBS*
404525	LIGHT POLE	51.06	PRIMARY	33.45	TBS*
404526	LIGHT POLE	50.42	PRIMARY	32.88	TBS*
404561	BUILDING	79.15	TRANSITIONAL	14.86	TBS*
404684	UTILITY POLE	317	CONICAL	21.22	TBS*
404746	BUILDING	183.39	HORIZONTAL	11.79	TBS*
404880	UTILITY POLE	236.57	HORIZONTAL	64.97	TBS*
405054	UTILITY POLE	208.40	HORIZONTAL	36.80	TBS*
405266	BUILDING	362.7	CONICAL	5.47	TBS*
405323	UTILITY POLE	490.13	CONICAL	139.70	TBS*
405330	UTILITY POLE	504.66	CONICAL	329.66	TBS*
405342	UTILITY POLE	370.94	CONICAL	83.96	TBS*
405589	UTILITY POLE	223.51	CONICAL	0.71	TBS*
405669	BUILDING	192.95	HORIZONTAL	21.35	TBS*
405678	BUILDING	190.43	HORIZONTAL	18.83	TBS*
405690	UTILITY POLE	181.76	HORIZONTAL	10.16	TBS*
405691	UTILITY POLE	214.52	HORIZONTAL	42.92	TBS*
405769	BUILDING	87.23	TRANSITIONAL	0.08	TBS*
405788	BUILDING	37.77	TRANSITIONAL	0.70	TBS*
405804	FENCE	21.15	PRIMARY	2.33	TBS*
405805	FENCE	23.44	PRIMARY	3.68	TBS*
405829	FENCE	23.48	PRIMARY	4.38	TBS*
405841	UTILITY POLE	78.29	TRANSITIONAL	18.76	TBS*
405863	FENCE	22.87	PRIMARY	4.83	TBS*
405866	LIGHT POLE	47.14	TRANSITIONAL	25.56	TBS*
405874	UTILITY POLE	86.22	TRANSITIONAL	10.91	TBS*
405884	BUILDING	39.30	TRANSITIONAL	1.42	TBS*
405945	UTILITY POLE	72.49	RW14R APP	4.57	TBS*
405959	BUILDING	98.94	RW14R APP	59.66	TBS*
405963	FENCE	25.62	PRIMARY	7.92	TBS*
405966	FENCE	25.17	PRIMARY	7.66	TBS*
405979	NATURAL HIGH POINT	18.18	PRIMARY	0.59	TBS*
405980	NATURAL HIGH POINT	19.02	PRIMARY	1.35	TBS*
405985	AIRFIELD SIGN	18.33	PRIMARY	0.85	TBS*
405988	AIRFIELD SIGN	18.82	PRIMARY	1.67	TBS*
405992	AIRFIELD SIGN	17.32	PRIMARY	0.18	TBS*
405996	UTILITY POLE	94.40	TRANSITIONAL	13.64	TBS*
405998	UTILITY POLE	95.39	TRANSITIONAL	30.68	TBS*
406005	LIGHT POLE	50.52	TRANSITIONAL	24.84	TBS*
406006	LIGHT POLE	61.33	TRANSITIONAL	26.35	TBS*
406008	LIGHT POLE	37.22	TRANSITIONAL	2.81	TBS*
406022	LIGHT POLE	59.63	TRANSITIONAL	22.54	TBS*
406024	LIGHT POLE	41.03	TRANSITIONAL	1.97	TBS*
406025	LIGHT POLE	41.03	TRANSITIONAL	8.17	TBS*
406032	FENCE	22.87	PRIMARY	5.56	TBS*
406040	AIRFIELD SIGN	19.51	PRIMARY	0.88	TBS*
406067	CRANE	181.00	HORIZONTAL	9.40	TBS*
406081	SMOKESTACK	172.10	HORIZONTAL	0.50	TBS*
406124	UTILITY POLE	76.92	TRANSITIONAL	2.77	TBS*
500002	T-L TWR	80.81	TRANSITIONAL	3.16	TBS*
500008	ELEC SYS	64.42	RW32L APP	20.87	TBS*
500011	GEN UTIL	21.45	PRIMARY	0.48	TBS*
500027	T-L TWR	121.34	RW14R APP	15.13	TBS*
500030	POLE	104.56	RW14R APP	31.27	TBS*
500031	POLE	81.06	RW14R APP	17.79	TBS*
500037	BLDG	92.61	RW14R APP	4.28	TBS*
500044	TOWER	96.42	RW14R APP	20.82	TBS*
500045	TOWER	71.91	RW32L APP	17.89	TBS*
550053	T-L TWR	237.00	HORIZONTAL	65.40	TBS*
550056	T-L TWR	177.00	HORIZONTAL	5.40	TBS*
550065	T-L TWR	445.00	HORIZONTAL	273.40	TBS*
550069	CTRL TWR	116.00	TRANSITIONAL	93.23	TBS*
550070	BLDG	108.00	TRANSITIONAL	15.39	TBS*
550071	BLDG	35.00	TRANSITIONAL	0.72	TBS*
550075	BLDG	101.00	RW14R APP	66.9	TBS*
550076	BLDG	77.00	RW14R APP	6.98	TBS*
550077	NAVAID	28.00	RW32L APP	0.69	REMOVE
550078	POLE	55.00	RW32L APP	12.60	REMOVE
550079	POLE	55.00	RW32L APP	12.35	REMOVE
550080	BLDG	50.00	RW32L APP	5.84	TBS*
550082	T-L TWR	66.00	RW14R APP	10.22	TBS*
550083	POLE	53.00	PRIMARY	35.27	TBS*
550085	T-L TWR	60.00	RW14R APP	8.47	TBS*
550087	POLE	65.00	PRIMARY	41.57	TBS*
550088	POLE	65.00	TRANSITIONAL	40.63	TBS*
550089	T-L TWR	63.00	RW32L APP	16.02	TBS*
650052	BTWR	146.98	TRANSITIONAL	40.78	TBS*
650076	BTWR	148.95	TRANSITIONAL	42.67	TBS*
650090	BANT	99.41	TRANSITIONAL	6.75	TBS*
850116	Other w/o Antenna	153.00	RW14R APP	32.37	TBS*
850117	Other w/o Antenna	166.00	RW14R APP	38.42	TBS*
850118	Other w/o Antenna	168.00	RW14R APP	36.86	TBS*
850121	Other w/o Antenna	161.00	RW14R APP	36.92	TBS*

TBS* – TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE

NOTES

1. This drawing reflects planning standards applicable to KCIA/Boeing Field to the greatest extent possible.
2. Coordinate data is NAD83. Elevation data is NAVD88. Survey dated 02/02/15.
3. Existing Runway 14R/32L Prior Permission Required Pavement (PPRP) only available for south departures with Airport Staff approval.
4. Runway elevations from Woolpert, Inc. survey dated 02/02/15.
5. USGS Quadrangle county composite King County, WA 2015.



REVISIONS

NO.	DATE.	BY	DESCRIPTION	PROJECT ENGR/ARCH
				DESIGNER
				DRAWN BY
				DATE
				CHECKED BY
				APPROVED BY

LAYOUT LEGEND

ITEM		
FAA PART 77 CONTOUR LINE	171.65'	
TERRAIN OBSTRUCTING AREA INCLUDING TREES		
TREE OBSTRUCTING AREA		
PART 77 OBSTRUCTIONS	00000	
PART 77 ROADWAY OBSTRUCTIONS		
PART 77 RAIL OBSTRUCTIONS		
PART 77 OVERHEAD LINE OBSTRUCTIONS		
PART 77 FENCE OBSTRUCTIONS		
AIRPORT PROPERTY LINE	P	

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Tulsa, OK 74120
phone: 918-585-8844
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KING COUNTY INT'L/BOEING FIELD AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

NOT FOR CONSTRUCTION

M&H NO.: 3231200-162066.01
DATE: OCTOBER 2021
DESIGNED BY: M&H
DRAWN BY: JWB
CHECKED BY: CF
DO NOT SCALE DRAWINGS

Figure ES3

Airport Airspace Drawing

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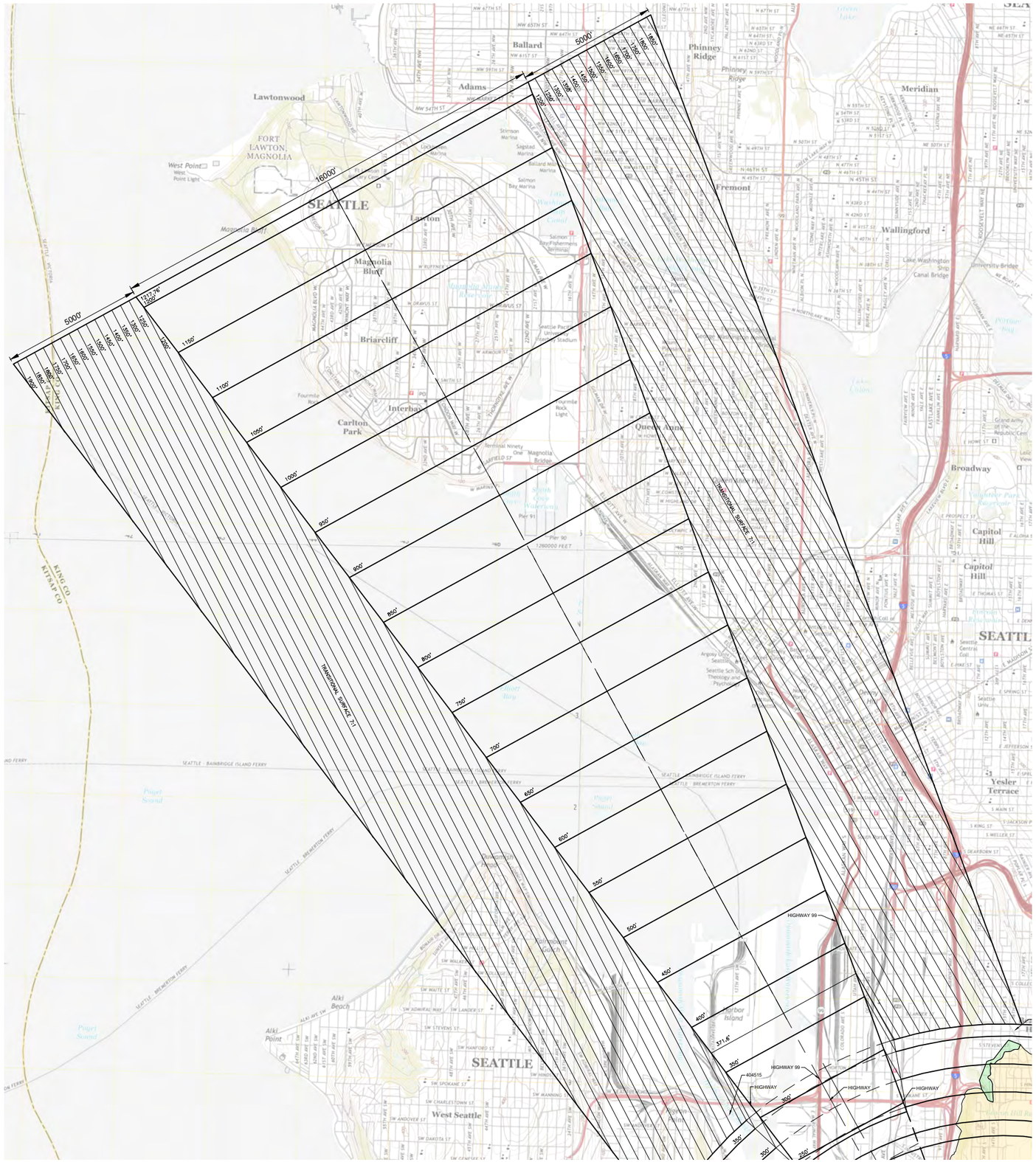

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15°35' E
± 0°22'
CHANGING BY
0°9' W / YR
(OCT. 11, 2018)

REVISIONS

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LAYOUT LEGEND

ITEM		
FAA PART 77 CONTOUR LINE	171.65'	
TERRAIN OBSTRUCTING AREA INCLUDING TREES		
TREE OBSTRUCTING AREA		
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Figure ES4

Airport Airspace Drawing - North Approach

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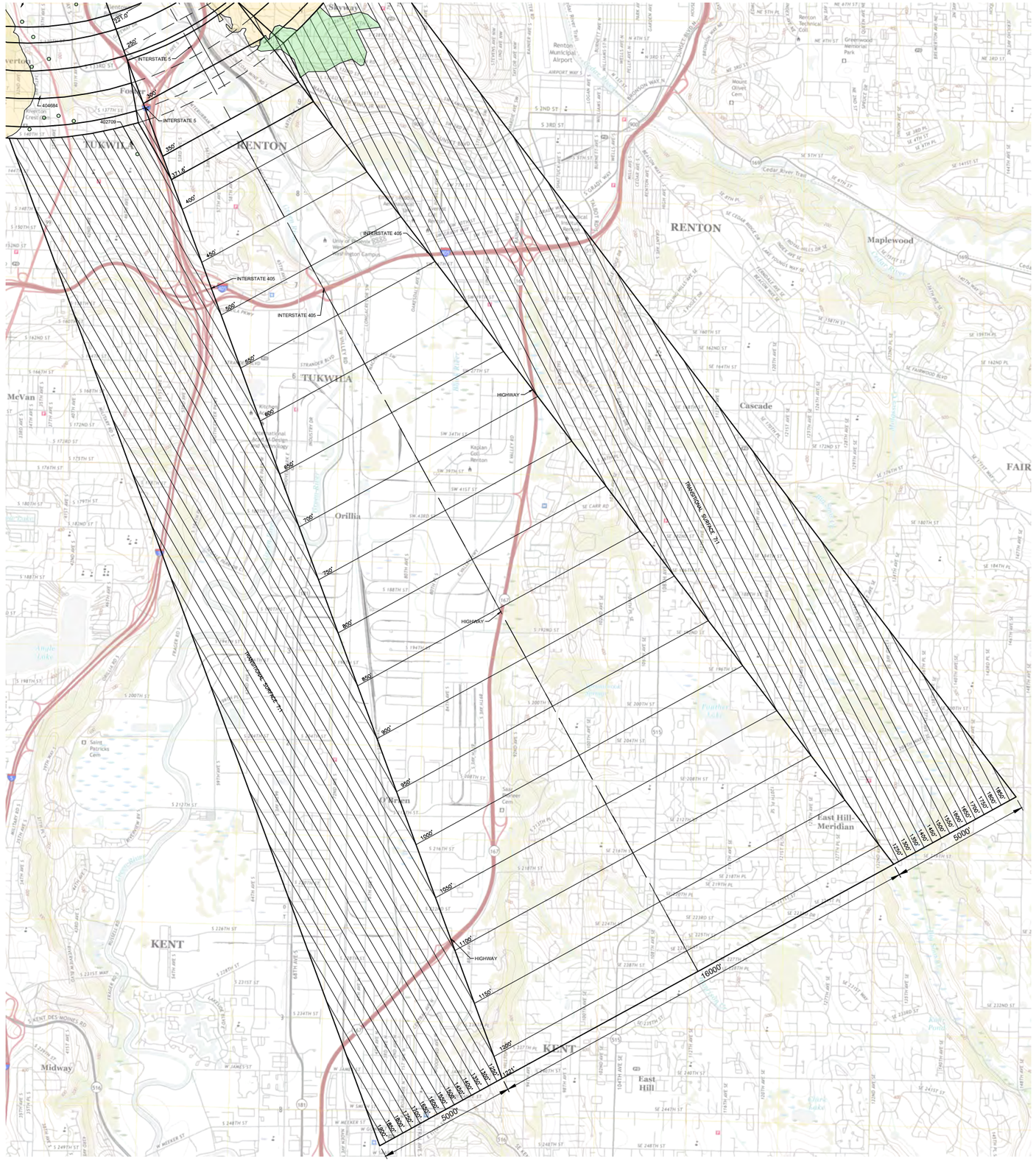

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5. USGS Quadrangle county composite King County, WA 2015.

15°35' E
± 0°22'
CHANGING BY
0°9' W / YR
(OCT. 11, 2018)

0 2000 4000

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LAYOUT LEGEND

ITEM		
FAA PART 77 CONTOUR LINE	171.65'	
TERRAIN OBSTRUCTING AREA INCLUDING TREES		
TREE OBSTRUCTING AREA		
PART 77 OBSTRUCTIONS	00000	
PART 77 ROADWAY OBSTRUCTIONS		
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AIRPORT PROPERTY LINE		

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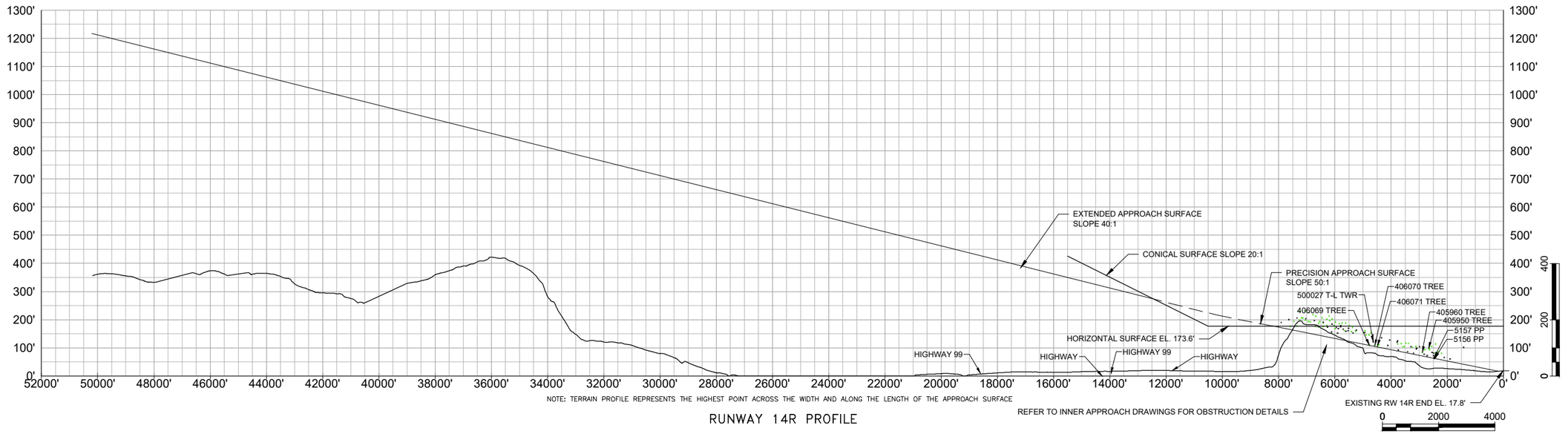
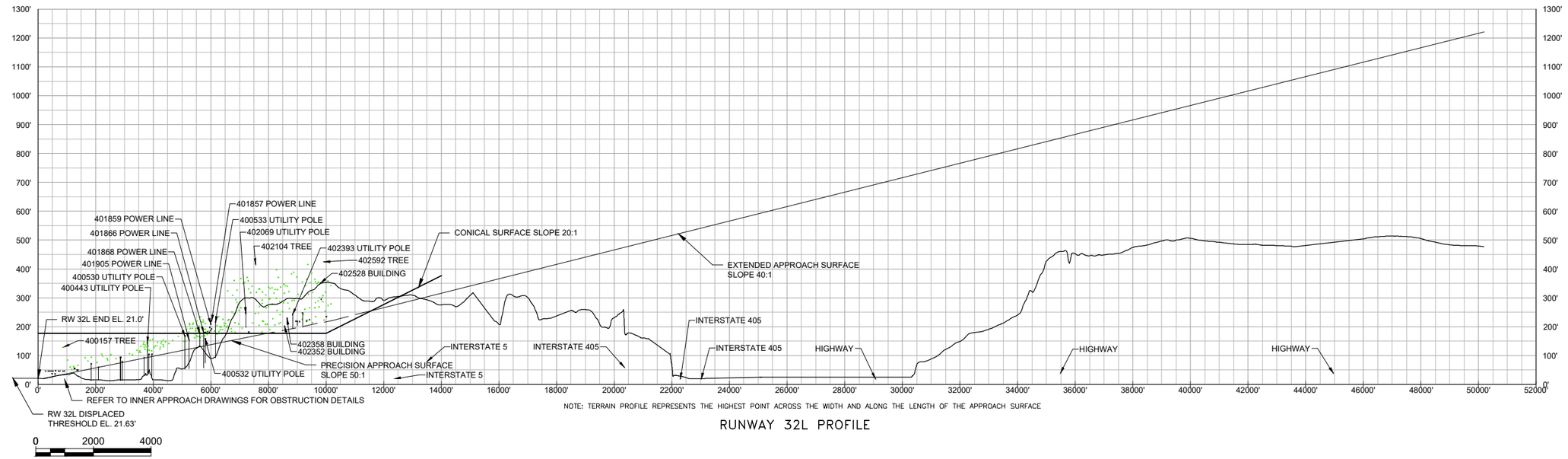
Figure ES5

Airport Airspace Drawing - South Approach



RUNWAY 14R PROFILE



RUNWAY 32L PROFILE

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				DATE
				CHECKED BY
				APPROVED BY

LAYOUT LEGEND		
ITEM		
FAA PART 77 CONTOUR LINE	171.65'	
TERRAIN OBSTRUCTING AREA INCLUDING TREES		
TREE OBSTRUCTING AREA		
PART 77 OBSTRUCTIONS	X	
PART 77 OBSTRUCTIONS – TREES	X	
PART 77 ROADWAY OBSTRUCTIONS		
PART 77 RAIL OBSTRUCTIONS		
PART 77 OVERHEAD LINE OBSTRUCTIONS		
PART 77 FENCE OBSTRUCTIONS		
AIRPORT PROPERTY LINE		

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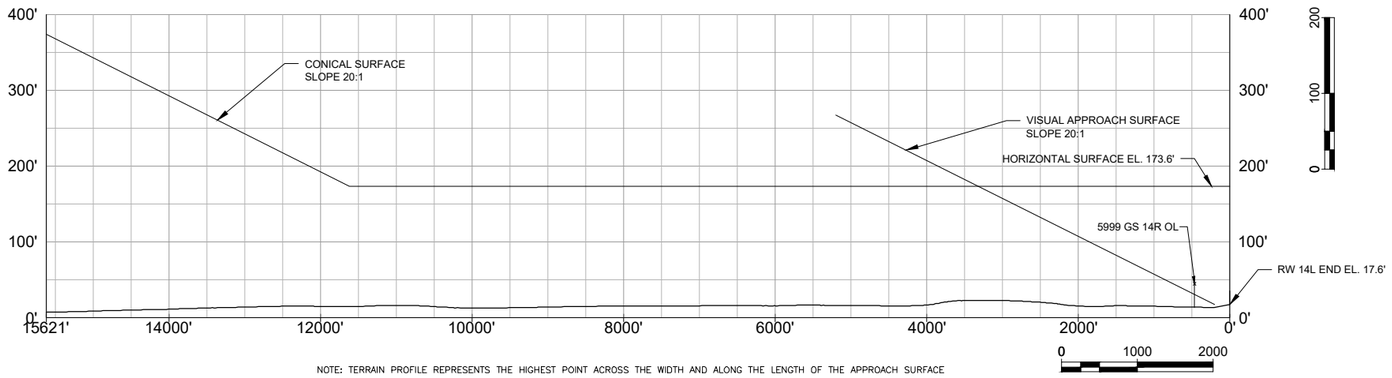
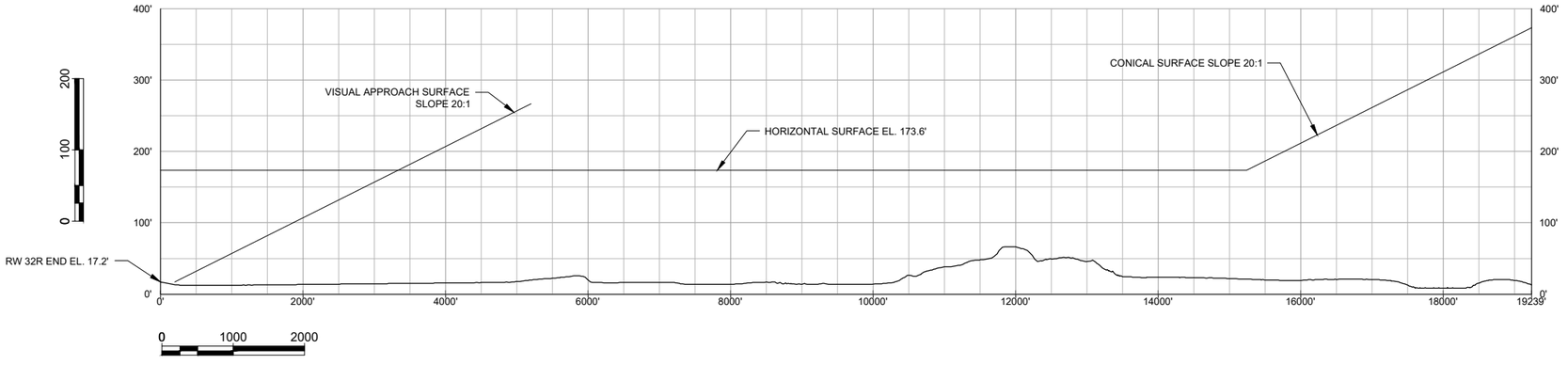
Figure ES6

Airport Airspace Drawing - Runway 14R/32L



NOTE: TERRAIN PROFILE REPRESENTS THE HIGHEST POINT ACROSS THE WIDTH AND ALONG THE LENGTH OF THE APPROACH SURFACE

RUNWAY 14L PROFILE



NOTE: TERRAIN PROFILE REPRESENTS THE HIGHEST POINT ACROSS THE WIDTH AND ALONG THE LENGTH OF THE APPROACH SURFACE

RUNWAY 32R PROFILE

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LAYOUT LEGEND		
ITEM		
FAA PART 77 CONTOUR LINE	171.65'	
TERRAIN OBSTRUCTING AREA INCLUDING TREES		
TREE OBSTRUCTING AREA		
PART 77 OBSTRUCTIONS	X	
PART 77 OBSTRUCTIONS – TREES	X	
PART 77 ROADWAY OBSTRUCTIONS		
PART 77 RAIL OBSTRUCTIONS		
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AIRPORT PROPERTY LINE		

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Figure ES7

Airport Airspace Drawing - Runway 14L/32R

L

FULL LIST OBSTRUCTIONS TO PART 77 APPROACH SURFACE

POINT	DESCRPTION	NORTHING	EASTING	ELEVATION (TOP)	SURFACE	PENETRATION	DOF/ASR REF#	DISPOSITION
5156	PP	202749.90	1274078.92	62.59	RW 14R APPROACH	2.71		*TBS
5157	PP	202842.17	1274206.07	65.15	RW 14R APPROACH	2.27		*TBS
5161	OL	201646.02	1274189.51	101.34	RW 14R APPROACH	59.28		OL
400000	ANTENNA	205177.85	1273924.44	145.47	RW 14R APPROACH	38.91		*TBS
400001	SMOKESTACK	204255.61	1274034.21	120.25	RW 14R APPROACH	30.92		*TBS
400006	TREE	202969.62	1274517.83	82.08	RW 14R APPROACH	19.96		*TBS
403185	UTILITY POLE	202850.74	1275047.41	69.42	RW 14R APPROACH	14.46		*TBS
403343	LIGHT POLE	203268.19	1274901.86	84.23	RW 14R APPROACH	20.56		*TBS
403344	LIGHT POLE	203244.34	1274774.71	83.45	RW 14R APPROACH	18.98		*TBS
403345	TREE	203127.55	1274533.45	104.87	RW 14R APPROACH	40.12		*TBS
403346	TREE	202888.55	1274601.54	85.20	RW 14R APPROACH	25.30		*TBS
403347	TREE	202796.53	1274672.08	80.60	RW 14R APPROACH	22.99		*TBS
403353	TREE	203815.10	1274631.13	105.79	RW 14R APPROACH	29.92		*TBS
403354	UTILITY POLE	203640.18	1274365.30	99.20	RW 14R APPROACH	23.85		*TBS
403355	UTILITY POLE	203768.05	1274172.75	104.09	RW 14R APPROACH	24.65		*TBS
403356	TREE	203518.92	1274316.08	87.72	RW 14R APPROACH	14.02		*TBS
403359	UTILITY POLE	202960.91	1274375.85	72.59	RW 14R APPROACH	9.25		*TBS
403412	LIGHT POLE	204425.61	1274392.25	124.30	RW 14R APPROACH	35.42		*TBS
403413	LIGHT POLE	204645.81	1274207.26	127.69	RW 14R APPROACH	33.17		*TBS
403490	TREE	204594.79	1274416.44	115.09	RW 14R APPROACH	23.48		*TBS
403491	TREE	204904.39	1274178.37	125.60	RW 14R APPROACH	26.28		*TBS
403560	UTILITY POLE	203868.55	1274099.74	86.22	RW 14R APPROACH	4.31		*TBS
403563	TREE	203926.01	1274566.05	102.20	RW 14R APPROACH	23.77		*TBS
403564	TREE	204034.86	1274471.54	115.62	RW 14R APPROACH	34.37		*TBS
403565	TREE	204037.62	1274617.37	118.24	RW 14R APPROACH	38.34		*TBS
403566	TREE	204149.65	1274491.47	116.93	RW 14R APPROACH	33.85		*TBS
403567	TREE	204144.90	1274371.44	104.58	RW 14R APPROACH	20.43		*TBS
403568	TREE	204240.10	1274319.75	114.61	RW 14R APPROACH	28.29		*TBS
403569	TREE	204346.57	1274251.36	113.40	RW 14R APPROACH	24.56		*TBS
403570	TREE	204240.59	1274422.39	103.66	RW 14R APPROACH	18.32		*TBS
403610	TREE	205049.47	1274112.48	152.23	RW 14R APPROACH	49.73		*TBS
403611	TREE	205178.25	1274093.53	152.09	RW 14R APPROACH	47.14		*TBS
403612	TREE	205305.63	1274020.73	153.44	RW 14R APPROACH	45.56		*TBS
403613	TREE	205245.88	1273769.38	145.75	RW 14R APPROACH	36.50		*TBS
403614	TREE	205340.93	1273722.67	145.21	RW 14R APPROACH	33.85		*TBS
403615	LIGHT POLE	204895.93	1274052.14	135.48	RW 14R APPROACH	35.09		*TBS
403618	TREE	204904.93	1273886.10	111.33	RW 14R APPROACH	9.18		*TBS
403619	OVERHEAD SIGN	204646.65	1274066.08	108.08	RW 14R APPROACH	12.20		*TBS
403622	LIGHT POLE	203665.81	1274173.55	80.98	RW 14R APPROACH	3.33		*TBS
403711	TREE	205500.84	1273935.55	160.17	RW 14R APPROACH	48.05		*TBS
403712	TREE	205608.42	1273900.01	153.25	RW 14R APPROACH	38.90		*TBS
403713	TREE	205723.30	1273882.42	197.45	RW 14R APPROACH	80.91		*TBS
403714	TREE	205837.47	1273828.33	186.02	RW 14R APPROACH	66.96		*TBS
403715	TREE	205917.32	1273765.96	172.61	RW 14R APPROACH	51.55		*TBS
403716	TREE	206027.45	1273718.02	178.86	RW 14R APPROACH	55.41		*TBS
403717	TREE	206138.04	1273672.59	188.01	RW 14R APPROACH	62.18		*TBS
403718	TREE	206248.56	1273613.98	188.15	RW 14R APPROACH	59.82		*TBS
403719	TREE	206343.42	1273572.44	185.63	RW 14R APPROACH	55.24		*TBS
403720	TREE	206466.61	1273515.89	191.97	RW 14R APPROACH	58.88		*TBS
403721	TREE	206585.05	1273475.79	202.77	RW 14R APPROACH	67.21		*TBS
403722	TREE	206701.20	1273472.15	212.94	RW 14R APPROACH	75.31		*TBS
403723	TREE	206037.01	1273876.44	178.13	RW 14R APPROACH	56.03		*TBS
403725	TREE	206010.77	1273324.13	160.77	RW 14R APPROACH	33.83		*TBS
403726	TREE	205757.99	1273396.32	157.34	RW 14R APPROACH	35.52		*TBS
403727	TREE	205649.55	1273504.11	158.89	RW 14R APPROACH	40.01		*TBS
403728	TREE	206380.30	1273244.34	179.41	RW 14R APPROACH	45.22		*TBS
403729	TREE	206506.95	1273168.97	195.82	RW 14R APPROACH	58.69		*TBS
403730	TREE	206589.67	1273107.02	179.02	RW 14R APPROACH	39.84		*TBS
403731	TREE	206709.73	1273065.05	176.41	RW 14R APPROACH	34.72		*TBS
403801	UTILITY POLE	206192.85	1273778.63	158.94	RW 14R APPROACH	33.17		*TBS
403802	UTILITY POLE	206343.39	1273682.51	179.23	RW 14R APPROACH	49.89		*TBS
403839	UTILITY POLE	206475.43	1273717.17	185.71	RW 14R APPROACH	54.40		*TBS
403840	BUILDING	206435.17	1273616.54	151.92	RW 14R APPROACH	20.35		*TBS
403841	TREE	206535.15	1273609.88	168.00	RW 14R APPROACH	34.60		*TBS
403842	TREE	206615.46	1273676.50	194.81	RW 14R APPROACH	60.65		*TBS
403878	NATURAL HIGH POINT	206662.39	1273576.68	156.57	RW 14R APPROACH	20.63		*TBS
403879	TREE	206808.01	1273486.53	202.27	RW 14R APPROACH	62.90		*TBS
403956	BUILDING	207050.81	1273513.27	192.77	RW 14R APPROACH	49.40		*TBS
403957	TREE	206969.64	1273446.20	205.98	RW 14R APPROACH	63.39		*TBS
403958	TREE	206887.83	1273376.18	187.85	RW 14R APPROACH	46.02		*TBS
403959	TREE	207000.26	1273315.62	193.59	RW 14R APPROACH	49.21		*TBS
403960	LIGHT POLE	206529.91	1273376.34	183.80	RW 14R APPROACH	48.25		*TBS
403961	LIGHT POLE	206384.14	1273421.34	172.22	RW 14R APPROACH	39.67		*TBS
403962	LIGHT POLE	206255.11	1273499.74	174.97	RW 14R APPROACH	45.43		*TBS
403963	LIGHT POLE	205995.91	1273611.47	169.57	RW 14R APPROACH	45.65		*TBS
403964	LIGHT POLE	205725.62	1273715.43	162.72	RW 14R APPROACH	44.55		*TBS
403965	LIGHT POLE	205454.97	1273825.37	154.06	RW 14R APPROACH	41.68		*TBS
403966	LIGHT POLE	206659.89	1273282.99	173.88	RW 14R APPROACH	35.16		*TBS
403967	LIGHT POLE	206819.38	1273246.73	191.24	RW 14R APPROACH	49.37		*TBS
403968	LIGHT POLE	206954.92	1273138.76	174.17	RW 14R APPROACH	28.89		*TBS
403969	LIGHT POLE	207115.20	1273133.33	196.79	RW 14R APPROACH	48.64		*TBS
403970	TREE	206871.60	1273005.79	176.63	RW 14R APPROACH	31.53		*TBS
403971	TREE	206980.98	1272975.31	175.86	RW 14R APPROACH	28.55		*TBS
403972	LIGHT POLE	208061.46	1272976.21	200.11	RW 14R APPROACH	33.86		*TBS
403973	LIGHT POLE	208380.99	1272985.29	190.08	RW 14R APPROACH	18.31		*TBS
403976	LIGHT POLE	207420.74	1273051.21	203.63	RW 14R APPROACH	49.34		*TBS
403977	LIGHT POLE	207743.63	1272994.59	206.04	RW 14R APPROACH	45.54		*TBS
403978	TREE	207508.56	1272998.36	205.56	RW 14R APPROACH	49.22		*TBS
403979	TREE	207637.25	1272986.54	199.29	RW 14R APPROACH	40.58		*TBS
403980	TREE	207308.34	1273043.61	193.60	RW 14R APPROACH	41.21		*TBS
403982	TREE	207317.40	1273194.29	192.16	RW 14R APPROACH	41.05		*TBS
403983	TREE	207503.89	1273173.88	198.09	RW 14R APPROACH	43.51		*TBS
403984	TREE	207423.21	1273281.92	225.24	RW 14R APPROACH	73.11		*TBS
403985	TREE	207239.72	1273270.18	217.47	RW 14R APPROACH	68.46		*TBS
403986	TREE	207139.24	1273297.64	212.55	RW 14R APPROACH	65.56		*TBS
403987	TREE	207086.45	1273402.54	186.95	RW 14R APPROACH	41.89		*TBS
403988	TREE	207206.68	1273417.17	231.36	RW 14R APPROACH	84.34		*TBS
403989	TREE	207329.08	1273364.34	215.78	RW 14R APPROACH	66.10		*TBS
404081	TREE	207566.38	1273256.63	230.54	RW 14R APPROACH	75.66		*TBS
404104	TREE	207655.99	1273173.62	207.15	RW 14R APPROACH	49.90		*TBS
404105	TREE	207771.96	1273201.50	229.28	RW 14R APPROACH	70.27		*TBS
404106	TREE	207815.08	1273101.03	177.44	RW 14R APPROACH	16.71		*TBS
404107	TREE	207932.43	1273119.23	193.98	RW 14R APPROACH	31.36		*TBS
404108	TREE	208061.04	1273083.67	176.09	RW 14R APPROACH	10.88		*TBS
404142	TREE	208227.21	1273078.74	210.09	RW 14R APPROACH	41.91		*TBS
404521	TREE	202517.04	1273715.51	113.29	RW 14R APPROACH	51.40		*TBS
405945	UTILITY POLE	203227.73	1274385.63	72.49	RW 14R APPROACH	4.57		*TBS
405950	TREE	202872.18	1273872.62	99.19	RW 14R APPROACH	32.58		*TBS
405952	TREE	202825.35	1273483.46	93.28	RW 14R APPROACH	23.75		*TBS
405953	TREE	202685.11	1273570.61	93.81	RW 14R APPROACH	27.58		*TBS
405956	TREE	202377.48	1273554.93	85.75	RW 14R APPROACH	24.77		*TBS
405960	TREE	203073.32	1273752.96	84.63	RW 14R APPROACH	13.34		*TBS
406069	TREE	204696.08	1272772.80	110.47	RW 14R APPROACH	1.30		*TBS
406070	TREE	204527.91	1272886.01	108.32	RW 14R APPROACH	3.19		*TBS
406071	TREE	204476.85	1272995.37	107.30	RW 14R APPROACH	4.11		*TBS
500027	T-L TWR	204892.36	1273439.29	121.34	RW 14R APPROACH	15.13	53-021855	
500030	POLE	203711.61	1274710.08	104.56	RW 14R APPROACH	31.27	53-021865	
500031	POLE	203148.94	1274726.39	81.06	RW 14R APPROACH	17.79	53-021866	
500037	BLDG	204165.09	1273972.65	92.61	RW 14R APPROACH	4.28	53-023203	
500044	TOWER	203742.12	1274525.82	96.42	RW 14R APPROACH	20.82	53-023127	
550073	FENCE	200680.90	1274854.58	26.00	RW 14R APPROACH	7.26	53-021843	
550075	BLDG	201446.77	1274237.32	101.00	RW 14R APPROACH	62.90	53-021845	
550076	BLDG	203300.14	1274299.79	77.00	RW 14R APPROACH	6.98	53-021847	
550082	T-L TWR	202798.74	1274865.82	66.00	RW 14R APPROACH	10.22	53-021867	
550085	T-L TWR	202547.72	1274850.01	60.00	RW 14R APPROACH	8.47	53-021871	
550086	T-L TWR	202608.15	1273869.96	67.00	RW 14R APPROACH	4.99	53-021872	
850116	Other w/o Antenna	205756.57	1273517.00	153.00	RW 14R APPROACH	32.37	2003-ANM-2082-OE	
850117	Other w/o Antenna	206085.28	1273393.69	166.00	RW 14R APPROACH	38.42	2003-ANM-2083-OE	
850118	Other w/o Antenna	206250.78	1273324.85	168.00	RW 14R APPROACH	36.86	2003-ANM-2084-OE	
850121	Other w/o Antenna	205921.85	1273459.82	161.00	RW 14R APPROACH	36.92	2003-ANM-2093-OE	
4035	OL DME	191331.58	1280166.79	36.90	RW 32L APPROACH	10.02		OL
5139	OL ON BLDG	190672.33	1280835.67	49.37	RW 32L APPROACH	4.50		OL
400141	RAILROAD	191020.73	1280893.94	45.72	RW 32L APPROACH	6.40		*TBS
400142	RAILROAD	191250.00	1280809.11	45.96	RW 32L APPROACH	11.48		*TBS
400144	RAILROAD	191518.60	1280755.16	47.31	RW 32L APPROACH	18.06		*TBS
400145	RAILROAD	191362.75	1280793.00	46.52	RW 32L APPROACH	14.16		*TBS
400146	RAILROAD	191632.10	1280667.74	46.40	RW 32L APPROACH	19.97		*TBS
400147	RAILROAD	191155.69	1280859.21	46.25	RW 32L APPROACH	9.63		*TBS
400148	RAILROAD	191853.15	1280650.54	46.44	RW 32L APPROACH	24.06		*TBS
400150	RAILROAD	191730.72	1280727.50	46.44	RW 32L APPROACH	21.17		*TBS
400151	RAILROAD	191064.64	1280989.72	46.08	RW 32L APPROACH	6.61		*TBS
400152	RAILROAD	191250.00	1280921.13	46.23	RW 32L APPROACH	10.67		*TBS
400153	RAILROAD	191455.40	1280845.14	46.40	RW 32L APPROACH	15.17		*TBS
400154	RAILROAD	191636.29	1280778.75	46.44	RW 32L APPROACH	19.03		*TBS
400155	RAILROAD	191741.11	1280627.19	46.39	RW 32L APPROACH	22.27		*TBS
400156	RAILROAD	190952.61	1280999.14	47.73	RW 32L APPROACH	6.20		*TBS
400157	TREE	191331.96	1280990.97	128.80	RW 32L APPROACH	94.01		*TBS
400158	TREE	191432.73	1280994.29	86.85	RW 32L APPROACH	53.79		*TBS
400159	TREE	191516.63	1280927.04	75.11	RW 32L APPROACH	44.17		*TBS
400160	TREE	191626.63	1280910.68	86.40	RW 32L APPROACH	57.55		*TBS
400161	TREE	191752.95	1280860.51	87.96	RW 32L APPROACH	61.80		*TBS
400163	NATURAL HIGH POINT	191842.70	1280780.06	32.47	RW 32L APPROACH	8.66		*TBS
400175	ROAD	191480.02	1280657.13	36.02	RW 32L APPROACH	7.03		*TBS
400178	ROAD	191860.07	1280517.17	36.24	RW 32L APPROACH	15.27		*TBS
400205	TREE	190642.71	1280215.17	86.70	RW 32L APPROACH	47.27		*TBS
400206	TREE	190776.29	1280112.45	46.25	RW 32L APPROACH	10.15		*TBS
400250	INTERSTATE	191396.80	1281093.05	63.81	RW 32L APPROACH	29.17		*TBS
400251	TREE	191181.53	1281014.10	83.97	RW 32L APPROACH	46.31		*TBS
400253	TREE	191038.33	1281183.76	61.46	RW 32L APPROACH	19.67		*TBS
400254	TREE	190907.22	1281256.36	66.64	RW 32L APPROACH	21.85		*TBS
400255	TREE	190672.72	1281350.45	92.05	RW 32L APPROACH	42.24		*TBS
400256	TREE	190599.65	1281421.85	81.21	RW 32L APPROACH	29.43		*TBS
400257	TREE	190488.71	1281454.37	94.57	RW 32L APPROACH	40.53		*TBS
400260	INTERSTATE	191286.15	1281095.42	61.24	RW 32L APPROACH	24.64		*TBS
400261	INTERSTATE	191189.61	1281147.40	56.88	RW 32L APPROACH	18.08		*TBS
400262	INTERSTATE	191133.94	1281239.59	54.88	RW 32L APPROACH	14.23		*TBS
400263	INTERSTATE	191239.85	1281238.57	57.05	RW 32L APPROACH	18.26		*TBS
400264	INTERSTATE	191333.13	1281187.68	59.76	RW 32L APPROACH	23.10		*TBS
400300	TREE	190923.84	1281494.11	73.39	RW 32L APPROACH	26.61		*TBS
400301	TREE	190771.44	1281569.05	114.71	RW 32L APPROACH	64.53		*TBS
400304	TREE	190670.26	1281639.71	80.99	RW 32L APPROACH	28.35		*TBS
400305	TREE	190546.87	1281725.14	82.09	RW 32L APPROACH	26.48		*TBS
400383	TREE	190276.68	1281813.68	104.99	RW 32L APPROACH	43.78		*TBS
400384	TREE	190110.46	1281896.51	89.61	RW 32L APPROACH	24.69		*TBS
400385	TREE	190131.61	1281620.05	97.15	RW 32L APPROACH	35.26		*TBS
400386	TREE	189969.69	1281683.22	84.29	RW 32L APPROACH	18.94		*TBS
400387	TREE	189872.16	1281753.73	103.12	RW 32L APPROACH	35.39		*TBS
400388	TREE	189707.58	1281809.59	89.27	RW 32L APPROACH	18.11		*TBS
400389	UTILITY POLE	190105.03	1281512.63	62.89	RW 32L APPROACH	1.56		*TBS
400393	UTILITY POLE	189628.71	1281676.06	82.91	RW 32L APPROACH	11.65		*TBS
400394	UTILITY POLE	189776.73	1281614.20	78.42	RW 32L APPROACH	10.36		*TBS
400395	UTILITY POLE	189929.41	1281554.07	72.01	RW 32L APPROACH	7.20		*TBS
400398	UTILITY POLE	190214.11	1281162.71	59.83	RW 32L APPROACH	3.78		*TBS
400399	UTILITY POLE	190353.12	1281112.31	53.47	RW 32L APPROACH	0.34		*TBS
400400	UTILITY POLE	190494.81	1281060.45	56.18	RW 32L APPROACH	6.04		*TBS
400401	UTILITY POLE	190636.19	1281008.42	51.70	RW 32L APPROACH	4.53		*TBS
400405	UTILITY POLE	190073.37	1281216.52	59.78	RW 32L APPROACH	0.74		*TBS
400407	TREE	188946.64	1281403.31	106.23	RW 32L APPROACH	25.63		*TBS
400409	UTILITY POLE	189333.05	1281481.72	93.51	RW 32L APPROACH	18.93		*TBS
400411	TREE	188927.80	1281623.42	97.60	RW 32L APPROACH	14.55		*TBS
400412	TREE	188791.37	1281691.07	100.75	RW 32L APPROACH	14.67		*TBS
400413	TREE	188662.86	1281634.19	116.04	RW 32L APPROACH	28.24		*TBS
400414	TREE	188590.70	1281546.79	110.76	RW 32L APPROACH	22.54		*TBS
400415	TREE	188460.10	1281508.48	138.57	RW 32L APPROACH	48.42		*TBS
400433	POWER LINE	190547.64	1281321.34	64.78	RW 32L APPROACH	13.05		*TBS
400434	TREE	190286.65	1281504.94	76.49	RW 32L APPROACH	18.42		*TBS
400435	UTILITY POLE	189166.42	1281271.85	79.12	RW 32L APPROACH	3.64		*TBS
400436	TREE	188599.67	1281304.48	118.52	RW 32L APPROACH	32.78		*TBS
400437	TREE	188425.90	1281270.48	131.73	RW 32L APPROACH	43.27		*TBS
400438	TREE	188634.53	1281033.55	102.94	RW 32L APPROACH	20.41		*TBS
400439	TREE	188427.02	1281138.89	111.86	RW 32L APPROACH	24.69		*TBS
400448	TREE	187997.28	1281162.74	144.21	RW 32L APPROACH	49.27		*TBS
400449	TREE	187987.15	1281334.78	155.99	RW 32L APPROACH	59.22		*TBS
400451	TREE	188167.36	1281262.88	143.57	RW 32L APPROACH	50.65		*TBS
400452	TREE	188112.91	1281370.14	153.73	RW 32L APPROACH	58.83		*TBS
400453	TREE	188268.41	1281218.25	129.73	RW 32L APPROACH	39.01		*TBS
400454	TREE	188326.94	1281309.94	145.59	RW 32L APPROACH	55.01		*TBS
400455	TREE	188217.22	1281360.82	117.71	RW 32L APPROACH	24.72		*TBS
400456	TREE	188344.91	1281433.37	137.10	RW 32L APPROACH	45.65		*TBS
400457	TREE	188259.01	1281493.85	133.02	RW 32L APPROACH	39.49		*TBS
400458	TREE	188328.99	1281571.37	138.81	RW 32L APPROACH	45.76		*TBS
400459	TREE	188066.34	1281654.39	133.26	RW 32L APPROACH	34.81		*TBS
400461	TREE	188157.25	1281736.49	128.45	RW 32L APPROACH	30.80		*TBS
400462	TREE	188066.17	1281862.09	119.03	RW 32L APPROACH	18.58		*TBS
400464	TREE	187892.71	1281755.63	140.92	RW 32L APPROACH	38.45		*TBS
400465	TREE	187793.26	1281740.27	154.07	RW 32L APPROACH	50.00		*TBS
400468	TREE	188241.82	1281862.92	109.07	RW 32L APPROACH	11.69		*TBS
400469	TREE	188461.33	1281639.54	122.07	RW 32L APPROACH	30.69		*TBS
400470	TREE	188479.85	1281743.48	130.17	RW 32L APPROACH	38.11		*TBS
400471	TREE	188323.76	1281675.75	118.83	RW 32L APPROACH	24.69		*TBS
400473	TREE	187922.52	1281555.10	146.02	RW 32L APPROACH	46.00		*TBS
400474	TREE	187679.93	1281399.26	147.59	RW 32L APPROACH	44.81		*TBS
400477	TREE	187675.60	1281295.22	147.69	RW 32L APPROACH	45.83		*TBS
400478	TREE	187789.05	1281318.88	139.59	RW 32L APPROACH	39.50		*TBS
400479	TREE	187779.93	1281207.61	130.02	RW 32L APPROACH	30.84		*TBS
400485	LIGHT POLE	188801.23	1282187.98	93.20	RW 32L APPROACH	2.51		*TBS
400486	LIGHT POLE	188626.83	1282215.39	104.78	RW 32L APPROACH	10.77		*TBS
400487	LIGHT POLE	188533.65	1282265.55	105.17	RW 32L APPROACH	9.05		*TBS
400492	TREE	188447.05	1282076.99	96.58	RW 32L APPROACH	0.75		*TBS
400493	TREE	188491.05	1282170.21	116.41	RW 32L APPROACH	20.45		*TBS
400494	TREE	188643.32	1281955.84	103.45	RW 32L APPROACH	12.23		*TBS
400495	TREE	188680.43	1282058.70	108.17	RW 32L APPROACH	16.60		*TBS
400497	TREE	188274.53	1282176.59	134.13	RW 32L APPROACH	34.31		*TBS
400498	TREE	188185.02	1282232.57	129.02	RW 32L APPROACH	27.10		*TBS
400499	TREE	188018.80	1282309.07	148.51	RW 32L APPROACH	42.93		*TBS
400500	TREE	188132.74	1282344.57	114.89	RW 32L APPROACH	10.97		*TBS
400501	TREE	188055.71	1282424.16	108.66	RW 32L APPROACH	2.62		*TBS
400502	TREE	187946.12	1282379.08	127.85	RW 32L APPROACH	20.32		*TBS
400503	TREE	187820.04	1282448.65	152.63	RW 32L APPROACH	42.23		*TBS
400504	TREE	187921.67	1282487.02	124.61	RW 32L APPROACH	15.62		*TBS
400506	TREE	188268.05	1282364.34	122.25	RW 32L APPROACH	20.52		*TBS
400507	TREE	188194.25	1282448.75	137.03	RW 32L APPROACH	33.18		*TBS
400508	TREE	188226.58	1282550.89	130.35	RW 32L APPROACH	26.10		*TBS
400509	TREE	188124.56	1282574.30	126.62	RW 32L APPROACH	20.35		*TBS
400510	TREE	188025.39	1282559.24	141.69	RW 32L APPROACH	33.82		*TBS
400513	TREE	187765.99	1282575.08	124.95	RW 32L APPROACH	12.38		*TBS
400514	TREE	187636.79	1282566.97	127.99	RW 32L APPROACH	13.24		*TBS
400516	TREE	187470.27	1282690.41	120.58	RW 32L APPROACH	1.72		*TBS
400519	TREE	187914.14	1282609.17	126.96	RW 32L APPROACH	16.67		*TBS
400520	TREE	187066.75	1282929.69	137.52	RW 32L APPROACH	9.28		*TBS
400521	TREE	187210.25	1282937.30	143.95	RW 32L APPROACH	18.15		*TBS
400522	TREE	187135.78	1283045.86	131.82	RW 32L APPROACH	3.68		*TBS
400525	UTILITY POLE	186972.16	1283069.22	178.50	RW 32L APPROACH	47.26		*TBS
400527	UTILITY POLE	186948.35	1282328.48	169.76	RW 32L APPROACH	45.22		*TBS
400528	UTILITY POLE	186963.52	1282759.74	177.42	RW 32L APPROACH	49.00		*TBS
400530	UTILITY POLE	186930.04	1281723.09	167.50	RW 32L APPROACH	48.46		*TBS
400532	UTILITY POLE	186898.96	1283141.53	157.88	RW 32L APPROACH	24.67		*TBS
400533	UTILITY POLE	187081.51	1284211.31	215.46	RW 32L APPROACH	75.17		*TBS
400598	TREE	187921.77	1283712.01	166.12	RW 32L APPROACH	45.36		*TBS
400599	TREE	187891.95	1283584.59	177.06	RW 32L APPROACH	57.01		*TBS
400600	TREE	187838.50	1283498.84	190.61	RW 32L APPROACH	70.44		*TBS
400601	TREE	187810.62	1283384.48	150.46	RW 32L APPROACH	30.90		*TBS
400602	TREE	187919.60	1283433.72	149.82	RW 32L APPROACH	31.70		*TBS
400603	TREE	187991.58	1283520.33	178.00	RW 32L APPROACH	60.31		*TBS
400604	TREE	188024.78	1283695.67	119.10	RW 32L APPROACH	0.31		*TBS
400610	TREE	188118.46	1283567.07	182.90	RW 32L APPROACH	66.99		*TBS
400611	TREE	188133.14	1283440.41	166.41	RW 32L APPROACH	51.98		*TBS
400612	TREE	188242.25	1283528.04	160.03	RW 32L APPROACH	46.67		*TBS
400613	TREE	188348.27	1283460.13	167.25	RW 32L APPROACH	56.39		*TBS
401582	TREE	186514.78	1282200.67	217.02	RW 32L APPROACH	86.10		*TBS
401583	TREE	186420.43	1282276.71	210.05	RW 32L APPROACH	76.74		*TBS
401584	TREE	186347.37	1282105.56	179.96	RW 32L APPROACH	47.02		*TBS
401585	TREE	186330.16	1282226.22	172.75	RW 32L APPROACH	38.34		*TBS
401587	TREE	186724.46	1282056.30	162.05	RW 32L APPROACH	36.19		*TBS
401588	TREE	186620.23	1282199.70	189.73	RW 32L APPROACH	60.67		*TBS
401589	TREE	186713.73	1282159.24	168.48	RW 32L APPROACH	41.44		*TBS
401590	TREE	186694.29	1282272.61	183.10	RW 32L APPROACH	54.64		*TBS
401591	TREE	186776.76	1282354.66	166.12	RW 32L APPROACH	38.32		*TBS
401594	TREE	186696.76	1282448.56	177.02	RW 32L APPROACH	46.91		*TBS
401595	TREE	186575.57	1282433.22	192.18	RW 32L APPROACH	60.09		*TBS
401596	TREE	186598.57	1282537.15	168.52	RW 32L APPROACH	35.84		*TBS
401598	TREE	186500.76	1282566.53	162.34	RW 32L APPROACH	27.66		*TBS
401600	TREE	186394.01	1282576.52	142.46	RW 32L APPROACH	5.81		*TBS
401601	TREE	186480.02	1282381.50	191.05	RW 32L APPROACH	57.79		*TBS
401602	TREE	186377.38	1282396.28	185.02	RW 32L APPROACH	49.81		*TBS
401603	TREE	186126.54	1282512.03	174.12	RW 32L APPROACH	33.40		*TBS
401605	TREE	186459.27	1281789.35	165.04	RW 32L APPROACH	37.10		*TBS
401606	TREE	186346.27	1281789.44	169.11	RW 32L APPROACH	39.19		*TBS
401607	TREE	186787.05	1283120.26	149.28	RW 32L APPROACH	14.31		*TBS
401609	TREE	187290.99	1283483.95	163.08	RW 32L APPROACH	33.45		*TBS
401610	TREE	187711.42	1283417.12	182.02	RW 32L APPROACH	60.41		*TBS
401611	TREE	187601.32	1283473.60	194.14	RW 32L APPROACH	70.06		*TBS
401612	TREE	187488.87	1283476.31	175.20	RW 32L APPROACH	49.12		*TBS
401613	TREE	187736.97	1283517.74	211.13	RW 32L APPROACH	89.00		*TBS
401614	TREE	187773.72	1283611.83	206.86	RW 32L APPROACH	84.47		*TBS
401615	TREE	187811.33	1283709.92	193.85	RW 32L APPROACH	71.18		*TBS
401774	TREE	187637.48	1283576.74	207.91	RW 32L APPROACH	83.47		*TBS
401775	TREE	187673.91	1283686.48	212.13	RW 32L APPROACH	87.28		*TBS
401776	TREE	187728.31	1283810.07	214.00	RW 32L APPROACH	88.91		*TBS
401795	TREE	187517.10	1283586.41	192.85	RW 32L APPROACH	66.20		*TBS
401796	TREE	187574.10	1283672.89	185.48	RW 32L APPROACH	59.01		*TBS
401797	TREE	187594.13	1283795.18	219.50	RW 32L APPROACH	92.20		*TBS
401798	TREE	187636.68	1283893.68	229.31	RW 32L APPROACH	101.81		*TBS
401817	TREE	187393.67	1283537.26	179.93	RW 32L APPROACH	51.59		*TBS
401818	TREE	187421.98	1283648.42	165.76	RW 32L APPROACH	36.85		*TBS
401819	TREE	187476.55	1283734.04	201.91	RW 32L APPROACH	73.14		*TBS
401820	TREE	187485.35	1283850.96	234.30	RW 32L APPROACH	104.56		*TBS
401821	TREE	187536.94	1283939.73	234.06	RW 32L APPROACH	104.37		*TBS
401822	TREE	187602.93	1284022.91	201.81	RW 32L APPROACH	72.48		*TBS
401845	POWER LINE	187186.86	1284316.70	242.74	RW 32L APPROACH	103.29		*TBS
401846	POWER LINE	187230.80	1284223.15	245.52	RW 32L APPROACH	107.74		*TBS
401850	TREE	187380.12	1284190.03	179.82	RW 32L APPROACH	44.98		*TBS
401851	TREE	187493.32	1284059.72	193.99	RW 32L APPROACH	62.38		*TBS
401852	TREE	187426.62	1283972.93	215.54	RW 32L APPROACH	83.59		*TBS
401853	TREE	187375.22	1283861.91	223.35	RW 32L APPROACH	91.57		*TBS
401854	TREE	187347.90	1283758.42	193.26	RW 32L APPROACH	61.99		*TBS
401855	TREE	187311.70	1283663.00	166.93	RW 32L APPROACH	35.94		*TBS
401856	TREE	187237.84	1283763.89	180.46	RW 32L APPROACH	47.21		*TBS
401857	POWER LINE	187147.22	1284055.29	220.26	RW 32L APPROACH	82.62		*TBS
401859	POWER LINE	187128.62	1283951.81	209.00	RW 32L APPROACH	72.03		*TBS
401861	POWER LINE	187110.04	1283848.42	197.75	RW 32L APPROACH	61.44		*TBS
401862	POWER LINE	187066.84	1283606.19	181.57	RW 32L APPROACH	46.83		*TBS
401863	POWER LINE	187049.04	1283505.23	180.99	RW 32L APPROACH	46.91		*TBS
401864	POWER LINE	187031.38	1283405.08	180.42	RW 32L APPROACH	46.99		*TBS
401865	POWER LINE	187013.32	1283302.67	179.83	RW 32L APPROACH	47.07		*TBS
401866	POWER LINE	186993.57	1283190.66	179.19	RW 32L APPROACH	47.16		*TBS
401867	POWER LINE	186969.25	1282965.13	178.13	RW 32L APPROACH	47.85		*TBS
401868	POWER LINE	186966.37	1282862.00	177.77	RW 32L APPROACH	48.43		*TBS
401869	POWER LINE	186959.92	1282657.64	175.61	RW 32L APPROACH	48.11		*TBS
401870	POWER LINE	186956.31	1282554.76	173.78	RW 32L APPROACH	47.20		*TBS
401871	POWER LINE	186952.72	1282452.67	171.97	RW 32L APPROACH	46.31		*TBS
401872	POWER LINE	186945.20	1282224.22	169.37	RW 32L APPROACH	45.78		*TBS
401873	POWER LINE	186941.93	1282116.18	168.97	RW 32L APPROACH	46.36		*TBS
401874	POWER LINE	186938.71	1282009.73	168.57	RW 32L APPROACH	46.92		*TBS
401875	POWER LINE	186935.51	1281903.81	168.18	RW 32L APPROACH	47.49		*TBS
401876	POWER LINE	186926.51	1281620.18	166.73	RW 32L APPROACH	48.61		*TBS
401877	POWER LINE	186922.85	1281513.32	165.93	RW 32L APPROACH	48.77		*TBS
401905	POWER LINE	186840.98	1281857.73	154.69	RW 32L APPROACH	32.79		*TBS
401917	POWER LINE	186972.50	1283572.51	181.08	RW 32L APPROACH	45.01		*TBS
401918	POWER LINE	186989.72	1283673.42	186.51	RW 32L APPROACH	49.77		*TBS
401919	POWER LINE	187008.83	1283785.40	192.53	RW 32L APPROACH	55.06		*TBS
401921	TREE	187313.49	1284106.22	202.92	RW 32L APPROACH	67.71		*TBS
401922	TREE	187290.83	1283982.82	178.97	RW 32L APPROACH	44.55		*TBS
401923	TREE	187250.52	1283868.49	181.03	RW 32L APPROACH	47.00		*TBS
401928	TREE	186889.86	1283909.63	231.16	RW 32L APPROACH	90.40		*TBS
401929	TREE	186899.69	1283799.38	184.65	RW 32L APPROACH	45.12		*TBS
401930	TREE	186916.85	1284007.09	204.58	RW 32L APPROACH	63.36		*TBS
401931	TREE	186922.97	1284154.68	235.46	RW 32L APPROACH	92.93		*TBS
401932	TREE	186973.09	1284267.27	182.98	RW 32L APPROACH	40.26		*TBS
401933	TREE	187034.08	1284354.56	222.46	RW 32L APPROACH	79.96		*TBS
401958	TREE	186909.96	1284435.76	218.36	RW 32L APPROACH	72.90		*TBS
401959	TREE	186788.23	1284333.04	203.50	RW 32L APPROACH	56.90		*TBS
401960	TREE	186856.45	1284238.81	158.75	RW 32L APPROACH	14.25		*TBS
401961	TREE	186810.07	1284115.81	198.91	RW 32L APPROACH	54.78		*TBS
401962	TREE	186772.81	1284000.35	189.43	RW 32L APPROACH	45.75		*TBS
401963	TREE	186737.18	1283897.08	200.38	RW 32L APPROACH	57.07		*TBS
401964	TREE	186791.38	1283808.12	174.58	RW 32L APPROACH	33.07		*TBS
401965	TREE	186622.17	1283889.13	190.22	RW 32L APPROACH	44.96		*TBS
401966	TREE	186660.61	1283983.14	225.69	RW 32L APPROACH	80.20		*TBS
401967	TREE	186698.40	1284124.91	212.10	RW 32L APPROACH	65.92		*TBS
401968	TREE	186707.64	1284248.46	210.05	RW 32L APPROACH	62.85		*TBS
401969	TREE	186751.61	1284494.36	323.89	RW 32L APPROACH	175.09		*TBS
401970	TREE	186882.57	1284540.10	229.01	RW 32L APPROACH	82.07		*TBS
401997	TREE	186740.68	1284614.17	276.60	RW 32L APPROACH	126.46		*TBS
401998	TREE	186685.93	1284391.86	221.24	RW 32L APPROACH	72.28		*TBS
401999	TREE	186605.63	1284305.12	224.86	RW 32L APPROACH	75.32		*TBS
402000	TREE	186586.80	1284169.41	201.84	RW 32L APPROACH	53.28		*TBS
402001	TREE	186549.43	1284049.80	199.30	RW 32L APPROACH	51.23		*TBS
402002	TREE	186426.27	1284183.87	182.59	RW 32L APPROACH	31.07		*TBS
402003	TREE	186495.33	1284257.22	193.05	RW 32L APPROACH	42.04		*TBS
402004	TREE	186513.27	1284369.27	250.51	RW 32L APPROACH	98.73		*TBS
402005	TREE	186543.30	1284471.20	308.69	RW 32L APPROACH	156.47		*TBS
402033	TREE	186638.03	1284758.24	335.13	RW 32L APPROACH	181.80		*TBS
402034	TREE	186557.70	1284594.66	360.39	RW 32L APPROACH	207.22		*TBS
402035	TREE	186537.70	1284707.23	320.27	RW 32L APPROACH	165.68		*TBS
402036	NATURAL HIGH POINT	186648.61	1284657.89	240.10	RW 32L APPROACH	87.92		*TBS
402037	TREE	186446.85	1284606.53	326.97	RW 32L APPROACH	171.75		*TBS
402038	TREE	186394.45	1284510.22	284.22	RW 32L APPROACH	129.00		*TBS
402039	TREE	186378.94	1284399.21	293.45	RW 32L APPROACH	139.03		*TBS
402040	TREE	186395.38	1284299.05	245.72	RW 32L APPROACH	92.55		*TBS
402041	TREE	186320.95	1284222.70	213.52	RW 32L APPROACH	59.78		*TBS
402042	TREE	186248.43	1284104.68	180.84	RW 32L APPROACH	26.95		*TBS
402043	TREE	186179.99	1284235.02	209.37	RW 32L APPROACH	53.03		*TBS
402044	TREE	186266.56	1284332.26	266.09	RW 32L APPROACH	110.34		*TBS
402045	TREE	186069.97	1284284.34	195.05	RW 32L APPROACH	36.32		*TBS
402046	TREE	186153.17	1284357.22	265.94	RW 32L APPROACH	107.97		*TBS
402047	TREE	186277.19	1284448.87	256.32	RW 32L APPROACH	99.64		*TBS
402049	TREE	186334.91	1284671.15	366.74	RW 32L APPROACH	208.93		*TBS
402051	TREE	186483.60	1284824.38	360.24	RW 32L APPROACH	203.57		*TBS
402068	NATURAL HIGH POINT	186023.08	1284379.75	181.16	RW 32L APPROACH	20.69		*TBS
402069	UTILITY POLE	186036.16	1284486.41	246.88	RW 32L APPROACH	85.60		*TBS
402070	NATURAL HIGH POINT	186145.08	1284481.11	218.59	RW 32L APPROACH	59.28		*TBS
402071	TREE	185865.33	1284406.47	180.77	RW 32L APPROACH	17.27		*TBS
402072	NATURAL HIGH POINT	185921.10	1284491.45	181.70	RW 32L APPROACH	18.36		*TBS
402073	TREE	185977.01	1284578.35	331.20	RW 32L APPROACH	168.01		*TBS
402074	BUILDING	186110.02	1284609.03	245.75	RW 32L APPROACH	84.60		*TBS
402075	TREE	186210.37	1284639.54	349.43	RW 32L APPROACH	189.74		*TBS
402076	TREE	186274.45	1284830.96	353.09	RW 32L APPROACH	192.69		*TBS
402084	TREE	186324.94	1284950.66	393.69	RW 32L APPROACH	233.03		*TBS
402085	TREE	186218.37	1284931.56	370.34	RW 32L APPROACH	207.99		*TBS
402088	TREE	186067.89	1284717.47	359.15	RW 32L APPROACH	196.22		*TBS
402089	TREE	185920.91	1284730.13	340.39	RW 32L APPROACH	174.75		*TBS
402091	TREE	185797.43	1284550.48	212.92	RW 32L APPROACH	46.85		*TBS
402092	BUILDING	186051.99	1284841.26	283.76	RW 32L APPROACH	119.36		*TBS
402093	TREE	186102.57	1284957.59	317.08	RW 32L APPROACH	152.45		*TBS
402098	TREE	185620.85	1284692.58	205.00	RW 32L APPROACH	34.47		*TBS
402099	TREE	185479.50	1284680.08	218.49	RW 32L APPROACH	45.59		*TBS
402100	TREE	185797.69	1284740.41	245.85	RW 32L APPROACH	77.96		*TBS
402102	ROAD	185932.85	1284838.84	258.01	RW 32L APPROACH	91.55		*TBS
402103	BUILDING	185998.96	1284927.83	282.93	RW 32L APPROACH	116.77		*TBS
402104	TREE	185975.97	1285088.96	416.31	RW 32L APPROACH	248.20		*TBS
402105	TREE	186078.59	1285143.84	379.96	RW 32L APPROACH	213.12		*TBS
402118	BUILDING	186198.88	1285090.94	337.85	RW 32L APPROACH	173.62		*TBS
402172	TREE	185918.87	1285265.43	336.67	RW 32L APPROACH	165.86		*TBS
402173	TREE	185845.22	1285133.06	331.01	RW 32L APPROACH	160.18		*TBS
402174	TREE	185888.33	1284992.42	318.84	RW 32L APPROACH	150.12		*TBS
402175	TREE	185740.93	1284887.67	330.23	RW 32L APPROACH	159.92		*TBS
402176	TREE	185783.39	1285006.23	269.30	RW 32L APPROACH	98.60		*TBS
402177	TREE	185698.21	1284797.05	246.29	RW 32L APPROACH	76.11		*TBS
402178	TREE	185550.12	1284769.44	181.65	RW 32L APPROACH	9.14		*TBS
402179	TREE	185331.11	1284759.62	208.08	RW 32L APPROACH	31.82		*TBS
402180	TREE	185429.04	1284819.00	208.42	RW 32L APPROACH	33.31		*TBS
402181	TREE	185551.17	1284880.97	218.54	RW 32L APPROACH	44.97		*TBS
402182	TREE	185639.54	1284942.78	280.68	RW 32L APPROACH	108.07		*TBS
402183	TREE	185690.76	1285047.03	292.26	RW 32L APPROACH	119.55		*TBS
402184	TREE	185731.63	1285153.70	320.45	RW 32L APPROACH	147.43		*TBS
402185	ROAD	185817.97	1285245.74	291.53	RW 32L APPROACH	119.14		*TBS
402186	TREE	185805.60	1285350.59	358.51	RW 32L APPROACH	184.90		*TBS
402233	TREE	185404.13	1284960.18	269.38	RW 32L APPROACH	92.48		*TBS
402234	TREE	185526.57	1284978.59	207.65	RW 32L APPROACH	32.71		*TBS
402235	TREE	185555.24	1285083.38	265.28	RW 32L APPROACH	89.84		*TBS
402236	TREE	185634.06	1285191.47	310.29	RW 32L APPROACH	135.20		*TBS
402237	BUILDING	185707.24	1285285.63	273.20	RW 32L APPROACH	98.48		*TBS
402238	TREE	185715.26	1285407.39	351.74	RW 32L APPROACH	176.00		*TBS
402249	TREE	185534.43	1285509.55	404.14	RW 32L APPROACH	224.24		*TBS
402250	TREE	185625.74	1285453.28	341.43	RW 32L APPROACH	163.67		*TBS
402251	TREE	185601.95	1285351.00	336.93	RW 32L APPROACH	159.74		*TBS
402252	TREE	185506.65	1285280.80	331.46	RW 32L APPROACH	153.27		*TBS
402253	TREE	185477.45	1285177.52	297.88	RW 32L APPROACH	120.17		*TBS
402254	TREE	185417.98	1285082.27	296.27	RW 32L APPROACH	118.43		*TBS
402255	TREE	185316.70	1284910.38	190.30	RW 32L APPROACH	12.34		*TBS
402256	TREE	185156.38	1284993.65	205.31	RW 32L APPROACH	23.73		*TBS
402257	TREE	185262.81	1285005.09	180.48	RW 32L APPROACH	0.66		*TBS
402258	TREE	185310.94	1285115.02	227.45	RW 32L APPROACH	47.42		*TBS
402259	TREE	185370.00	1285197.86	279.16	RW 32L APPROACH	99.37		*TBS
402260	TREE	185373.92	1285309.62	316.26	RW 32L APPROACH	135.46		*TBS
402261	TREE	185489.88	1285387.42	334.98	RW 32L APPROACH	155.47		*TBS
402299	TREE	185382.76	1285713.44	389.01	RW 32L APPROACH	204.49		*TBS
402303	TREE	185375.87	1285411.00	328.84	RW 32L APPROACH	147.11		*TBS
402304	TREE	185275.39	1285396.39	328.21	RW 32L APPROACH	144.85		*TBS
402305	TREE	185246.27	1285263.50	298.25	RW 32L APPROACH	115.66		*TBS
402306	TREE	185177.74	1285178.27	256.26	RW 32L APPROACH	73.29		*TBS
402308	TREE	185010.64	1285028.37	210.76	RW 32L APPROACH	26.29		*TBS
402309	TREE	184907.95	1285089.47	251.91	RW 32L APPROACH	65.06		*TBS
402310	TREE	185002.59	1285133.88	214.03	RW 32L APPROACH	28.41		*TBS
402311	TREE	185073.37	1285206.27	241.70	RW 32L APPROACH	56.62		*TBS
402312	TREE	185138.38	1285294.04	287.10	RW 32L APPROACH	102.33		*TBS
402313	BUILDING	185158.60	1285403.76	266.67	RW 32L APPROACH	81.20		*TBS
402314	TREE	185204.45	1285494.86	337.59	RW 32L APPROACH	152.05		*TBS
402315	TREE	185401.30	1285541.32	396.73	RW 32L APPROACH	214.19		*TBS
402316	TREE	185305.34	1285500.05	371.03	RW 32L APPROACH	187.20		*TBS
402317	BUILDING	185310.06	1285635.98	315.99	RW 32L APPROACH	130.94		*TBS
402318	TREE	185154.15	1285627.30	347.61	RW 32L APPROACH	159.91		*TBS
402319	BUILDING	185221.95	1285740.27	311.15	RW 32L APPROACH	123.55		*TBS
402349	TREE	185047.65	1285543.14	342.19	RW 32L APPROACH	153.43		*TBS
402350	TREE	185024.69	1285432.44	316.04	RW 32L APPROACH	127.94		*TBS
402351	TREE	184996.97	1285316.95	282.51	RW 32L APPROACH	95.03		*TBS
402352	BUILDING	184907.66	1285239.92	200.88	RW 32L APPROACH	12.58		*TBS
402353	TREE	184779.67	1285243.73	282.41	RW 32L APPROACH	91.82		*TBS
402356	TREE	184674.06	1285354.46	291.11	RW 32L APPROACH	97.61		*TBS
402357	TREE	184804.87	1285383.59	262.47	RW 32L APPROACH	70.98		*TBS
402358	BUILDING	184908.29	1285412.47	228.50	RW 32L APPROACH	38.55		*TBS
402360	TREE	185031.96	1285657.81	340.43	RW 32L APPROACH	150.29		*TBS
402361	TREE	185127.75	1285796.52	395.12	RW 32L APPROACH	205.33		*TBS
402389	TREE	185030.44	1285850.67	387.79	RW 32L APPROACH	195.77		*TBS
402390	TREE	184905.76	1285738.20	382.71	RW 32L APPROACH	189.58		*TBS
402391	TREE	184937.65	1285598.84	321.46	RW 32L APPROACH	130.24		*TBS
402392	BUILDING	184867.44	1285504.21	241.26	RW 32L APPROACH	49.71		*TBS
402393	UTILITY POLE	184733.60	1285505.16	243.02	RW 32L APPROACH	49.11		*TBS
402394	BUILDING	184603.10	1285487.82	219.26	RW 32L APPROACH	23.23		*TBS
402397	BUILDING	184504.31	1285569.78	217.94	RW 32L APPROACH	19.39		*TBS
402398	TREE	184380.07	1285528.62	225.57	RW 32L APPROACH	25.23		*TBS
402399	ROAD	184607.66	1285599.13	218.77	RW 32L APPROACH	21.76		*TBS
402400	BUILDING	184802.26	1285595.62	268.19	RW 32L APPROACH	74.62		*TBS
402401	TREE	184801.07	1285741.46	290.48	RW 32L APPROACH	95.48		*TBS
402402	TREE	184901.40	1285867.89	388.13	RW 32L APPROACH	193.69		*TBS
402403	TREE	184864.98	1285997.92	382.80	RW 32L APPROACH	186.47		*TBS
402425	UTILITY POLE	184752.94	1286045.40	365.16	RW 32L APPROACH	166.40		*TBS
402426	TREE	184779.78	1285873.06	372.00	RW 32L APPROACH	175.37		*TBS
402428	TREE	184712.31	1286181.44	385.98	RW 32L APPROACH	185.21		*TBS
402467	BUILDING	184642.10	1286078.73	344.00	RW 32L APPROACH	142.98		*TBS
402468	TREE	184687.78	1285808.87	311.93	RW 32L APPROACH	114.31		*TBS
402469	UTILITY POLE	184682.64	1285667.97	254.60	RW 32L APPROACH	58.24		*TBS
402470	BUILDING	184534.08	1285785.61	228.50	RW 32L APPROACH	28.40		*TBS
402471	UTILITY POLE	184457.19	1285706.73	247.61	RW 32L APPROACH	46.92		*TBS
402472	TREE	184380.62	1285630.33	242.38	RW 32L APPROACH	41.08		*TBS
402473	TREE	184251.80	1285613.87	221.56	RW 32L APPROACH	18.16		*TBS
402474	BUILDING	184310.34	1285730.44	218.58	RW 32L APPROACH	15.08		*TBS
402476	TREE	184460.85	1285881.65	259.93	RW 32L APPROACH	57.62		*TBS
402477	TREE	184573.70	1285877.48	320.14	RW 32L APPROACH	119.86		*TBS
402478	TREE	184617.31	1285979.96	355.63	RW 32L APPROACH	155.12		*TBS
402479	TREE	184502.96	1285997.33	343.17	RW 32L APPROACH	140.49		*TBS
402480	TREE	184517.34	1286104.19	364.28	RW 32L APPROACH	160.83		*TBS
402481	TREE	184628.41	1286243.73	416.63	RW 32L APPROACH	213.78		*TBS
402488	TREE	184461.58	1286328.91	412.91	RW 32L APPROACH	206.32		*TBS
402489	TREE	184520.11	1286210.47	415.36	RW 32L APPROACH	210.93		*TBS
402490	TREE	184389.08	1286230.63	385.25	RW 32L APPROACH	178.33		*TBS
402491	TREE	184380.68	1286121.47	352.65	RW 32L APPROACH	146.63		*TBS
402492	TREE	184380.95	1285995.52	312.47	RW 32L APPROACH	107.67		*TBS
402493	TREE	184351.64	1285881.22	222.19	RW 32L APPROACH	17.98		*TBS
402494	BUILDING	184239.39	1285821.83	223.86	RW 32L APPROACH	18.24		*TBS
402495	TREE	184181.35	1285714.29	265.26	RW 32L APPROACH	59.65		*TBS
402496	TREE	184070.83	1285722.42	213.25	RW 32L APPROACH	5.63		*TBS
402498	UTILITY POLE	184204.01	1285915.53	250.40	RW 32L APPROACH	43.26		*TBS
402499	BUILDING	184240.73	1286013.81	232.70	RW 32L APPROACH	25.27		*TBS
402500	TREE	184274.60	1286109.86	319.17	RW 32L APPROACH	111.40		*TBS
402501	TREE	184224.61	1286208.57	355.63	RW 32L APPROACH	146.04		*TBS
402502	TREE	184299.17	1286300.55	364.67	RW 32L APPROACH	155.50		*TBS
402503	TREE	184367.72	1286410.35	400.89	RW 32L APPROACH	191.87		*TBS
402508	TREE	184304.97	1286495.70	403.77	RW 32L APPROACH	192.83		*TBS
402509	TREE	184259.26	1286394.68	349.62	RW 32L APPROACH	138.85		*TBS
402510	TREE	184162.48	1286297.59	354.11	RW 32L APPROACH	142.58		*TBS
402511	TREE	184167.26	1286105.44	283.34	RW 32L APPROACH	73.73		*TBS
402512	TREE	184107.99	1285963.57	265.94	RW 32L APPROACH	56.66		*TBS
402514	TREE	184061.38	1286127.49	288.67	RW 32L APPROACH	76.99		*TBS
402515	TREE	184071.98	1286233.70	300.64	RW 32L APPROACH	88.13		*TBS
402516	TREE	184039.87	1285887.65	235.20	RW 32L APPROACH	25.45		*TBS
402518	TREE	183931.22	1285931.11	268.63	RW 32L APPROACH	56.55		*TBS
402520	TREE	183876.93	1286075.20	302.01	RW 32L APPROACH	87.60		*TBS
402521	TREE	183778.60	1286014.71	223.17	RW 32L APPROACH	7.62		*TBS
402524	TREE	183823.33	1286177.73	253.52	RW 32L APPROACH	37.19		*TBS
402525	TREE	183931.86	1286211.63	286.27	RW 32L APPROACH	71.52		*TBS
402526	TREE	183982.63	1286305.09	308.51	RW 32L APPROACH	93.75		*TBS
402527	NATURAL HIGH POINT	184075.58	1286358.59	295.22	RW 32L APPROACH	81.57		*TBS
402528	BUILDING	184150.09	1286457.13	351.57	RW 32L APPROACH	138.29		*TBS
402588	TREE	183636.39	1286253.02	278.89	RW 32L APPROACH	58.55		*TBS
402589	TREE	183741.82	1286242.62	273.91	RW 32L APPROACH	55.52		*TBS
402590	BUILDING	183848.66	1286322.83	234.95	RW 32L APPROACH	17.67		*TBS
402591	TREE	183924.99	1286391.72	320.29	RW 32L APPROACH	103.68		*TBS
402592	TREE	184042.63	1286510.93	424.64	RW 32L APPROACH	208.96		*TBS
402593	TREE	183900.21	1286518.43	359.15	RW 32L APPROACH	140.89		*TBS
402594	BUILDING	184127.46	1286604.52	353.14	RW 32L APPROACH	138.04		*TBS
402604	TREE	184012.28	1286751.13	394.44	RW 32L APPROACH	175.91		*TBS
402605	TREE	184012.89	1286615.03	424.50	RW 32L APPROACH	207.29		*TBS
402607	TREE	183869.51	1286756.94	413.45	RW 32L APPROACH	192.33		*TBS
402608	TREE	183903.68	1286636.42	422.93	RW 32L APPROACH	203.60		*TBS
402610	TREE	183724.54	1286412.74	342.04	RW 32L APPROACH	121.72		*TBS
402669	TREE	183639.55	1287006.11	349.35	RW 32L APPROACH	120.20		*TBS
402670	TREE	183607.29	1286487.79	285.37	RW 32L APPROACH	61.74		*TBS
402671	TREE	183075.46	1286614.15	290.16	RW 32L APPROACH	53.34		*TBS
402672	TREE	183095.29	1287162.75	361.94	RW 32L APPROACH	118.98		*TBS
402675	TREE	182489.93	1286889.11	308.02	RW 32L APPROACH	55.06		*TBS
402676	TREE	182475.27	1287517.49	357.06	RW 32L APPROACH	96.24		*TBS
402685	TREE	181901.43	1287784.73	347.94	RW 32L APPROACH	71.32		*TBS
402686	TREE	181568.00	1287611.25	334.32	RW 32L APPROACH	52.48		*TBS
402687	TREE	181956.95	1287169.09	289.28	RW 32L APPROACH	21.27		*TBS
402688	TREE	180734.69	1287954.97	348.17	RW 32L APPROACH	43.93		*TBS
402689	TREE	181442.05	1288155.58	332.79	RW 32L APPROACH	41.65		*TBS
402690	TREE	181456.51	1288662.47	386.09	RW 32L APPROACH	89.18		*TBS
402694	TREE	180352.95	1289506.45	436.42	RW 32L APPROACH	105.18		*TBS
402695	TREE	180941.24	1288568.76	357.42	RW 32L APPROACH	50.34		*TBS
405751	TREE	190700.56	1280309.28	60.30	RW 32L APPROACH	20.98		*TBS
405752	TREE	190745.27	1280525.19	52.04	RW 32L APPROACH	11.42		*TBS
406137	TREE	187262.24	1282117.02	124.84	RW 32L APPROACH	7.84		*TBS
406140	TREE	187712.17	1281899.75	121.28	RW 32L APPROACH	14.26		*TBS
500008	ELEC SYS	190869.75	1281058.56	64.42	RW 32L APPROACH	20.87	53-021645	
500045	TOWER	190395.30	1281281.55	71.91	RW 32L APPROACH	17.89	53-023138	
550077	NAVAID	191448.75	1280424.89	28.00	RW 32L APPROACH	0.69	53-021850	
550078	POLE	190862.63	1280925.98	55.00	RW 32L APPROACH	12.60	53-021851	
550079	POLE	190774.99	1280791.12	55.00	RW 32L APPROACH	12.35	53-021852	
550080	BLDG	190584.03	1280600.07	50.00	RW 32L APPROACH	5.84	53-021853	
550089	T-L TWR	190771.63	1281236.65	63.00	RW 32L APPROACH	16.02	53-021881	
800022	pole	189493.62	1281734.45	93.44	RW 32L APPROACH	19.26	2003-ANM-1828-OE	

*TBS - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE.

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KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

NOT FOR CONSTRUCTION

M&H NO.: 3231200-162066.01
DATE: OCTOBER 2021
DESIGNED BY: M&H
DRAWN BY: JWB
CHECKED BY: CDF
DO NOT SCALE DRAWINGS

Figure ES8

Obstruction Tables

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RUNWAY 14R OBSTRUCTIONS TO PART 77 APPROACH SURFACE

POINT	DESCRPTION	DOF/ASR REF#	ELEVATION (TOP)	PENETRATION (100' SPACING)	DISPOSITION
			(USFT)	(USFT)	
5156	PP		62.59	2.71	*TBS
5157	PP		65.15	2.27	*TBS
5161	OL		101.34	59.28	*TBS
400000	ANTENNA		145.47	38.91	*TBS
400001	SMOKESTACK		120.25	30.92	*TBS
403185	UTILITY POLE		69.42	14.46	*TBS
403343	LIGHT POLE		84.23	20.56	*TBS
403344	LIGHT POLE		83.45	18.98	*TBS
403354	UTILITY POLE		99.20	23.85	*TBS
403355	UTILITY POLE		104.09	24.65	*TBS
403359	UTILITY POLE		72.59	9.25	*TBS
403412	LIGHT POLE		124.30	35.42	*TBS
403413	LIGHT POLE		127.69	33.17	*TBS
403560	UTILITY POLE		86.22	4.31	*TBS
403615	LIGHT POLE		135.48	35.09	*TBS
403619	OVERHEAD SIGN		108.08	12.20	*TBS
403622	LIGHT POLE		80.98	3.33	*TBS
403801	UTILITY POLE		158.94	33.17	*TBS
403802	UTILITY POLE		179.23	49.89	*TBS
403839	UTILITY POLE		185.71	54.40	*TBS
403840	BUILDING		151.92	20.35	*TBS
403878	NATURAL HIGH POINT		156.57	20.63	*TBS
403956	BUILDING		192.77	49.40	*TBS
403960	LIGHT POLE		183.80	48.25	*TBS
403961	LIGHT POLE		172.22	39.67	*TBS
403962	LIGHT POLE		174.97	45.43	*TBS
403963	LIGHT POLE		169.57	45.65	*TBS
403964	LIGHT POLE		162.72	44.55	*TBS
403965	LIGHT POLE		154.06	41.68	*TBS
403966	LIGHT POLE		173.88	35.16	*TBS
403967	LIGHT POLE		191.24	49.37	*TBS
403968	LIGHT POLE		174.17	28.89	*TBS
403969	LIGHT POLE		196.79	48.64	*TBS
403972	LIGHT POLE		200.11	33.86	*TBS
403973	LIGHT POLE		190.08	18.31	*TBS
403976	LIGHT POLE		203.63	49.34	*TBS
403977	LIGHT POLE		206.04	45.54	*TBS
405945	UTILITY POLE		72.49	4.57	*TBS
500027	T-L TWR	53-021855	121.34	15.13	*TBS
500030	POLE	53-021865	104.56	31.27	*TBS
500031	POLE	53-021866	81.06	17.79	*TBS
500037	BLDG	53-023203	92.61	4.28	*TBS
500044	TOWER	53-023127	96.42	20.82	*TBS
550073	FENCE	53-021843	26.00	7.26	*TBS
550075	BLDG	53-021845	101.00	62.90	*TBS
550076	BLDG	53-021847	77.00	6.98	*TBS
550082	T-L TWR	53-021867	66.00	10.22	*TBS
550085	T-L TWR	53-021871	60.00	8.47	*TBS
550086	T-L TWR	53-021872	67.00	4.99	*TBS
850116	Other w/o Antenna	2003-ANM-2082-OE	153.00	32.37	*TBS
850117	Other w/o Antenna	2003-ANM-2083-OE	166.00	38.42	*TBS
850118	Other w/o Antenna	2003-ANM-2084-OE	168.00	36.86	*TBS
850121	Other w/o Antenna	2003-ANM-2093-OE	161.00	36.92	*TBS

*TBS - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE.

POINT	DESCRPTION	ELEVATION (TOP)	PENETRATION (100' SPACING)	DISPOSITION
		(USFT)	(USFT)	
400006	TREE	82.08	19.96	*TBS
403345	TREE	104.87	40.12	*TBS
403346	TREE	85.20	25.30	*TBS
403347	TREE	80.60	22.99	*TBS
403353	TREE	105.79	29.92	*TBS
403356	TREE	87.72	14.02	*TBS
403490	TREE	115.09	23.48	*TBS
403491	TREE	125.60	26.28	*TBS
403563	TREE	102.20	23.77	*TBS
403564	TREE	115.62	34.37	*TBS
403565	TREE	118.24	38.34	*TBS
403566	TREE	116.93	33.85	*TBS
403567	TREE	104.58	20.43	*TBS
403568	TREE	114.61	28.29	*TBS
403569	TREE	113.40	24.56	*TBS
403570	TREE	103.66	18.32	*TBS
403610	TREE	152.23	49.73	*TBS
403611	TREE	152.09	47.14	*TBS
403612	TREE	153.44	45.56	*TBS
403613	TREE	145.75	36.50	*TBS
403614	TREE	145.21	33.85	*TBS
403618	TREE	111.33	9.18	*TBS
403711	TREE	160.17	48.05	*TBS
403712	TREE	153.25	38.90	*TBS
403713	TREE	197.45	80.91	*TBS
403714	TREE	186.02	66.96	*TBS
403715	TREE	172.61	51.55	*TBS
403716	TREE	178.86	55.41	*TBS
403717	TREE	188.01	62.18	*TBS
403718	TREE	188.15	59.82	*TBS
403719	TREE	185.63	55.24	*TBS
403720	TREE	191.97	58.88	*TBS
403721	TREE	202.77	67.21	*TBS
403722	TREE	212.94	75.31	*TBS
403723	TREE	178.13	56.03	*TBS
403725	TREE	160.77	33.83	*TBS
403726	TREE	157.34	35.52	*TBS
403727	TREE	158.89	40.01	*TBS
403728	TREE	179.41	45.22	*TBS
403729	TREE	195.82	58.69	*TBS
403730	TREE	179.02	39.84	*TBS
403731	TREE	176.41	34.72	*TBS
403841	TREE	168.00	34.60	*TBS
403842	TREE	194.81	60.65	*TBS
403879	TREE	202.27	62.90	*TBS
403957	TREE	205.98	63.39	*TBS
403958	TREE	187.85	46.02	*TBS
403959	TREE	193.59	49.21	*TBS
403970	TREE	176.63	31.53	*TBS
403971	TREE	175.86	28.55	*TBS
403978	TREE	205.56	49.22	*TBS
403979	TREE	199.29	40.58	*TBS
403980	TREE	193.60	41.21	*TBS
403982	TREE	192.16	41.05	*TBS
403983	TREE	198.09	43.51	*TBS
403984	TREE	225.24	73.11	*TBS
403985	TREE	217.47	68.46	*TBS
403986	TREE	212.55	65.56	*TBS
403987	TREE	186.95	41.89	*TBS
403988	TREE	231.36	84.34	*TBS
403989	TREE	215.78	66.10	*TBS
404081	TREE	230.54	75.66	*TBS
404104	TREE	207.15	49.90	*TBS
404105	TREE	229.28	70.27	*TBS
404106	TREE	177.44	16.71	*TBS
404107	TREE	193.98	31.36	*TBS
404108	TREE	176.09	10.88	*TBS
404142	TREE	210.09	41.91	*TBS
404521	TREE	113.29	51.40	*TBS
405950	TREE	99.19	32.58	*TBS
405952	TREE	93.28	23.75	*TBS
405953	TREE	93.81	27.58	*TBS
405956	TREE	85.75	24.77	*TBS
405960	TREE	84.63	13.34	*TBS
406069	TREE	110.47	1.30	*TBS
406070	TREE	108.32	3.19	*TBS
406071	TREE	107.30	4.11	*TBS

*TBS - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE.

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KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

NOT FOR CONSTRUCTION

M&H NO.: 3231200-162066.01
DATE: OCTOBER 2021
DESIGNED BY: M&H
DRAWN BY: JWB
CHECKED BY: CDF
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Figure ES9

Obstruction Tables Runway 14R

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RUNWAY 32L OBSTRUCTIONS TO PART 77 APPROACH SURFACE

POINT	DESCRPTION	DOF/ASR REF#	ABOVE GROUND LEVEL	ELEVATION (TOP)	PENETRATION (100' SPACING)	DISPOSITION
			(USFT)	(USFT)	(USFT)	
4035	OL DME			36.90	10.02	*TBS
5139	OL ON BLDG			49.37	4.50	*TBS
400141	RAILROAD		23	45.72	6.40	*TBS
400142	RAILROAD		23	45.96	11.48	*TBS
400144	RAILROAD		23	47.31	18.06	*TBS
400145	RAILROAD		23	46.52	14.16	*TBS
400146	RAILROAD		23	46.40	19.97	*TBS
400147	RAILROAD		23	46.25	9.63	*TBS
400148	RAILROAD		23	46.44	24.06	*TBS
400150	RAILROAD		23	46.44	21.17	*TBS
400151	RAILROAD		23	46.08	6.61	*TBS
400152	RAILROAD		23	46.23	10.67	*TBS
400153	RAILROAD		23	46.40	15.17	*TBS
400154	RAILROAD		23	46.44	19.03	*TBS
400155	RAILROAD		23	46.39	22.27	*TBS
400156	RAILROAD		23	47.73	6.20	*TBS
400163	NATURAL HIGH POINT			32.47	8.66	*TBS
400175	ROAD			36.02	7.03	*TBS
400178	ROAD			36.24	15.27	*TBS
400250	INTERSTATE		17	63.81	29.17	*TBS
400260	INTERSTATE		17	61.24	24.64	*TBS
400261	INTERSTATE		17	56.88	18.08	*TBS
400262	INTERSTATE		17	54.88	14.23	*TBS
400263	INTERSTATE		17	57.05	18.26	*TBS
400264	INTERSTATE		17	59.76	23.10	*TBS
400389	UTILITY POLE			62.89	1.56	*TBS
400393	UTILITY POLE			82.91	11.65	*TBS
400394	UTILITY POLE			78.42	10.36	*TBS
400395	UTILITY POLE			72.01	7.20	*TBS
400398	UTILITY POLE			59.83	3.78	*TBS
400399	UTILITY POLE			53.47	0.34	*TBS
400400	UTILITY POLE			56.18	6.04	*TBS
400401	UTILITY POLE			51.70	4.53	*TBS
400405	UTILITY POLE			59.78	0.74	*TBS
400409	UTILITY POLE			93.51	18.93	*TBS
400433	POWER LINE			64.78	13.05	*TBS
400435	UTILITY POLE			79.12	3.64	*TBS
400485	LIGHT POLE			93.20	2.51	*TBS
400486	LIGHT POLE			104.78	10.77	*TBS
400487	LIGHT POLE			105.17	9.05	*TBS
400525	UTILITY POLE			178.50	47.26	*TBS
400527	UTILITY POLE			169.76	45.22	*TBS
400528	UTILITY POLE			177.42	49.00	*TBS
400530	UTILITY POLE			167.50	48.46	*TBS
400532	UTILITY POLE			157.88	24.67	*TBS
400533	UTILITY POLE			215.46	75.17	*TBS
401845	POWER LINE			242.74	103.29	*TBS
401846	POWER LINE			245.52	107.74	*TBS
401857	POWER LINE			220.26	82.62	*TBS
401859	POWER LINE			209.00	72.03	*TBS
401861	POWER LINE			197.75	61.44	*TBS
401862	POWER LINE			181.57	46.83	*TBS
401863	POWER LINE			180.99	46.91	*TBS
401864	POWER LINE			180.42	46.99	*TBS
401865	POWER LINE			179.83	47.07	*TBS
401866	POWER LINE			179.19	47.16	*TBS
401867	POWER LINE			178.13	47.85	*TBS
401868	POWER LINE			177.77	48.43	*TBS
401869	POWER LINE			175.61	48.11	*TBS
401870	POWER LINE			173.78	47.20	*TBS
401871	POWER LINE			171.97	46.31	*TBS
401872	POWER LINE			169.37	45.78	*TBS
401873	POWER LINE			168.97	46.36	*TBS
401874	POWER LINE			168.57	46.92	*TBS
401875	POWER LINE			168.18	47.49	*TBS
401876	POWER LINE			166.73	48.61	*TBS
401877	POWER LINE			165.93	48.77	*TBS
401905	POWER LINE			154.69	32.79	*TBS
401917	POWER LINE			181.08	45.01	*TBS
401918	POWER LINE			186.51	49.77	*TBS
401919	POWER LINE			192.53	55.06	*TBS
402036	NATURAL HIGH POINT			240.10	87.92	*TBS
402068	NATURAL HIGH POINT			181.16	20.69	*TBS
402069	UTILITY POLE			246.88	85.60	*TBS
402070	NATURAL HIGH POINT			218.59	59.28	*TBS
402072	NATURAL HIGH POINT			181.70	18.36	*TBS
402074	BUILDING			245.75	84.60	*TBS
402092	BUILDING			283.76	119.36	*TBS
402102	ROAD			258.01	91.55	*TBS
402103	BUILDING			282.93	116.77	*TBS
402118	BUILDING			337.85	173.62	*TBS
402185	ROAD			291.53	119.14	*TBS
402237	BUILDING			273.20	98.48	*TBS
402313	BUILDING			266.67	81.20	*TBS
402317	BUILDING			315.99	130.94	*TBS
402319	BUILDING			311.15	123.55	*TBS
402352	BUILDING			200.88	12.58	*TBS
402358	BUILDING			228.50	38.55	*TBS
402392	BUILDING			241.26	49.71	*TBS
402393	UTILITY POLE			243.02	49.11	*TBS
402394	BUILDING			219.26	23.23	*TBS
402397	BUILDING			217.94	19.39	*TBS
402399	ROAD			218.77	21.76	*TBS
402400	BUILDING			268.19	74.62	*TBS
402425	UTILITY POLE			365.16	166.40	*TBS
402467	BUILDING			344.00	142.98	*TBS
402469	UTILITY POLE			254.60	58.24	*TBS
402470	BUILDING			228.50	28.40	*TBS
402471	UTILITY POLE			247.61	46.92	*TBS
402474	BUILDING			218.58	15.08	*TBS
402494	BUILDING			223.86	18.24	*TBS

POINT	DESCRPTION	DOF/ASR REF#	ABOVE GROUND LEVEL	ELEVATION (TOP)	PENETRATION (100' SPACING)	DISPOSITION
402498	UTILITY POLE			250.40	43.26	*TBS
402499	BUILDING			232.70	25.27	*TBS
402527	NATURAL HIGH POINT			295.22	81.57	*TBS
402528	BUILDING			351.57	138.29	*TBS
402590	BUILDING			234.95	17.67	*TBS
402594	BUILDING			353.14	138.04	*TBS
500008	ELEC SYS	53-021645		64.42	20.87	*TBS
500045	TOWER	53-023138		71.91	17.89	*TBS
550077	NAVAID	53-021850		28.00	0.69	*TBS
550078	POLE	53-021851		55.00	12.60	*TBS
550079	POLE	53-021852		55.00	12.35	*TBS
550080	BLDG	53-021853		50.00	5.84	*TBS
550089	T-L TWR	53-021881		63.00	16.02	*TBS
800022	pole	2003-ANM-1828-OE		93.44	19.26	*TBS

*TBS - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE.

POINT	DESCRPTION	ABOVE GROUND LEVEL	ELEVATION (TOP)	APPROACH 32L (100' SPACING)	DISPOSITION
		(USFT)	(USFT)	(USFT)	
400157	TREE		128.80	94.01	*TBS
400158	TREE		86.85	53.79	*TBS
400159	TREE		75.11	44.17	*TBS
400160	TREE		86.40	57.55	*TBS
400161	TREE		87.96	61.80	*TBS
400205	TREE		86.70	47.27	*TBS
400206	TREE		46.25	10.15	*TBS
400251	TREE		83.97	46.31	*TBS
400253	TREE		61.46	19.67	*TBS
400254	TREE		66.64	21.85	*TBS
400255	TREE		92.05	42.24	*TBS
400256	TREE		81.21	29.43	*TBS
400257	TREE		94.57	40.53	*TBS
400300	TREE		73.39	26.61	*TBS
400301	TREE		114.71	64.53	*TBS
400304	TREE		80.99	28.35	*TBS
400305	TREE		82.09	26.48	*TBS
400383	TREE		104.99	43.78	*TBS
400384	TREE		89.61	24.69	*TBS
400385	TREE		97.15	35.26	*TBS
400386	TREE		84.29	18.94	*TBS
400387	TREE		103.12	35.39	*TBS
400388	TREE		89.27	18.11	*TBS
400407	TREE		106.23	25.63	*TBS
400411	TREE		97.60	14.55	*TBS
400412	TREE		100.75	14.67	*TBS
400413	TREE		116.04	28.24	*TBS
400414	TREE		110.76	22.54	*TBS
400415	TREE		138.57	48.42	*TBS
400434	TREE		76.49	18.42	*TBS
400436	TREE		118.52	32.78	*TBS
400437	TREE		131.73	43.27	*TBS
400438	TREE		102.94	20.41	*TBS
400439	TREE		111.86	24.69	*TBS
400448	TREE		144.21	49.27	*TBS
400449	TREE		155.99	59.22	*TBS
400451	TREE		143.57	50.65	*TBS
400452	TREE		153.73	58.83	*TBS
400453	TREE		129.73	39.01	*TBS
400454	TREE		145.59	55.01	*TBS
400455	TREE		117.71	24.72	*TBS
400456	TREE		137.10	45.65	*TBS
400457	TREE		133.02	39.49	*TBS
400458	TREE		138.81	45.76	*TBS
400459	TREE		133.26	34.81	*TBS
400461	TREE		128.45	30.80	*TBS
400462	TREE		119.03	18.58	*TBS
400464	TREE		140.92	38.45	*TBS
400465	TREE		154.07	50.00	*TBS
400468	TREE		109.07	11.69	*TBS
400469	TREE		122.07	30.69	*TBS
400470	TREE		130.17	38.11	*TBS
400471	TREE		118.83	24.69	*TBS
400473	TREE		146.02	46.00	*TBS
400474	TREE		147.59	44.81	*TBS
400477	TREE		147.69	45.83	*TBS
400478	TREE		139.59	39.50	*TBS
400479	TREE		130.02	30.84	*TBS
400492	TREE		96.58	0.75	*TBS
400493	TREE		116.41	20.45	*TBS
400494	TREE		103.45	12.23	*TBS
400495	TREE		108.17	16.60	*TBS
400497	TREE		134.13	34.31	*TBS
400498	TREE		129.02	27.10	*TBS
400499	TREE		148.51	42.93	*TBS
400500	TREE		114.89	10.97	*TBS
400501	TREE		108.66	2.62	*TBS
400502	TREE		127.85	20.32	*TBS
400503	TREE		152.63	42.23	*TBS
400504	TREE		124.61	15.62	*TBS
400506	TREE		122.25	20.52	*TBS
400507	TREE		137.03	33.18	*TBS
400508	TREE		130.35	26.10	*TBS
400509	TREE		126.62	20.35	*TBS
400510	TREE		141.69	33.82	*TBS
400513	TREE		124.95	12.38	*TBS
400514	TREE		127.99	13.24	*TBS
400516	TREE		120.58	1.72	*TBS
400519	TREE		126.96	16.67	*TBS
400520	TREE		137.52	9.28	*TBS
400521	TREE		143.95	18.15	*TBS
400522	TREE		131.82	3.68	*TBS
400598	TREE		166.12	45.36	*TBS
400599	TREE		177.06	57.01	*TBS
400600	TREE		190.61	70.44	*TBS
400601	TREE		150.46	30.90	*TBS
400602	TREE		149.82	31.70	*TBS
400603	TREE		178.00	60.31	*TBS
400604	TREE		119.10	0.31	*TBS
400610	TREE		182.90	66.99	*TBS
400611	TREE		166.41	51.98	*TBS
400612	TREE		160.03	46.67	*TBS
400613	TREE		167.25	56.39	*TBS
401582	TREE		217.02	86.10	*TBS
401583	TREE		210.05	76.74	*TBS
401584	TREE		179.96	47.02	*TBS
401585	TREE		172.75	38.34	*TBS
401587	TREE		162.05	36.19	*TBS
401588	TREE		189.73	60.67	*TBS
401589	TREE		168.48	41.44	*TBS
401590	TREE		183.10	54.64	*TBS
401591	TREE		166.12	38.32	*TBS
401594	TREE		177.02	46.91	*TBS
401595	TREE		192.18	60.09	*TBS
401596	TREE		168.52	35.84	*TBS
401598	TREE		162.34	27.66	*TBS
401600	TREE		142.46	5.81	*TBS
401601	TREE		191.05	57.79	*TBS
401602	TREE		185.02	49.81	*TBS
401603	TREE		174.12	33.40	*TBS
401605	TREE		165.04	37.10	*TBS
401606	TREE		169.11	39.19	*TBS
401607	TREE		149.28	14.31	*TBS
401609	TREE		163.08	33.45	*TBS
401610	TREE		182.02	60.41	*TBS

POINT	DESCRPTION	ABOVE GROUND LEVEL	ELEVATION (TOP)	APPROACH 32L (100' SPACING)	DISPOSITION
401611	TREE		194.14	70.06	*TBS
401612	TREE		175.20	49.12	*TBS
401613	TREE		211.13	89.00	*TBS
401614	TREE		206.86	84.47	*TBS
401615	TREE		193.85	71.18	*TBS
401774	TREE		207.91	83.47	*TBS
401775	TREE		212.13	87.28	*TBS
401776	TREE		214.00	88.91	*TBS
401795	TREE		192.85	66.20	*TBS
401796	TREE		185.48	59.01	*TBS
401797	TREE		219.50	92.20	*TBS
401798	TREE		229.31	101.81	*TBS
401817	TREE		179.93	51.59	*TBS
401818	TREE		165.76	36.85	*TBS
401819	TREE		201.91	73.14	*TBS
401820	TREE		234.30	104.56	*TBS
401821	TREE		234.06	104.37	*TBS
401822	TREE		201.81	72.48	*TBS
401850	TREE		179.82	44.98	*TBS
401851	TREE		193.99	62.38	*TBS
401852	TREE		215.54	83.99	*TBS
401853	TREE		223.35	91.57	*TBS
401854	TREE		193.26	61.99	*TBS
401855	TREE		166.93	35.94	*TBS
401856	TREE		180.46	47.21	*TBS
401921	TREE		202.92	67.71	*TBS
401922	TREE		178.97	44.55	*TBS
401923	TREE		181.03	47.00	*TBS
401928	TREE		231.16	90.40	*TBS
401929	TREE		184.65	45.12	*TBS
401930	TREE		204.58	63.36	*TBS
401931	TREE		235.46	92.93	*TBS
401932	TREE		182.98	40.26	*TBS
401933	TREE		222.46	79.96	*TBS
401958	TREE		218.36	72.90	*TBS
401959	TREE		203.50	56.90	*TBS
401960	TREE		158.75	14.25	*TBS
401961	TREE		198.91	54.78	*TBS
401962	TREE		189.43	45.75	*TBS
401963	TREE		200.38	57.07	*TBS
401964	TREE		174.58	33.07	*TBS
401965	TREE		190.22	44.96	*TBS
401966	TREE		225.69	80.20	*TBS
401967	TREE		212.10	65.92	*TBS
401968	TREE		210.05	62.85	*TBS
401969	TREE		323.89	175.09	*TBS
401970	TREE		229.01	82.07	*TBS
401997	TREE		276.60	126.46	*TBS
401998	TREE		221.24	72.28	*TBS
401999	TREE		224.86	75.12	*TBS
402000	TREE		201.84	53.28	*TBS
402001	TREE		199.30	51.23	*TBS
402002	TREE		182.59	31.07	*TBS
402003	TREE		193.05	42.04	*TBS
402004	TREE		250.51	98.73	*TBS
402005	TREE		308.69	156.47	*TBS
402033	TREE		335.13	181.80	*TBS
402034	TREE		360.39	207.22	*TBS
402035	TREE		320.27	165.68	*TBS
402037	TREE		326.97	171.75	*TBS
402038	TREE		284.22	129.00	*TBS
402039	TREE		293.45	139.03	*TBS
402040	TREE		245.72	92.55	*TBS
402041	TREE		213.52	59.78	*TBS
402042	TREE		180.84	26.95	*TBS
402043	TREE		209.37	53.03	*TBS
402044	TREE		266.09	110.34	*TBS
402045	TREE		195.05	36.32	*TBS
402046	TREE		265.94	107.97	*TBS
402047	TREE		256.32	99.64	*TBS
402049	TREE		366.74	208.93	*TBS
402051	TREE		360.24	203.57	*TBS
402071	TREE		180.77	17.27	*TBS
402073	TREE		331.20	168.01	*TBS
402075	TREE		349.43	189.74	*TBS
402076	TREE		353.09	192.69	*TBS
402084	TREE		393.69	233.03	*TBS
402085	TREE		370.34	207.99	*TBS
402088	TREE		359.15	196.22	*TBS
402089	TREE		340.39	174.75	*TBS
402091	TREE		212.92	46.85	*TBS
402093	TREE		317.08	152.45	*TBS
402098	TREE		205.00	34.47	*TBS
402099	TREE		218.49	45.59	*TBS
402100	TREE		245.85	77.96	*TBS
402104	TREE		416.31	248.20	*TBS
402105	TREE		379.96	213.12	*TBS
402172	TREE		336.67	165.86	*TBS
402173	TREE		331.01	160.18	*TBS
402174	TREE		318.84	150.12	*TBS
402175	TREE		330.23	159.92	*TBS
402176	TREE		269.30	98.60	*TBS
402177	TREE		246.29	76.11	*TBS
402178	TREE		181.65	9.14	*TBS
402179	TREE		208.08	31.82	*TBS
402180	TREE		208.42	33.31	*TBS
402181	TREE		218.54	44.97	*TBS
402182	TREE		280.68	108.07	*TBS
402183	TREE		292.26	119.55	*TBS
402184	TREE		320.45	147.43	*TBS
402186	TREE		358.51	184.90	*TBS
402233	TREE		269.38	92.48	*TBS
402234	TREE		207.65	32.71	*TBS
402235	TREE		265.28	89.84	*TBS
402236	TREE		310.29	135.20	*TBS
402238	TREE		351.74	176.00	*TBS
402249	TREE		404.14	224.24	*TBS
402250	TREE		341.43	163.67	*TBS
402251	TREE		336.93	159.74	*TBS
402252	TREE		331.46	153.27	*TBS
402253	TREE		297.88	120.17	*TBS
402254	TREE		296.27	118.43	*TBS
402255	TREE		190.30	12.34	*TBS
402256	TREE		205.31	23.73	*TBS
402257	TREE		180.48	0.66	*TBS
402258	TREE		227.45	47.42	*TBS

POINT	DESCRPTION	ABOVE GROUND LEVEL	ELEVATION (TOP)	APPROACH 32L (100' SPACING)	DISPOSITION
402259	TREE		279.16	99.37	*TBS
402260	TREE		316.26	135.46	*TBS
402261	TREE		314.98	155.47	*TBS
402299	TREE		389.01	204.49	*TBS
402303	TREE		328.84	147.11	*TBS
402304	TREE		328.21	144.85	*TBS
402305	TREE		298.25	115.66	*TBS
402306	TREE		256.26	73.29	*TBS
402308	TREE		210.76	26.29	*TBS
402309	TREE		251.91	65.06	*TBS
402310	TREE		214.03	28.41	*TBS
402311	TREE		241.70	56.62	*TBS
402312	TREE		287.10	102.33	*TBS
402314	TREE		337.59	152.05	*TBS
402315	TREE		396.73	214.19	*TBS
402316	TREE		371.03	187.20	*TBS
402318	TREE		347.61	159.91	*TBS
402349	TREE		342.19	153.43	*TBS
402350	TREE		316.04	127.94	*TBS
402351	TREE		282.51	95.03	*TBS
402353	TREE		282.41	91.82	*TBS
402356	TREE		291.11	97.61	*TBS
402357	TREE		262.47	70.98	*TBS
402360	TREE		340.43	150.29	*TBS
402361	TREE		395.12	205.33	*TBS
402389	TREE		387.79	195.77	*TBS
402390	TREE		382.71	189.58	*TBS
402391	TREE		321.46	130.24	*TBS
402398	TREE		225.57	25.23	*TBS
402401	TREE		290.48	95.48	*TBS
402402	TREE		388.13	193.69	*TBS
402403	TREE		382.80	186.47	*TBS
402426	TREE		372.00	175.37	*TBS
402428	TREE		385.98	185.21	*TBS
402468	TREE		311.93	114.31	*TBS
402472	TREE		242.38	41.08	*TBS
402473	TREE		221.56	18.16	*TBS
402476	TREE		259.93	57.62	*TBS
402477	TREE		320.14	119.86	*TBS
402478	TREE		355.63	155.12	*TBS
402479	TREE		343.17	140.49	*TBS
402480	TREE		364.28	160.83	*TBS
402481	TREE		416.63	213.78	*TBS
402488	TREE		412.91	206.32	*TBS
402489	TREE		415.36	210.93	*TBS
402490	TREE		385.25	178.33	*TBS
402491	TREE		352.65	146.63	*TBS
402492	TREE		382.80	186.47	*TBS
402493	TREE		222.19	17.98	*TBS
402495	TREE		265.26	59.65	*TBS
402496	TREE		213.25	5.63	*TBS
402500	TREE		319.17	111.40	*TBS
402501	TREE		355.63	146.04	*TBS
402502	TREE		364.67	155.50	*TBS
402503	TREE		400.89	191.87	*TBS
402508	TREE		403.77	192.83	*TBS
402509	TREE		349.62	138.85	*TBS
402510	TREE		354.11	142.58	*TBS
402511	TREE		283.34	73.73	*TBS
402512	TREE		265.94	56.66	*TBS
402514	TREE		288.67	76.99	*TBS
402515	TREE		300.64	88.13	*TBS
402516	TREE		235.20	25.45	*TBS
402518	TREE		268.63	56.55	*TBS
402520	TREE		302.01	87.60	*TBS
402521	TREE		223.17	7.62	*TBS
402524	TREE		253.52	37.19	*TBS
402525	TREE		286.27	71.52	*TBS
402526	TREE		308.51	93.75	*TBS
402588	TREE		278.89	58.55	*TBS
402589	TREE		273.91	55.52	*TBS
402591	TREE		320.29	103.68	*TBS
402592	TREE		424.64	208.96	*TBS
402593	TREE		359.15	140.89	*TBS
402604	TREE		394.44	175.91	*TBS
402605	TREE		424.50	207.29	*TBS
402607	TREE		413.45	192.33	*TBS
402608	TREE		422.93	203.60	*TBS
402610	TREE		342.04	121.72	*TBS
402669	TREE		349.35	120.20	*TBS
402670	TREE		285.37	61.74	*TBS
402671	TREE		290.16	53.34	*TBS
402672	TREE		361.94	118.98	*TBS
402675	TREE		308.02	55.06	*TBS
402676	TREE		357.06	96.24	*TBS
402685	TREE		347.94	71.32	*TBS
402686	TREE		334.32	52.48	*TBS
402687	TREE		299.28	21.27	*TBS
402688	TREE		348.17	43.93	*TBS
402689	TREE		332.79	41.65	*TBS
402690	TREE		386.09	89.18	*TBS
402694	TREE		436.42	105.18	*TBS
402695	TREE		357.42	50.34	*TBS
405751	TREE		60.30	20.98	*TBS
405752	TREE		52.04	11.42	*TBS
406137	TREE		124.84	7.84	*TBS
406140	TREE		121.28	14.26	*TBS

*TBS - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE.

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KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

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Figure ES10

Obstruction Tables Runway 32L

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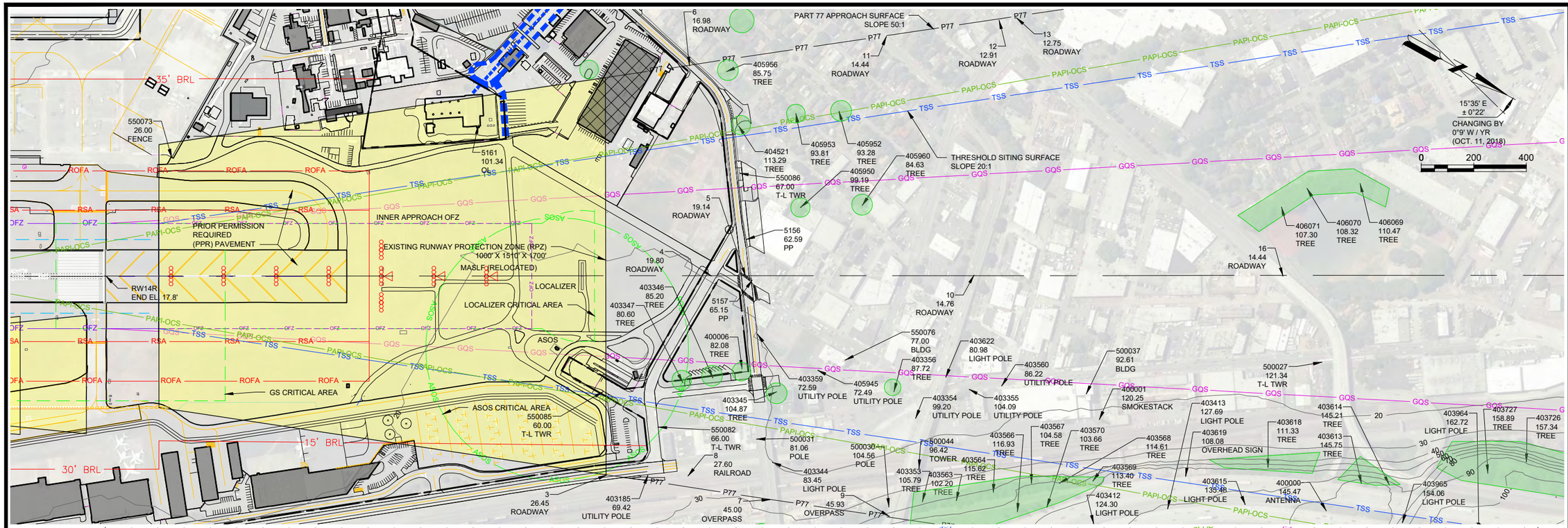
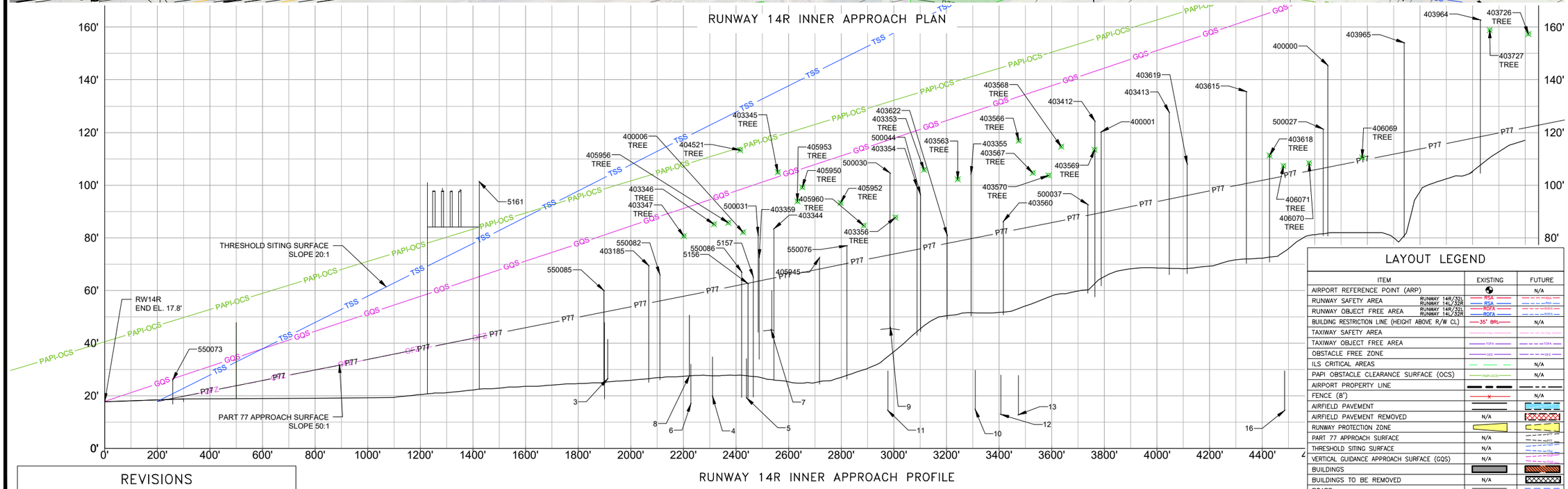


RUNWAY 14R INNER APPROACH PLAN



RUNWAY 14R INNER APPROACH PROFILE

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		N/A
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA	RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA	ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA		
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
OBSTACLE FREE ZONE	OFZ	OFZ
ILS CRITICAL AREAS		N/A
PAPI OBSTACLE CLEARANCE SURFACE (OCS)	PAPI-OCS	N/A
AIRPORT PROPERTY LINE		
FENCE (8')		N/A
AIRFIELD PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE		
PART 77 APPROACH SURFACE	N/A	P77
THRESHOLD SITING SURFACE	N/A	TSS
VERTICAL GUIDANCE APPROACH SURFACE (GQS)	N/A	GQS
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
FUEL STORAGE	F	F
BEACON	★	N/A
WINDSOCK		N/A
PRECISION APPROACH PATH INDICATOR (PAPI)		N/A
TAXIWAY HOLDLINES AND SIGNS		
SURVEY MONUMENTS	MON. A	N/A
AIRPORT SUPPORT VEHICLE ACCESS LANES		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		∝

REVISIONS

NO.	DATE	BY	DESCRIPTION

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Figure ES11

Inner Portion of Approach Surface - Runway 14R

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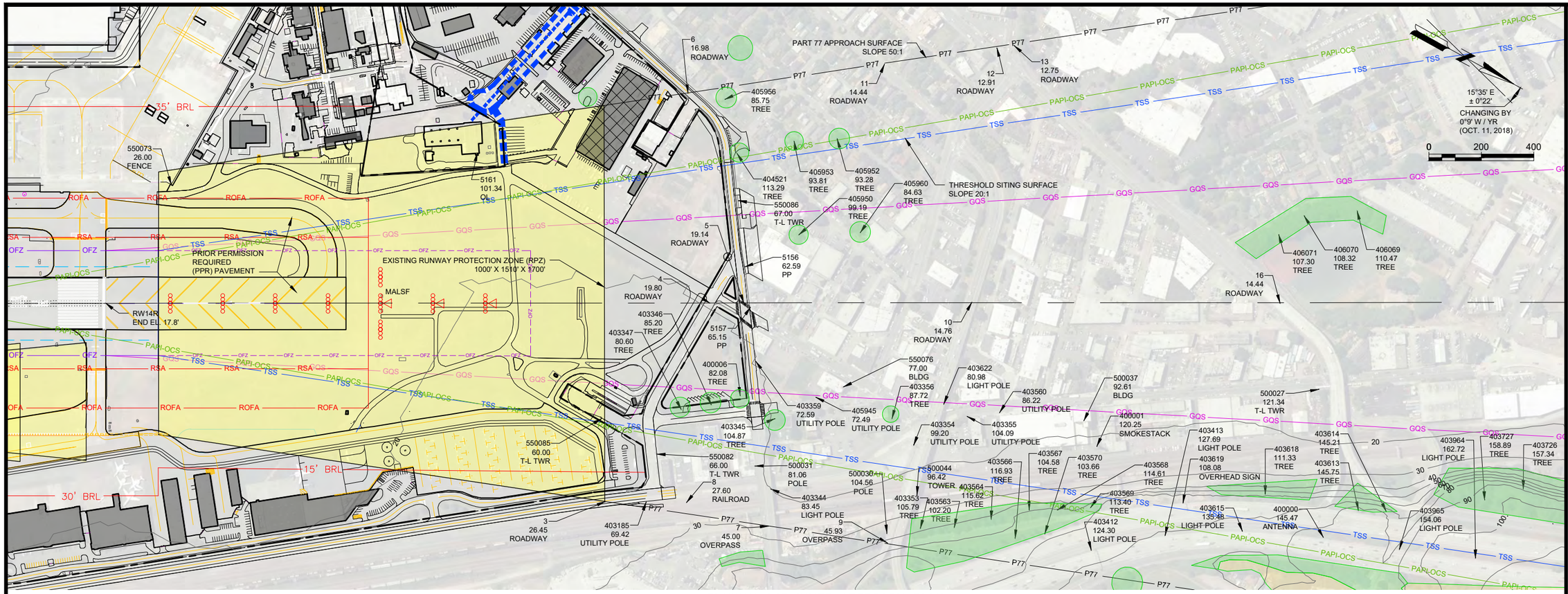

RUNWAY 14R INNER APPROACH PLAN

PAPI OBSTACLE CLEARANCE SURFACE OBSTRUCTIONS

NONE IDENTIFIED

INNER APPROACH OFZ OBSTRUCTIONS

NONE IDENTIFIED

VERTICALLY GUIDED APPROACH SURFACE OBSTRUCTIONS

NONE IDENTIFIED

THRESHOLD SITING OBSTRUCTIONS

NONE IDENTIFIED

PART 77 TREE OBSTRUCTIONS

NO.	DESCRIPTION	ELEVATION	GROUND ELEV.	SURFACE	PENETRATION	DISPOSITION
400006	TREE	82.08	21.4	RW14R PART 77 APPROACH	24.96	TBS*
403345	TREE	104.87	19.1	RW14R PART 77 APPROACH	45.12	TBS*
403346	TREE	85.2	22.3	RW14R PART 77 APPROACH	30.30	TBS*
403347	TREE	80.6	22.3	RW14R PART 77 APPROACH	27.99	TBS*
403353	TREE	105.79	30.1	RW14R PART 77 APPROACH	34.92	TBS*
403356	TREE	87.72	15.7	RW14R PART 77 APPROACH	19.02	TBS*
403563	TREE	102.2	31.1	RW14R PART 77 APPROACH	28.77	TBS*
403564	TREE	115.62	32.0	RW14R PART 77 APPROACH	39.37	TBS*
403566	TREE	116.93	54.9	RW14R PART 77 APPROACH	38.85	TBS*
403567	TREE	104.58	31.9	RW14R PART 77 APPROACH	25.43	TBS*
403568	TREE	114.61	38.0	RW14R PART 77 APPROACH	33.29	TBS*
403569	TREE	113.4	37.1	RW14R PART 77 APPROACH	29.56	TBS*
403570	TREE	103.66	58.3	RW14R PART 77 APPROACH	23.32	TBS*
403613	TREE	145.75	82.2	RW14R PART 77 APPROACH	41.50	TBS*
403614	TREE	145.21	78.1	RW14R PART 77 APPROACH	38.85	TBS*
403618	TREE	111.33	64.9	RW14R PART 77 APPROACH	14.18	TBS*
403726	TREE	157.34	93.3	RW14R PART 77 APPROACH	40.52	TBS*
403727	TREE	158.89	95.5	RW14R PART 77 APPROACH	45.01	TBS*
404521	TREE	113.29	16.7	RW14R PART 77 APPROACH	56.40	TBS*
405950	TREE	99.19	17.1	RW14R PART 77 APPROACH	37.58	TBS*
405952	TREE	93.28	15.4	RW14R PART 77 APPROACH	28.75	TBS*
405953	TREE	93.81	15.7	RW14R PART 77 APPROACH	32.58	TBS*
405956	TREE	85.75	16.6	RW14R PART 77 APPROACH	29.77	TBS*
405960	TREE	84.63	15.8	RW14R PART 77 APPROACH	18.34	TBS*
406069	TREE	110.47	13.1	RW14R PART 77 APPROACH	6.30	TBS*
406070	TREE	108.32	13.1	RW14R PART 77 APPROACH	8.19	TBS*
406071	TREE	107.3	13.4	RW14R PART 77 APPROACH	9.11	TBS*

TBS* - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE

PART 77 OBSTRUCTIONS

NO.	DESCRIPTION	TOP ELEVATION	GROUND EL.	PENETRATION	SURFACE	DISPOSTION
3	ROADWAY	41.4532	26.45	0	RW14R PART 77 APPR	TBS*
4	ROADWAY	34.8048	19.8	0	RW14R PART 77 APPR	TBS*
5	ROADWAY	34.1424	19.14	0	RW14R PART 77 APPR	TBS*
6	ROADWAY	31.9795	16.98	0	RW14R PART 77 APPR	TBS*
7	OVERPASS	60	45	0	RW14R PART 77 APPR	TBS*
8	RAILROAD	50.6034	27.6	0	RW14R PART 77 APPR	TBS*
9	OVERPASS	60.9331	45.93	0	RW14R PART 77 APPR	TBS*
10	ROADWAY	29.7638	14.76	0	RW14R PART 77 APPR	TBS*
11	ROADWAY	29.4357	14.44	0	RW14R PART 77 APPR	TBS*
12	ROADWAY	27.913	12.91	0	RW14R PART 77 APPR	TBS*
13	ROADWAY	27.7526	12.75	0	RW14R PART 77 APPR	TBS*
16	ROADWAY	29.4357	14.44	0	RW14R PART 77 APPR	TBS*
5156	PP	62.59	17.5	2.71	RW14R PART 77 APPR	TBS*
5157	PP	65.15	19.2	2.27	RW14R PART 77 APPR	TBS*
5161	OL	101.34	17	59.28	RW14R PART 77 APPR	TBS*
400000	ANTENNA	145.47	82	38.9	RW14R PART 77 APPR	TBS*
400001	SMOKESTACK	120.25	21.5	30.9	RW14R PART 77 APPR	TBS*
403185	UTILITY POLE	69.42	26.9	14.46	RW14R PART 77 APPR	TBS*
403343	LIGHT POLE	84.23	28.2	20.56	RW14R PART 77 APPR	TBS*
403344	LIGHT POLE	83.45	26	18.98	RW14R PART 77 APPR	TBS*
403354	UTILITY POLE	99.2	16.2	23.85	RW14R PART 77 APPR	TBS*
403355	UTILITY POLE	104.09	15.9	24.65	RW14R PART 77 APPR	TBS*
403359	UTILITY POLE	72.59	19.9	9.25	RW14R PART 77 APPR	TBS*
403412	LIGHT POLE	124.3	67	35.42	RW14R PART 77 APPR	TBS*
403413	LIGHT POLE	127.69	70.3	33.17	RW14R PART 77 APPR	TBS*
403560	UTILITY POLE	86.22	16.4	4.31	RW14R PART 77 APPR	TBS*
403615	LIGHT POLE	135.48	74	35.09	RW14R PART 77 APPR	TBS*
403619	OVERHEAD SIGN	108.08	66.9	12.2	RW14R PART 77 APPR	TBS*
403622	LIGHT POLE	80.98	15.4	3.33	RW14R PART 77 APPR	TBS*
403964	LIGHT POLE	162.72	102.5	44.55	RW14R PART 77 APPR	TBS*
403965	LIGHT POLE	154.06	89.4	41.68	RW14R PART 77 APPR	TBS*
405945	UTILITY POLE	72.49	17.2	4.57	RW14R PART 77 APPR	TBS*
405959	BUILDING	98.94	16	59.66	PART 77 TRANSITIONAL	TBS*
500027	T-L TWR	121.34	15.8	15.13	RW14R PART 77 APPR	TBS*
500030	POLE	104.56	36.2	31.27	RW14R PART 77 APPR	TBS*
500031	POLE	81.06	22.2	17.79	RW14R PART 77 APPR	TBS*
500037	BLDG	92.61	18.5	4.28	RW14R PART 77 APPR	TBS*
500044	TOWER	96.42	25.2	20.82	RW14R PART 77 APPR	TBS*
550073	FENCE	26	12.4	7.26	RW14R PART 77 APPR	TBS*
550075	BLDG	101	16	62.9	RW14R PART 77 APPR	TBS*
550076	BLDG	77	16.4	6.98	RW14R PART 77 APPR	TBS*
550082	T-L TWR	66	25.2	10.22	RW14R PART 77 APPR	TBS*
550085	T-L TWR	60	23.2	8.47	RW14R PART 77 APPR	TBS*
550086	T-L TWR	67	17.5	4.99	RW14R PART 77 APPR	TBS*

TBS* - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE

REVISIONS

NO.	DATE	BY	DESCRIPTION

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		N/A
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA	RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA	ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	TSA
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
OBSTACLE FREE ZONE	OFZ	OFZ
ILS CRITICAL AREAS		N/A
PAPI OBSTACLE CLEARANCE SURFACE (OCS)	PAPI-OCS	N/A
AIRPORT PROPERTY LINE		
FENCE (8')	X	N/A
AIRFIELD PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE		
PART 77 APPROACH SURFACE	N/A	P77
THRESHOLD SITING SURFACE	N/A	TSS
VERTICAL GUIDANCE APPROACH SURFACE (GQS)	N/A	GQS
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
FUEL STORAGE	F	F
BEACON		N/A
WINDSOCK		N/A
PRECISION APPROACH PATH INDICATOR (PAPI)		N/A
TAXIWAY HOLDLINES AND SIGNS		
SURVEY MONUMENTS	MON. A	N/A
AIRPORT SUPPORT VEHICLE ACCESS LANES		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		

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Figure ES12

Inner Portion of Approach Surface - Runway 14R Data Tables

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\\CORP.MEADHUNT.COM\SHAREDFOLDERS\ENTP\323120011\162066.011TECH\CAD\AIRPORTLAYOUTPLAN\INNER APPROACH SURFACE - RW 14R-1.DWG
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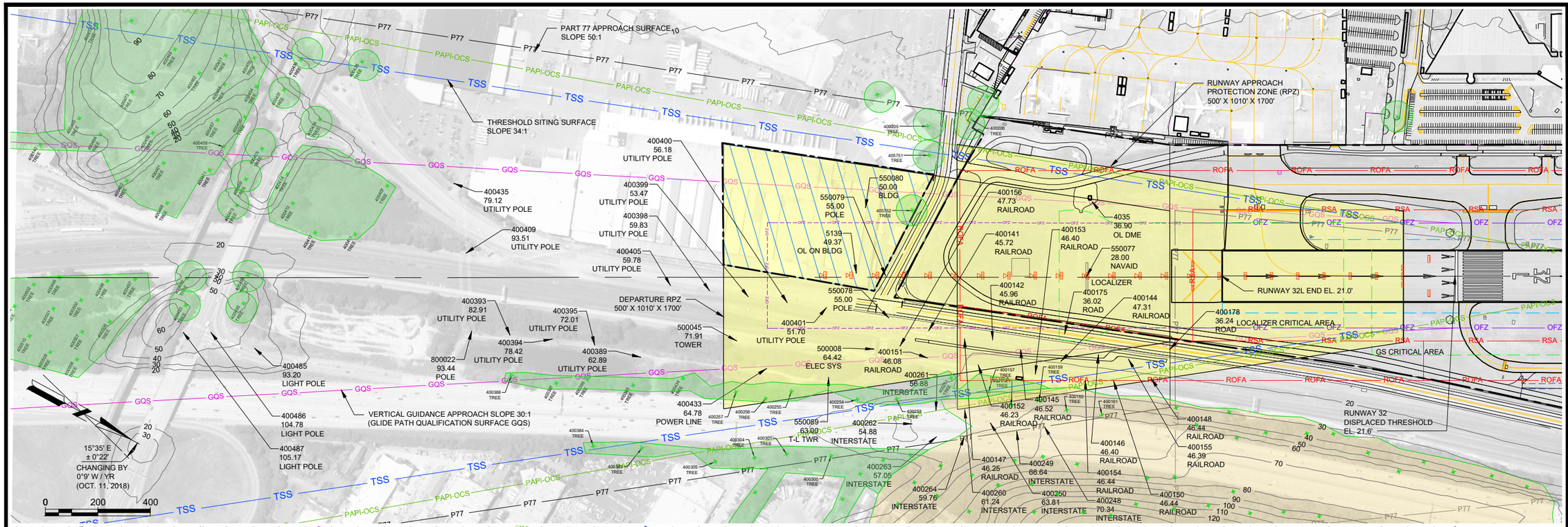

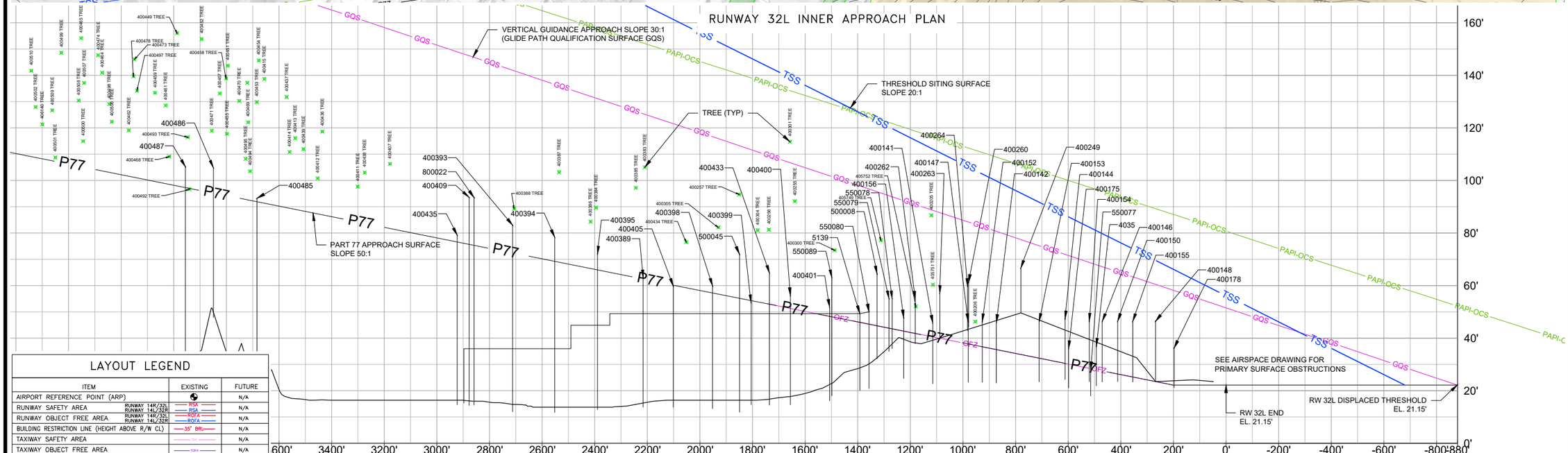

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		N/A
RUNWAY SAFETY AREA	RUNWAY 14R/32L, RUNWAY 14L/32R — RSA	N/A
RUNWAY OBJECT FREE AREA	RUNWAY 14R/32L, RUNWAY 14L/32R — ROFA	N/A
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	N/A
TAXIWAY OBJECT FREE AREA	TOFA	N/A
ILS CRITICAL AREAS		N/A
PAPI OBSTACLE CLEARANCE SURFACE (OCS)	PAPI-OCS	N/A
AIRPORT PROPERTY LINE		
FENCE (8')		N/A
AIRFIELD PAVEMENT		N/A
AIRFIELD PAVEMENT REMOVED	N/A	N/A
RUNWAY PROTECTION ZONE/APPROACH SURFACE		N/A
PART 77 APPROACH SURFACE	P77	N/A
RUNWAY PROTECTION ZONE/APPROACH SURFACE	TSS	N/A
BUILDINGS		N/A
ROADS		
RUNWAY END IDENTIFIER LIGHTS (REILS)		N/A

REVISIONS

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Figure ES13

Inner Portion of Approach Surface - Runway 32L

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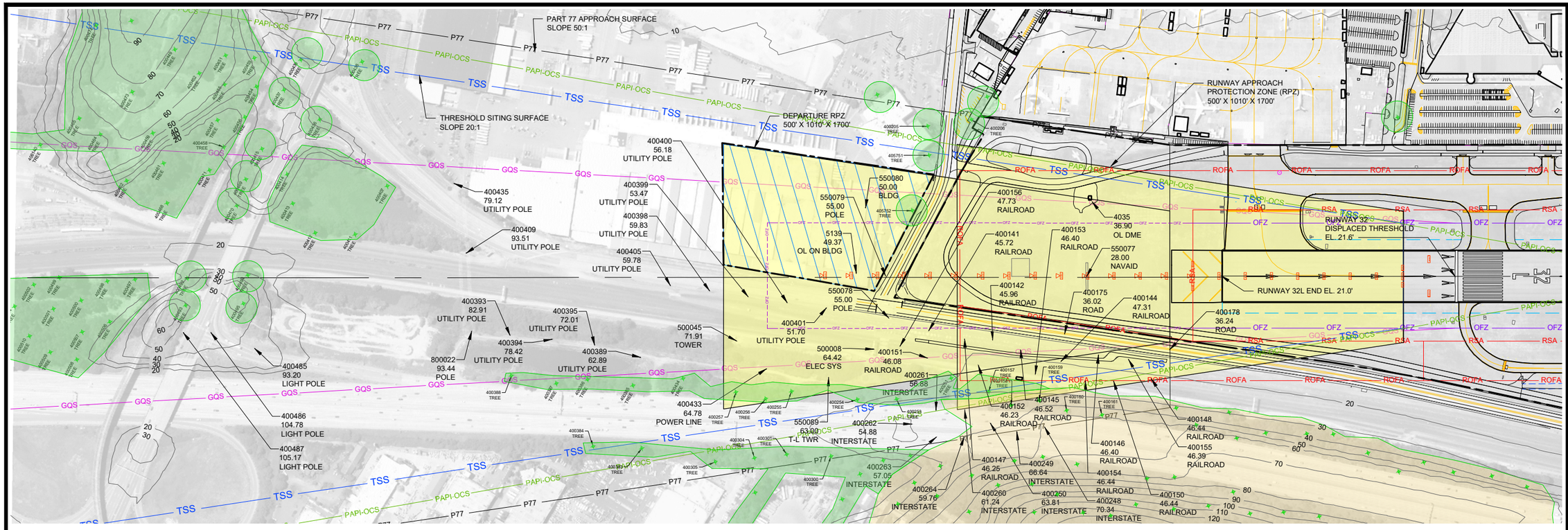

RUNWAY 32L INNER APPROACH PLAN

VERTICALLY GUIDED APPROACH SURFACE OBSTRUCTIONS

NONE IDENTIFIED

PART 77 TREE OBSTRUCTIONS

POINT	DESCRPTION	ELEVATION (TOP)	GROUND ELEVATION	SURFACE	PENETRATION	DISPOSITION
400157	TREE	128.80	28.6	RW32L APP	94.01	TBS*
400158	TREE	86.85	34.7	RW32L APP	53.79	TBS*
400159	TREE	75.11	35.8	RW32L APP	44.17	TBS*
400160	TREE	86.40	44.4	RW32L APP	57.55	TBS*
400161	TREE	87.96	48.1	RW32L APP	61.80	TBS*
400205	TREE	86.70	11.5	RW32L APP	47.27	TBS*
400206	TREE	46.25	11.2	RW32L APP	10.15	TBS*
400251	TREE	83.97	18.6	RW32L APP	46.31	TBS*
400253	TREE	61.46	30.2	RW32L APP	19.67	TBS*
400254	TREE	66.64	16.8	RW32L APP	21.85	TBS*
400255	TREE	92.05	16.2	RW32L APP	42.24	TBS*
400256	TREE	81.21	16.4	RW32L APP	29.43	TBS*
400257	TREE	94.57	16.4	RW32L APP	40.53	TBS*
400300	TREE	73.39	16.6	RW32L APP	26.61	TBS*
400301	TREE	114.71	16.3	RW32L APP	64.53	TBS*
400304	TREE	80.99	16.2	RW32L APP	28.35	TBS*
400305	TREE	82.09	16.1	RW32L APP	26.48	TBS*
400383	TREE	104.99	16.1	RW32L APP	43.78	TBS*
400384	TREE	89.61	13.8	RW32L APP	24.69	TBS*
400385	TREE	97.15	15.9	RW32L APP	35.26	TBS*
400386	TREE	84.29	13.8	RW32L APP	18.94	TBS*
400387	TREE	103.12	13.8	RW32L APP	35.39	TBS*
400388	TREE	89.27	13.8	RW32L APP	18.11	TBS*
400407	TREE	106.23	16.4	RW32L APP	25.63	TBS*
400411	TREE	97.60	16.4	RW32L APP	14.55	TBS*
400412	TREE	100.75	16.4	RW32L APP	14.67	TBS*
400413	TREE	116.04	16.1	RW32L APP	28.24	TBS*
400414	TREE	110.76	31.7	RW32L APP	22.54	TBS*
400415	TREE	138.57	35.8	RW32L APP	48.42	TBS*
400434	TREE	76.49	16.1	RW32L APP	18.42	TBS*
400436	TREE	118.52	21.1	RW32L APP	32.78	TBS*
400437	TREE	131.73	35.1	RW32L APP	43.27	TBS*
400438	TREE	102.94	16.2	RW32L APP	20.41	TBS*
400439	TREE	111.86	16.2	RW32L APP	24.69	TBS*
400449	TREE	155.99	75.9	RW32L APP	59.22	TBS*
400451	TREE	143.57	53.2	RW32L APP	50.65	TBS*
400452	TREE	153.73	60.9	RW32L APP	58.83	TBS*
400453	TREE	129.73	35.3	RW32L APP	39.01	TBS*
400454	TREE	145.59	35.7	RW32L APP	55.01	TBS*
400455	TREE	117.71	45.0	RW32L APP	24.72	TBS*
400456	TREE	137.10	20.3	RW32L APP	45.65	TBS*
400457	TREE	133.02	16.1	RW32L APP	39.49	TBS*
400458	TREE	138.81	21.3	RW32L APP	45.76	TBS*
400459	TREE	133.26	54.4	RW32L APP	34.81	TBS*
400461	TREE	128.45	16.1	RW32L APP	30.80	TBS*
400462	TREE	119.03	26.2	RW32L APP	18.58	TBS*
400464	TREE	140.92	49.6	RW32L APP	38.45	TBS*
400465	TREE	154.07	52.4	RW32L APP	50.00	TBS*
400468	TREE	109.07	16.0	RW32L APP	11.69	TBS*
400469	TREE	122.07	35.1	RW32L APP	30.69	TBS*
400470	TREE	130.17	19.5	RW32L APP	38.11	TBS*
400471	TREE	118.83	16.1	RW32L APP	24.69	TBS*
400473	TREE	146.02	77.7	RW32L APP	46.00	TBS*
400474	TREE	147.59	60.6	RW32L APP	44.81	TBS*

INNER APPROACH OBSTACLE FREE ZONE OBSTRUCTIONS

POINT	DESCRPTION	ELEVATION (TOP)	GROUND ELEVATION	SURFACE	PENETRATION	DISPOSITION
5139	OL ON BLDG	48.47	13.8	OFZ	4.5	REMOVE
400400	UTILITY POLE	56.18	14.7	OFZ	6.04	REMOVE
400401	UTILITY POLE	51.70	14.7	OFZ	4.53	REMOVE
550077	NAVAID	28	14.4	OFZ	0.69	REMOVE
550078	POLE	55	14.5	OFZ	12.6	REMOVE
550079	POLE	55	13.4	OFZ	12.35	REMOVE

PART 77 TREE OBSTRUCTIONS

POINT	DESCRPTION	ELEVATION (TOP)	GROUND ELEVATION	SURFACE	PENETRATION	DISPOSITION
400492	TREE	96.58	30.9	RW32L APP	0.75	TBS*
400493	TREE	116.41	52.1	RW32L APP	20.45	TBS*
400494	TREE	103.45	30.9	RW32L APP	12.23	TBS*
400495	TREE	108.17	51.7	RW32L APP	16.60	TBS*
400497	TREE	134.13	15.8	RW32L APP	34.31	TBS*
400498	TREE	129.02	16.2	RW32L APP	27.10	TBS*
400499	TREE	148.51	16.4	RW32L APP	42.93	TBS*
400500	TREE	114.89	15.7	RW32L APP	10.97	TBS*
400501	TREE	108.66	15.2	RW32L APP	2.62	TBS*
400502	TREE	127.85	16.4	RW32L APP	20.32	TBS*
400506	TREE	122.25	20.5	RW32L APP	20.52	TBS*
400507	TREE	137.03	14.7	RW32L APP	33.18	TBS*
400508	TREE	130.35	16.3	RW32L APP	26.10	TBS*
400509	TREE	126.62	13.8	RW32L APP	20.35	TBS*
400510	TREE	141.69	13.8	RW32L APP	33.82	TBS*
405751	TREE	60.30	11.7	RW32L APP	20.98	TBS*
405752	TREE	52.04	12.5	RW32L APP	11.42	TBS*
406140	TREE	121.28	16.1	RW32L APP	14.26	TBS*

TBS* - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE

PAPI OBSTACLE CLEARANCE SURFACE OBSTRUCTIONS

NONE IDENTIFIED

THRESHOLD SITING OBSTRUCTIONS

NONE IDENTIFIED

PART 77 OBSTRUCTIONS

POINT	DESCRPTION	ELEVATION (TOP)	GROUND ELEVATION	SURFACE	PENETRATION	DISPOSITION
4035	OL DME	36.9		RW32L APP	10.02	TBS*
5139	OL ON BLDG	49.37		RW32L APP	4.5	REMOVE(OFZ)
400141	RAILROAD	45.72		RW32L APP	6.4	TBS*
400142	RAILROAD	45.96		RW32L APP	11.48	TBS*
400144	RAILROAD	47.31		RW32L APP	18.06	TBS*
400145	RAILROAD	46.52		RW32L APP	14.16	TBS*
400146	RAILROAD	46.4		RW32L APP	19.97	TBS*
400147	RAILROAD	46.25		RW32L APP	9.63	TBS*
400148	RAILROAD	46.44		RW32L APP	24.06	TBS*
400150	RAILROAD	46.44		RW32L APP	21.17	TBS*
400151	RAILROAD	46.08		RW32L APP	6.61	TBS*
400152	RAILROAD	46.23		RW32L APP	10.67	TBS*
400153	RAILROAD	46.4		RW32L APP	15.17	TBS*
400154	RAILROAD	46.44		RW32L APP	19.03	TBS*
400155	RAILROAD	46.39		RW32L APP	22.27	TBS*
400156	RAILROAD	47.73		RW32L APP	6.2	TBS*
400163	NATURAL HIGH POINT	32.47		RW32L APP	8.66	TBS*
400175	ROAD	36.02		RW32L APP	7.03	TBS*
400178	ROAD	36.24		RW32L APP	15.27	TBS*
400250	INTERSTATE	63.81		RW32L APP	29.17	TBS*
400260	INTERSTATE	61.24		RW32L APP	24.64	TBS*
400261	INTERSTATE	56.88		RW32L APP	18.08	TBS*
400262	INTERSTATE	54.88		RW32L APP	14.23	TBS*
400263	INTERSTATE	57.05		RW32L APP	18.26	TBS*
400264	INTERSTATE	59.76		RW32L APP	23.1	TBS*
400389	UTILITY POLE	62.89		RW32L APP	1.56	TBS*
400393	UTILITY POLE	82.91		RW32L APP	11.65	TBS*
400394	UTILITY POLE	78.42		RW32L APP	10.36	TBS*
400395	UTILITY POLE	72.01		RW32L APP	7.2	TBS*
400398	UTILITY POLE	59.83		RW32L APP	3.78	TBS*
400399	UTILITY POLE	53.47		RW32L APP	0.34	TBS*
400400	UTILITY POLE	56.18		RW32L APP	6.04	REMOVE(OFZ)
400401	UTILITY POLE	51.7		RW32L APP	4.53	REMOVE(OFZ)
400405	UTILITY POLE	59.78		RW32L APP	0.74	TBS*
400409	UTILITY POLE	93.51		RW32L APP	18.93	TBS*
400433	POWER LINE	64.78		RW32L APP	13.05	TBS*
400435	UTILITY POLE	79.12		RW32L APP	3.64	TBS*
400485	LIGHT POLE	93.2		RW32L APP	2.51	TBS*
400486	LIGHT POLE	104.78		RW32L APP	10.77	TBS*
400487	LIGHT POLE	105.17		RW32L APP	9.05	TBS*
500008	ELEC SYS	64.42		RW32L APP	20.87	TBS*
500045	TOWER	71.91		RW32L APP	17.89	TBS*
550077	NAVAID	28		RW32L APP	0.69	REMOVE(OFZ)
550078	POLE	55		RW32L APP	12.6	REMOVE(OFZ)
550079	POLE	55		RW32L APP	12.35	REMOVE(OFZ)
550080	BLDG	50		RW32L APP	5.84	TBS*
550089	T-L TWR	63		RW32L APP	16.02	TBS*
800022	pole	93.44		RW32L APP	19.26	TBS*

TBS* - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE

15°35' E
± 0°22'
CHANGING BY
0°9' W / YR
(OCT. 11, 2018)

0 200 400

REVISIONS

NO.	DATE	BY	DESCRIPTION

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		N/A
RUNWAY SAFETY AREA	RUNWAY 14R/32L RSA RUNWAY 14L/32R RSA	N/A
RUNWAY OBJECT FREE AREA	RUNWAY 14R/32L ROFA RUNWAY 14L/32R ROFA	N/A
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	N/A
TAXIWAY OBJECT FREE AREA	TOFA	N/A
ILS CRITICAL AREAS		N/A
PAPI OBSTACLE CLEARANCE SURFACE (OCS)	PAPI-OCS	N/A
AIRPORT PROPERTY LINE		
FENCE (8')	X	N/A
AIRFIELD PAVEMENT		N/A
AIRFIELD PAVEMENT REMOVED	N/A	N/A
RUNWAY PROTECTION ZONE/APPROACH SURFACE		N/A
PART 77 APPROACH SURFACE	P77	N/A
RUNWAY PROTECTION ZONE/APPROACH SURFACE	TSS	N/A
BUILDINGS		N/A
ROADS		
RUNWAY END IDENTIFIER LIGHTS (REILS)		N/A

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phone: 918-585-8844
meadhunt.com

KING COUNTY INT'L/BOEING FIELD AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

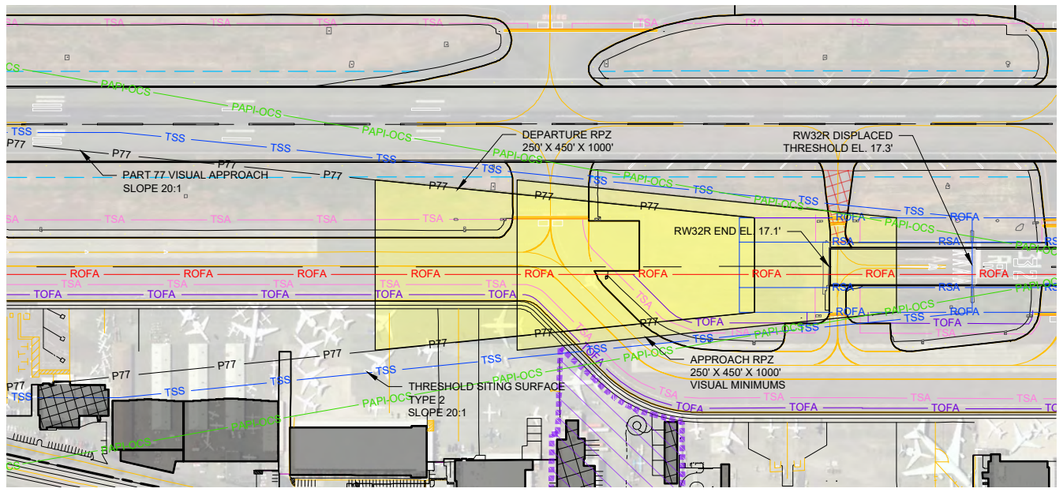
ISSUED

NOT FOR CONSTRUCTION

M&H NO.: 3231200-162066.01
DATE: OCTOBER 2021
DESIGNED BY: M&H
DRAWN BY: JWB
CHECKED BY: CDF
DO NOT SCALE DRAWINGS

Figure ES14

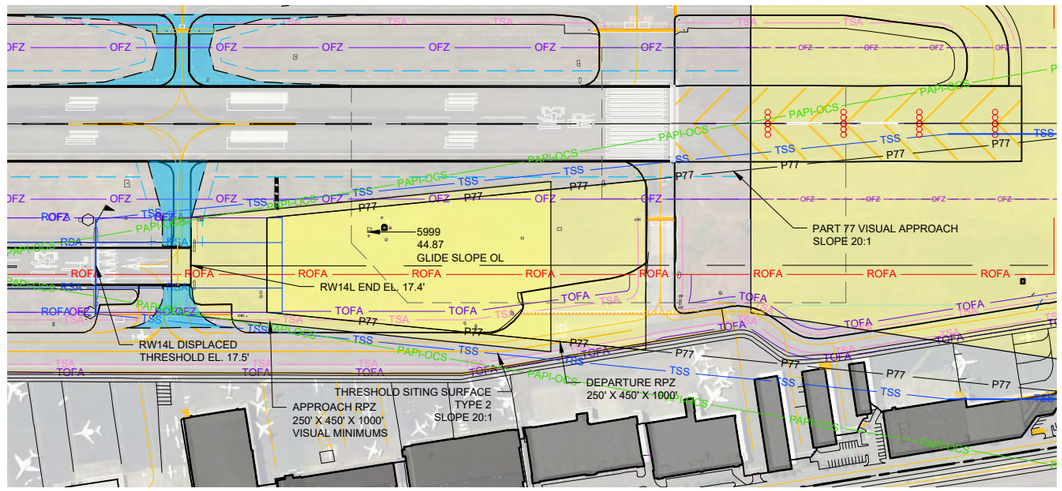
Inner Portion of Approach Surface - Runway 32L Data Tables



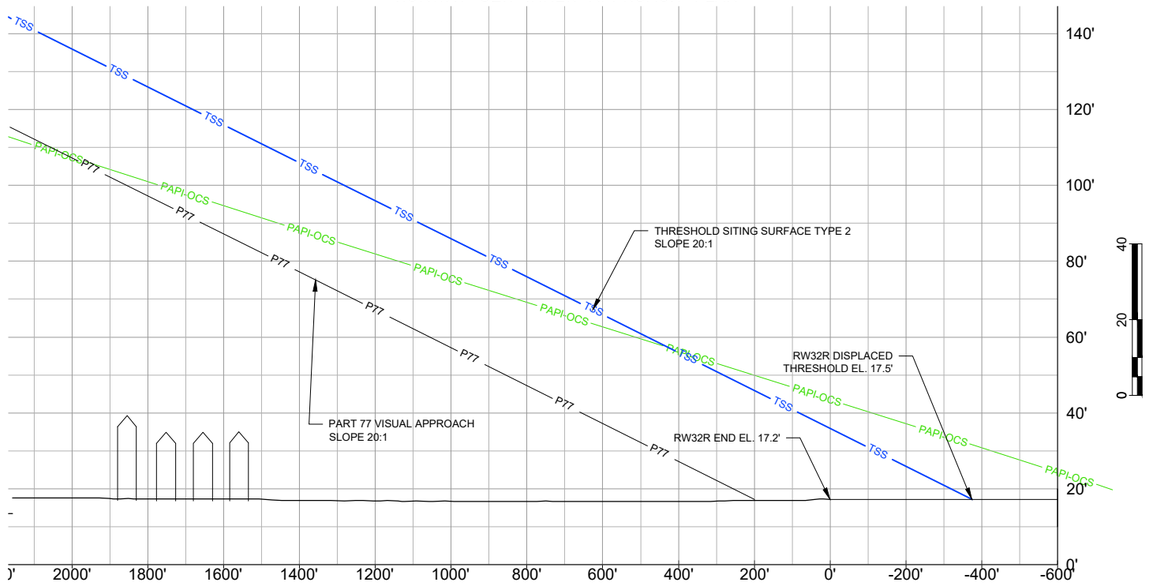
RUNWAY 32R INNER APPROACH PLAN

15°35' E
± 0°22'
CHANGING BY
0°9' W / YR
(OCT. 11, 2018)

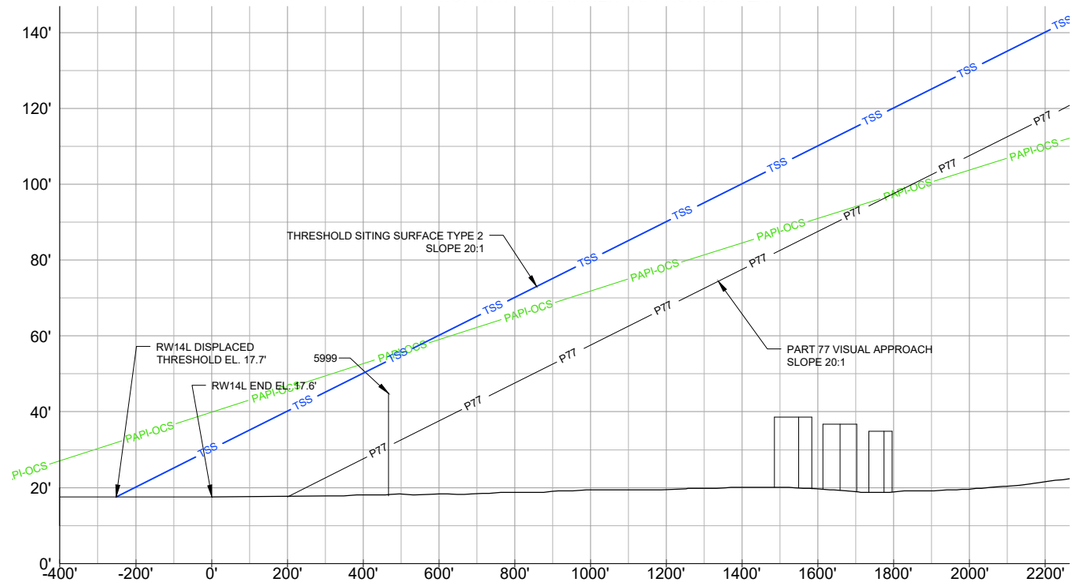
0 200 400



RUNWAY 14L INNER APPROACH PLAN



RUNWAY 32R INNER APPROACH PROFILE



RUNWAY 14L INNER APPROACH PROFILE

PART 77 OBSTRUCTIONS

NONE IDENTIFIED

THRESHOLD SITING SURFACE OBSTRUCTIONS

NONE IDENTIFIED

PAPI OBSTACLE CLEARANCE SURFACE OBSTRUCTIONS

NONE IDENTIFIED

REVISIONS

NO.	DATE	BY	DESCRIPTION

PART 77 OBSTRUCTIONS

POINT	DESCRPTION	ELEVATION (TOP)	GROUND ELEVATION	SURFACE	PENETRATION	DISPOSITION
5999	GLIDE SLOPE OL	44.87	17	RW14L APP	14.03	OB LIGHTED

THRESHOLD SITING SURFACE OBSTRUCTIONS

NONE IDENTIFIED

PAPI OBSTACLE CLEARANCE SURFACE OBSTRUCTIONS

NONE IDENTIFIED

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		N/A
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA	RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA	ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	TSA
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
ILS CRITICAL AREAS		N/A
PAPI OBSTACLE CLEARANCE SURFACE (OCS)	PAPI-OCS	N/A
AIRPORT PROPERTY LINE		
FENCE (8')		N/A
AIRFIELD PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE/APPROACH SURFACE		N/A
PART 77 APPROACH SURFACE	P77	N/A
RUNWAY PROTECTION ZONE/APPROACH SURFACE	TSS	N/A
BUILDINGS		
ROADS		
WINDSOCK		N/A
TAXIWAY HOLDLINES AND SIGNS		
AIRPORT SUPPORT VEHICLE ACCESS LANES		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		

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KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

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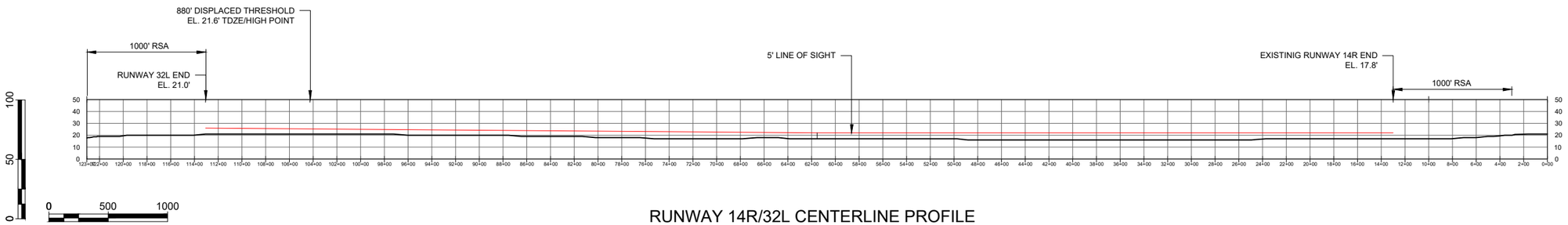
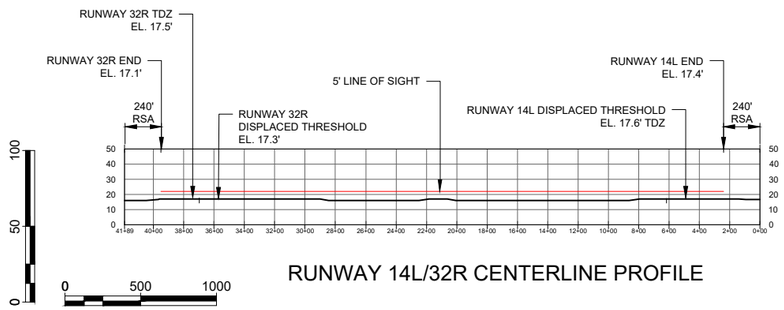
Figure ES15

Inner Portion of Approach Surface - Runway 14L/32R



RUNWAY 14R/32L CENTERLINE PROFILE



RUNWAY 14L/32R CENTERLINE PROFILE

REVISIONS

NO.	DATE	BY	DESCRIPTION

NOTES

1. This drawing reflects planning standards applicable to KCIA/Boeing Field to the greatest extent possible.
2. Coordinate data is NAD83. Elevation data is NAVD88. Survey dated 02/02/15.
3. Existing Runway 14R/32L Prior Permission Required Pavement (PPRP) only available for south departures with Airport Staff approval.
4. Runway elevations from Woolpert, Inc. survey dated 02/02/15.

LAYOUT LEGEND

ITEM	EXISTING	
RUNWAY LINE OF SIGHT		

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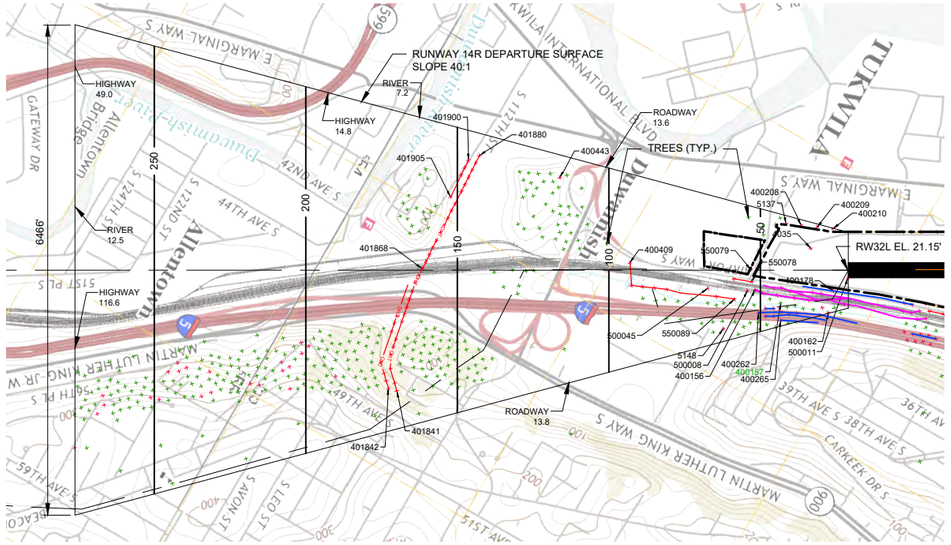
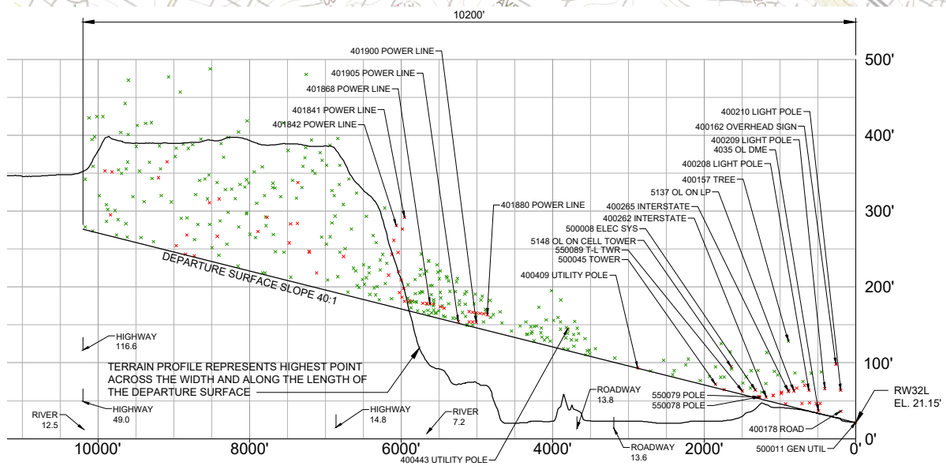
Figure ES16

Runway Centerline Profiles

lix

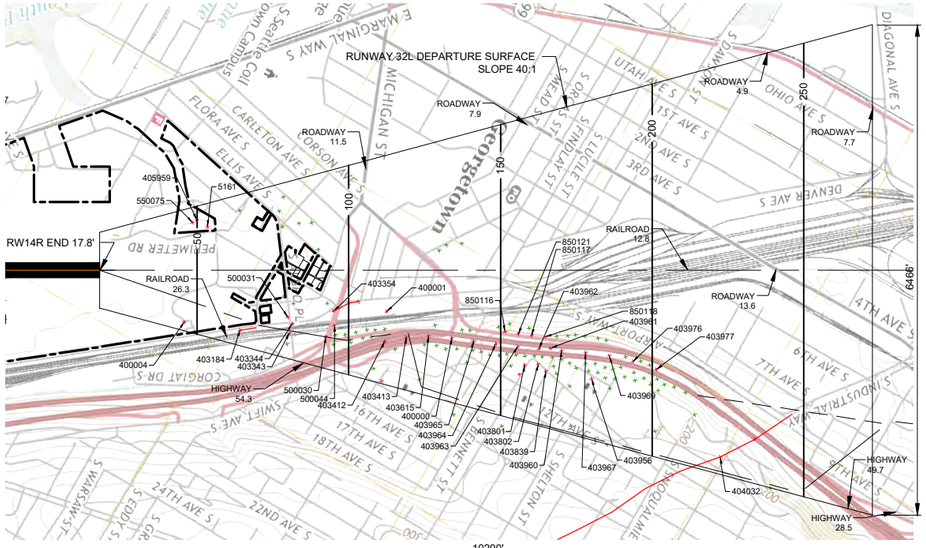
RW14R DEPARTURE SURFACE PLAN

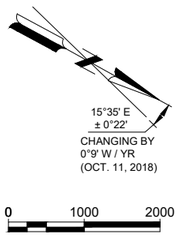


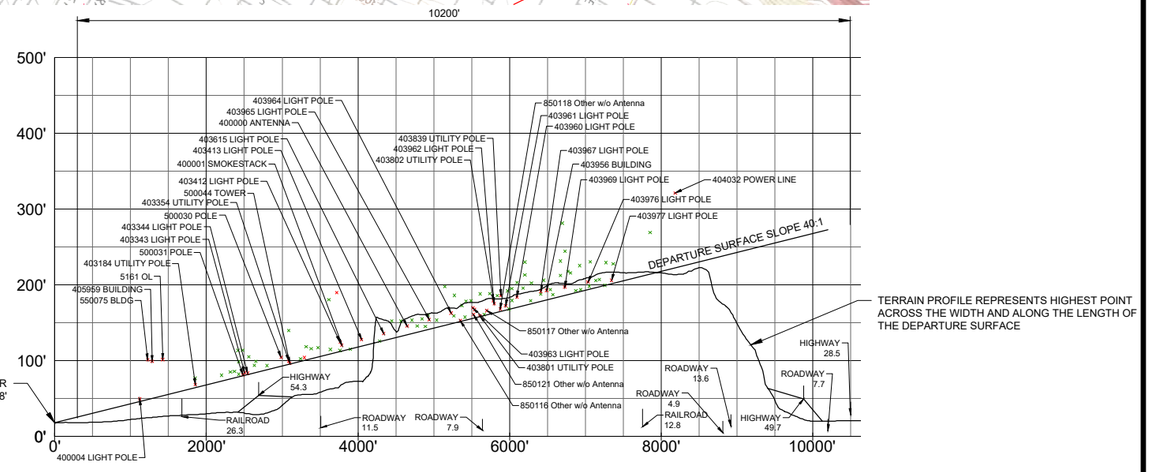


RW14R DEPARTURE SURFACE PROFILE

RW32L DEPARTURE SURFACE PLAN







RW32L DEPARTURE SURFACE PROFILE

RW14R DEPARTURE SURFACE OBSTRUCTIONS

OB#	DESC	ELEV	SURFACE	PEN	DISP
4035	OL DME	36.9	RW14R DEP	3.3	TBS*
5137	OL ON LP	63.01	RW14R DEP	21.1	TBS*
5148	OL ON CELL TOWER	94.98	RW14R DEP	32.7	TBS*
400157	TREE	128.8	RW14R DEP	85.4	TBS*
400162	OVERHEAD SIGN	98.21	RW14R DEP	70.8	TBS*
400178	ROAD	36.42	RW14R DEP	9.1	TBS*
400208	LIGHT POLE	64.21	RW14R DEP	28	TBS*
400209	LIGHT POLE	66.1	RW14R DEP	34.9	TBS*
400210	LIGHT POLE	64.13	RW14R DEP	38	TBS*
400262	INTERSTATE	54.88	RW14R DEP	4	TBS*
400265	INTERSTATE	62.38	RW14R DEP	19	TBS*
400409	UTILITY POLE	93.51	RW14R DEP	0.4	TBS*
400443	UTILITY POLE	144.46	RW14R DEP	28.2	TBS*

OB#	DESC	ELEV	SURFACE	PEN	DISP
401841	POWER LINE	291.95	RW14R DEP	121.3	TBS*
401842	POWER LINE	281.29	RW14R DEP	107.9	TBS*
401868	POWER LINE	177.77	RW14R DEP	16.3	TBS*
401880	POWER LINE	163.51	RW14R DEP	20.7	TBS*
401900	POWER LINE	153.54	RW14R DEP	7.1	TBS*
401905	POWER LINE	154.69	RW14R DEP	2.4	TBS*
500008	ELEC SYS	64.42	RW14R DEP	9.7	TBS*
500011	GEN UTIL	21.45	RW14R DEP	0.2	TBS*
500045	TOWER	71.91	RW14R DEP	4.5	TBS*
550078	POLE	55	RW14R DEP	2	REMOVE
550079	POLE	55	RW14R DEP	1.9	REMOVE
550089	T-L TWR	63	RW14R DEP	4.3	TBS*

TBS* - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE

RW32L DEPARTURE SURFACE OBSTRUCTIONS

OB#	DESC	ELEV	SURFACE	PEN	DISP
5161	OL	101.34	RW32L DEP	47.8	TBS*
400000	ANTENNA	145.47	RW32L DEP	9.2	TBS*
400001	SMOKESTACK	120.25	RW32L DEP	7.5	TBS*
400004	LIGHT POLE	49.77	RW32L DEP	3.9	TBS*
403184	UTILITY POLE	68.35	RW32L DEP	4.4	TBS*
403343	LIGHT POLE	84.23	RW32L DEP	3.8	TBS*
403344	LIGHT POLE	83.45	RW32L DEP	2	TBS*
403354	UTILITY POLE	99.2	RW32L DEP	4.1	TBS*
403412	LIGHT POLE	124.3	RW32L DEP	12.9	TBS*
403413	LIGHT POLE	127.69	RW32L DEP	9.3	TBS*
403615	LIGHT POLE	135.48	RW32L DEP	9.4	TBS*
403801	UTILITY POLE	158.94	RW32L DEP	0.9	TBS*
403802	UTILITY POLE	179.23	RW32L DEP	16.7	TBS*
403839	UTILITY POLE	185.71	RW32L DEP	20.7	TBS*
403956	BUILDING	192.77	RW32L DEP	13.1	TBS*
403960	LIGHT POLE	183.8	RW32L DEP	14.1	TBS*
403961	LIGHT POLE	172.22	RW32L DEP	5.6	TBS*
403962	LIGHT POLE	174.97	RW32L DEP	11.5	TBS*

OB#	DESC	ELEV	SURFACE	PEN	DISP
403963	LIGHT POLE	169.57	RW32L DEP	13.7	TBS*
403964	LIGHT POLE	162.72	RW32L DEP	14.3	TBS*
403965	LIGHT POLE	154.06	RW32L DEP	13	TBS*
403967	LIGHT POLE	191.24	RW32L DEP	13.1	TBS*
403969	LIGHT POLE	196.79	RW32L DEP	11.2	TBS*
403976	LIGHT POLE	203.63	RW32L DEP	9.6	TBS*
403977	LIGHT POLE	206.04	RW32L DEP	4	TBS*
404032	POWER LINE	321.15	RW32L DEP	98.8	TBS*
405959	BUILDING	98.94	RW32L DEP	47.9	TBS*
500030	POLE	104.56	RW32L DEP	12.2	TBS*
500031	POLE	81.06	RW32L DEP	1.2	TBS*
500044	TOWER	96.42	RW32L DEP	1.2	TBS*
550075	BLDG	101	RW32L DEP	52.1	TBS*
850116	Other w/o Antenna	153	RW32L DEP	1.6	TBS*
850117	Other w/o Antenna	166	RW32L DEP	5.8	TBS*
850118	Other w/o Antenna	168	RW32L DEP	3.3	TBS*
850121	Other w/o Antenna	161	RW32L DEP	5.3	TBS*

TBS* - TO BE FURTHER STUDIED IN INDIVIDUAL AIRSPACE CASE

NOTES

1. This drawing reflects planning standards applicable to KCIA/Boeing Field to the greatest extent possible.
2. Coordinate data is NAD83. Elevation data is NAVD88. Survey dated 02/02/15.
3. Existing Runway 14R/32L Prior Permission Required Pavement (PPRP) only available for south departures with Airport Staff approval.
4. Runway elevations from Woolpert, Inc. survey dated 02/02/15.
5. USGS Quadrangle county composite King County, WA 2015.

REVISIONS

NO.	DATE.	BY	DESCRIPTION

PROJECT ENGR/ARCH	.
DESIGNER	.
DRAWN BY	.
DATE	.
CHECKED BY	.
APPROVED BY	.

LAYOUT LEGEND

ITEM	
AIRPORT PROPERTY LINE	
DEPARTURE SURFACE CONTOUR LINE	100
TERRAIN OBSTRUCTING AREA INCLUDING TREES	
TREE OBSTRUCTING AREA	
PART 77 OBSTRUCTIONS	X
PART 77 OBSTRUCTIONS – TREES	X
PART 77 ROADWAY OBSTRUCTIONS	
PART 77 RAIL OBSTRUCTIONS	
PART 77 OVERHEAD LINE OBSTRUCTIONS	
PART 77 FENCE OBSTRUCTIONS	

Mead & Hunt

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AIRPORT LAYOUT PLAN

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CHECKED BY:	CDF

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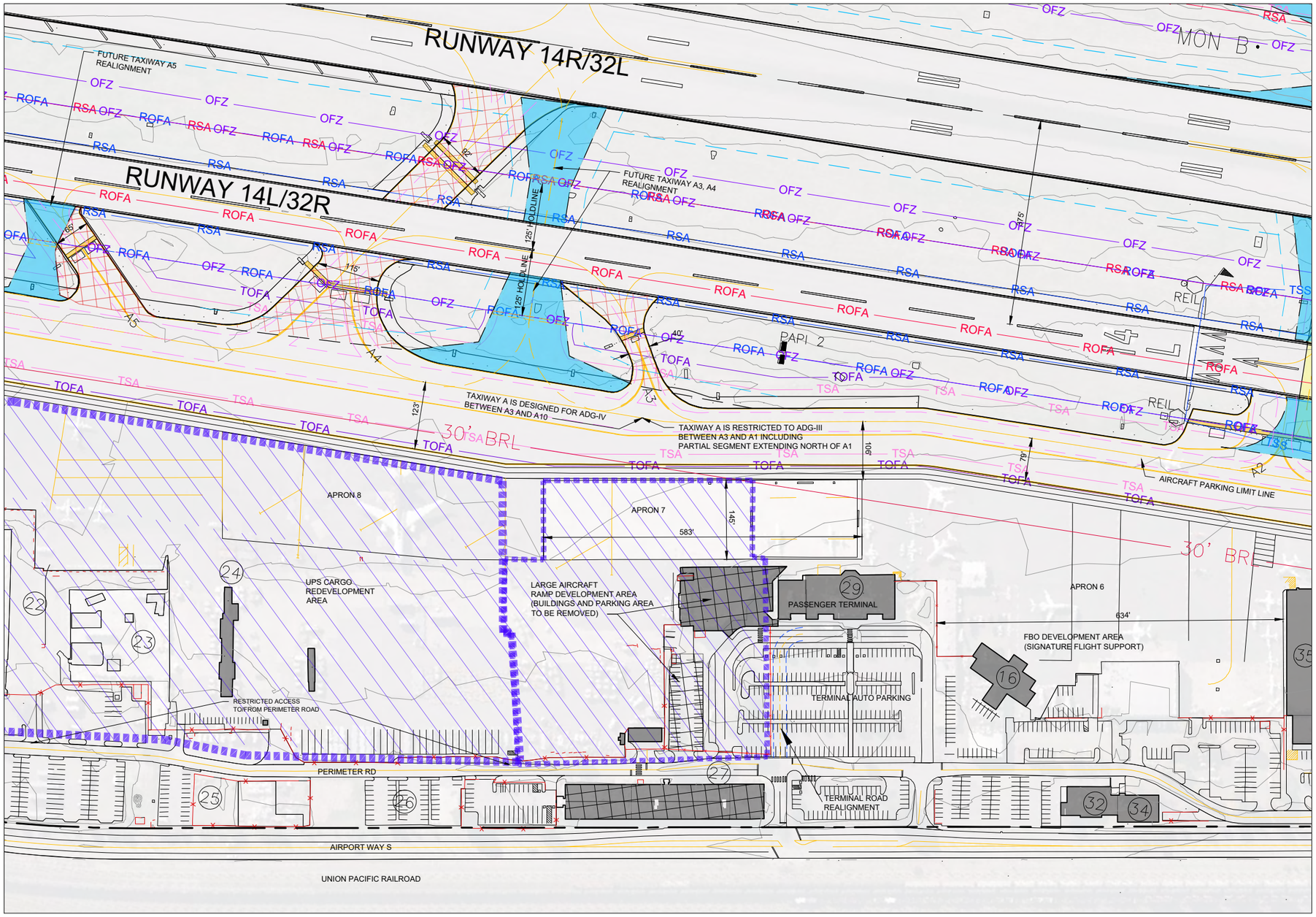
Figure ES17

Departure Surface Drawing

lx

\\CORP.MEADHUNT.COM\SHAREDFOLDERS\ENTP\323120016\2066.011\TECH\CAD\AIRPORTLAYOUTPLAN\DEPARTURE SURFACES.DWG
11/9/2021 4:11:28 PM



REVISIONS

NO.	DATE	BY	DESCRIPTION

BUILDING LEGEND

#	DESCRIPTION	ADDRESS	ELEVATION*	#	DESCRIPTION	ADDRESS	ELEVATION*
16	SIGNATURE FBO		31' EST.	29	AIRPORT TERMINAL	7277 PERIMETER ROAD SOUTH	59.6'
22	VACANT	7607 PERIMETER ROAD SOUTH		30	REMOVED		
23	UPS	7585 PERIMETER ROAD SOUTH	38.3'	31	REMOVED		
24	UPS SORT SHACK	75XX PERIMETER ROAD SOUTH	34.9'	32	AVIATION STORE	7201 PERIMETER ROAD SOUTH	32.9'
25	UPS	7500 PERIMETER ROAD SOUTH		33	REMOVED		
26	UPS	7440 PERIMETER ROAD SOUTH		34	AVIATION TRAINING CENTER	7170 PERIMETER ROAD SOUTH	32.9'
27	K.C. AGENCIES (TBR)	7300 PERIMETER ROAD SOUTH	45.7'	35	7023 PERIMETER ROAD, LLC	7023 PERIMETER ROAD SOUTH	56.6'
28	QUAD 7 DEVELOPMENT, LLC	.	59.8'				

(TBR) TO BE REMOVED

* TOP ELEVATIONS FROM AGIS SURVEY BY WOOLPERT, INC. (AUGUST 2016)

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA	RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA	ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	TSA
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
ILS CRITICAL AREAS		N/A
AIRPORT PROPERTY LINE		
FENCE (8')		
AIRFIELD PAVEMENT		
AIRFIELD SHOULDER PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE		
PART 77 APPROACH SURFACE	P77	P77
THRESHOLD SITING SURFACE	TSS	TSS
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
FUEL STORAGE	F	F
BEACON	★	N/A
WINDSOCK		N/A
PRECISION APPROACH PATH INDICATOR (PAPI)		N/A
TAXIWAY HOLDLINES AND SIGNS		
SURVEY MONUMENTS	MON. A	N/A
AIRPORT SUPPORT VEHICLE ACCESS LANE'S		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		
ACCESS CORRIDORS (THROUGH-THE-FENCE)		
FUTURE DEVELOPMENT AREAS		

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meadhunt.com

KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

NOT FOR CONSTRUCTION

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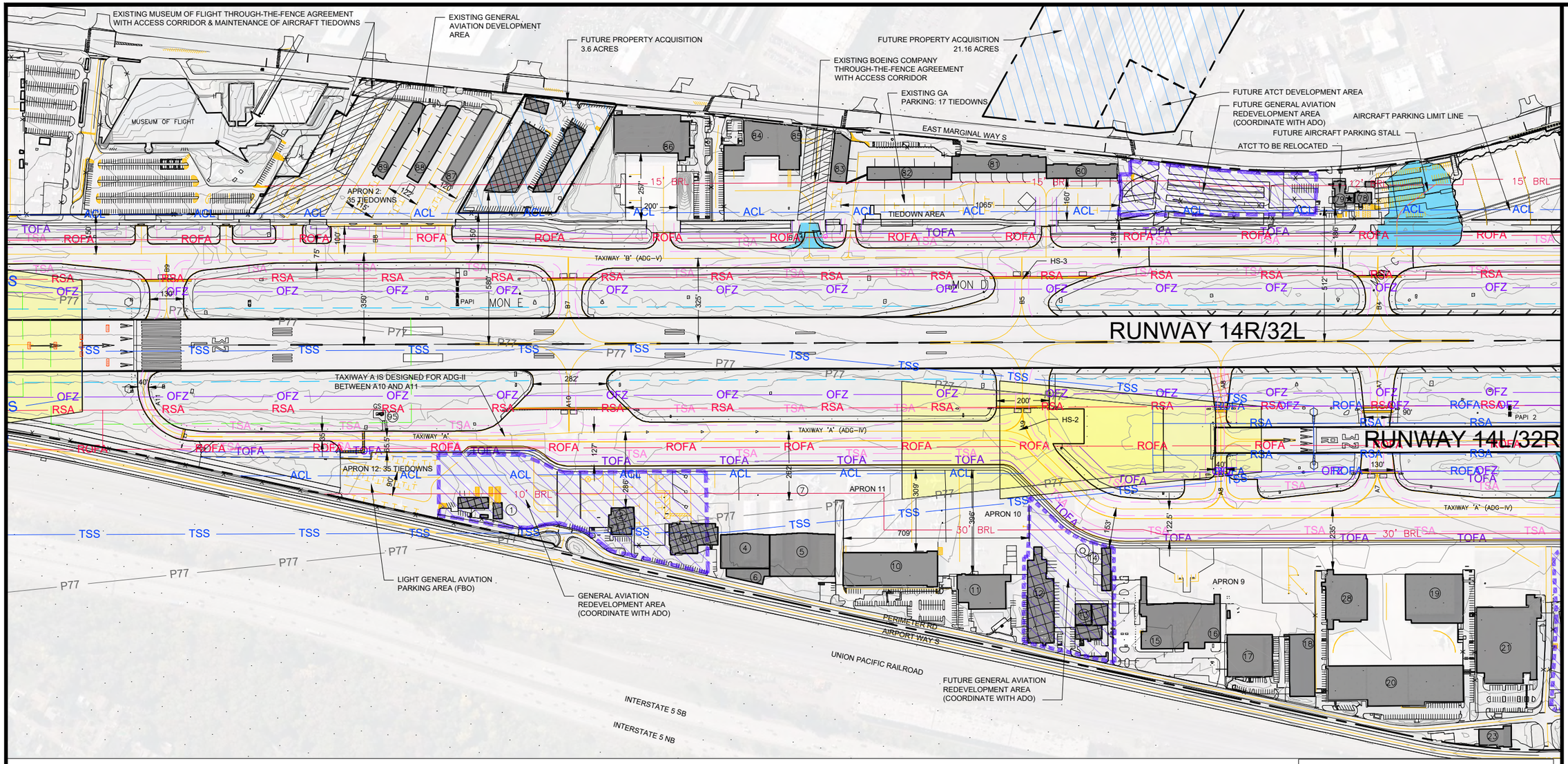
Figure ES18

Terminal Area Plan

lxi



REVISIONS

NO.	DATE	BY	DESCRIPTION

CHANGING BY 0°9' W / YR (OCT. 11, 2018)

15°35' E ± 0°22'

0 200 400

BUILDING LEGEND

#	DESCRIPTION	ADDRESS	ELEVATION*	#	DESCRIPTION	ADDRESS	ELEVATION*	#	DESCRIPTION	ADDRESS	ELEVATION*
1	VACANT (TBR)	8600 PERIMETER ROAD SOUTH	40.5'	15	MENTE	8075 PERIMETER ROAD SOUTH	52' EST.	84	REMOVED		
2	KENMORE AERO SERVICES (TBR)	8555 PERIMETER ROAD SOUTH	40.2'	16	SIGNATURE FBO	.	31' EST.	85	GDH-I, LLC	8900 EAST MARGINAL WAY	48.2'
3	KENMORE AERO SERVICES (TBR)	8535 PERIMETER ROAD SOUTH	44.3'	17	NORDSTROMS, INC.	7979 PERIMETER ROAD SOUTH	45.6'	86	CHARLESAIR, LLC	9010 EAST MARGINAL WAY	46.8'
4	MODERN AVIATION HANGAR	8490 PERIMETER ROAD SOUTH	52' EST.	18	NORDSTROMS, INC.	7xxx PERIMETER ROAD SOUTH	49.8'	87	HANGAR "E"	9210 EAST MARGINAL WAY	36.3'
5	MODERN AVIATION HANGAR	8473 PERIMETER ROAD SOUTH	52' EST.	19	QUAD 7 DEVELOPMENT, LLC	7777 PERIMETER ROAD SOUTH	59.3'	88	HANGAR "D"	9220 EAST MARGINAL WAY	35.7'
6	MODERN AVIATION OFFICE	8500 PERIMETER ROAD SOUTH	34' EST.	20	QUAD 7 DEVELOPMENT, LLC	7827 PERIMETER ROAD SOUTH	53.6'	89	HANGAR "C"	9230 EAST MARGINAL WAY	36.3'
7	PUMP STATION		32' EST.	21	HANGAR HOLDINGS	7675 PERIMETER ROAD SOUTH	90.3'				
8	HANGAR II, LLC (TBR)	8465 PERIMETER ROAD SOUTH	36.9'	28	QUAD 7 DEVELOPMENT, LLC	.	59.8'	95	RW34L GLIDE SLOPE EQUIP. BLDG.		26.5'
9	HANGAR II, LLC T-HANGAR (TBR)	8453 PERIMETER ROAD SOUTH	36.4'	78	ARFF BUILDING	8190 EAST MARGINAL WAY	38.3'				
10	MODERN AVIATION	8403 PERIMETER ROAD SOUTH	60.7'	79	ATCT (TBR-'27)	8200 EAST MARGINAL WAY	85.1'				
11	MODERN AVIATION	8285 PERIMETER ROAD SOUTH	47.7'	80	T-HANGAR (TBR-'27)	8700 A EAST MARGINAL WAY	37.4'				
12	VACANT (TBR)	8201 PERIMETER ROAD SOUTH	37.2'	81	T-HANGAR (TBR-'27)	8700 B EAST MARGINAL WAY	41.5'				
13	KENMORE AIR HARBOR (TBR)	8167 & 8187 PERIMETER ROAD SOUTH	39.6'	82	T-HANGAR (TBR-'27)	8700 C EAST MARGINAL WAY	36.3'				
14	KENMORE AIR HARBOR (TBR)	8185 PERIMETER ROAD SOUTH	35.2'	83	T-HANGAR (TBR-'27)	8700 D EAST MARGINAL WAY	35.8'				

(TBR) TO BE REMOVED

* TOP ELEVATIONS FROM AGIS SURVEY BY WOOLPERT, INC. (AUGUST 2016)

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA, RSA	RSA, RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA, ROFA	ROFA, ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	TSA
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
ILS CRITICAL AREAS		N/A
AIRPORT PROPERTY LINE		
FENCE (8')		
AIRFIELD PAVEMENT		
AIRFIELD SHOULDER PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE		
PART 77 APPROACH SURFACE	P77	P77
THRESHOLD SITING SURFACE	TSS	TSS
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
FUEL STORAGE	F	F
BEACON	★	N/A
WINDSOCK		N/A
PRECISION APPROACH PATH INDICATOR (PAPI)		N/A
TAXIWAY HOLDLINES AND SIGNS		
SURVEY MONUMENTS	MON. A	N/A
AIRPORT SUPPORT VEHICLE ACCESS LANES		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		
ACCESS CORRIDORS (THROUGH-THE-FENCE)		
FUTURE DEVELOPMENT AREAS		

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KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

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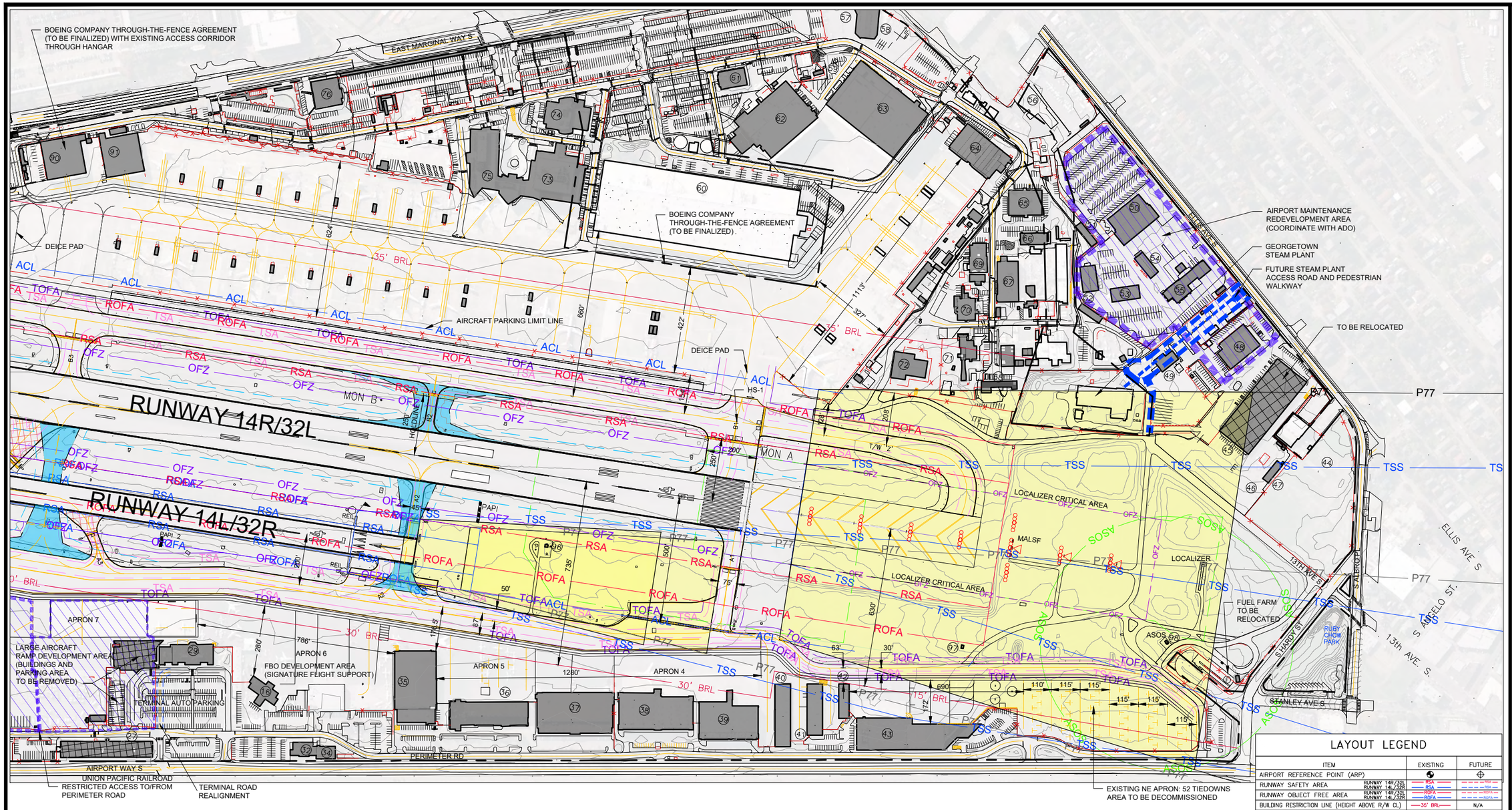
Figure ES19

Area Plan South



BUILDING LEGEND

#	DESCRIPTION	ADDRESS	ELEVATION*
16	SIGNATURE FBO		31' EST.
27	K.C. AGENCIES (TBR)	7300 PERIMETER ROAD SOUTH	45.7'
29	AIRPORT TERMINAL	7277 PERIMETER ROAD SOUTH	59.6'
32	AVIATION STORE	7201 PERIMETER ROAD SOUTH	32.9'
33	REMOVED		
34	AVIATION TRAINING CENTER	7170 PERIMETER ROAD SOUTH	32.9'
35	7023 PERIMETER ROAD, LLC	7023 PERIMETER ROAD SOUTH	56.6'
36	SIGNATURE	7001 PERIMETER ROAD SOUTH	49.7'
37	SIGNATURE	6987 PERIMETER ROAD SOUTH	55.7'
38	KING COUNTY JET CENTER, INC.	6801 B PERIMETER ROAD SOUTH	56.1'
39	KING COUNTY JET CENTER, INC.	6801 A PERIMETER ROAD SOUTH	58.1'
40	T-HANGAR	6711 PERIMETER ROAD SOUTH	38.9'
41	T-HANGAR	6691 PERIMETER ROAD SOUTH	38.3'
42	T-HANGAR	6671 PERIMETER ROAD SOUTH	34.8'
43	J & J AIRPORT PROPERTIES, LLC	6605 PERIMETER ROAD SOUTH	51.6'
44	VACANT	6404 ELLIS AVE.	
45	MAINTENANCE (TO BE RELOCATED)	6518 ELLIS AVE.	36.6'
46	REMOVED		
47	NORTH EQUIPMENT SHED (TBR)		35.8'
48	FUTURE AIRPORT ADMIN OFFICES	6610 ELLIS AVE.	34.4'
49	KC DNR WASTEWATER	6640 ELLIS AVE.	39.9'
50	FUTURE AIRPORT MAINTENANCE REDEVELOPMENT AREA	6736 ELLIS AVE.	42.4'
51	FUTURE AIRPORT MAINTENANCE REDEVELOPMENT AREA		37.5'
52	FUTURE AIRPORT MAINTENANCE REDEVELOPMENT AREA		38.0'
53	FUTURE AIRPORT MAINTENANCE REDEVELOPMENT AREA		34.7'
54	FUTURE AIRPORT MAINTENANCE REDEVELOPMENT AREA		45.4'
55	FUTURE AIRPORT MAINTENANCE REDEVELOPMENT AREA		43.1'
56	FUTURE AIRPORT MAINTENANCE REDEVELOPMENT AREA		
57	BOEING CO. – MARKOV SITE		30.9'
58	BOEING CO. – MARKOV SITE		30.9'
59	BOEING CO. – 75 YEAR LEASE		30.9'
60	BOEING CO. – 75 YEAR LEASE (THROUGH THE FENCE AGREEMENT)		107.9'
61	BOEING CO. – 75 YEAR LEASE		46.5'
62	BOEING CO. – 75 YEAR LEASE		79.8'
63	BOEING CO. – 75 YEAR LEASE		99.8'
64	BOEING CO. – 75 YEAR LEASE		63.7'
65	BOEING CO. – 75 YEAR LEASE		55.5'
66	BOEING CO. – 75 YEAR LEASE		25.4'
67	BOEING CO. – 75 YEAR LEASE		49.9'
68	BOEING CO. – 75 YEAR LEASE		33.3'
69	BOEING CO. – 75 YEAR LEASE		35.9'
70	BOEING CO. – 75 YEAR LEASE		47.6'
71	BOEING CO. – 75 YEAR LEASE		47.4'
72	BOEING CO. – 75 YEAR LEASE		32.9'
73	BOEING CO. – 75 YEAR LEASE		105.0'
74	BOEING CO. – 75 YEAR LEASE		106.9'
75	BOEING CO. – 75 YEAR LEASE		82.0'
76	BOEING CO. – CREDIT UNION	7960 EAST MARGINAL WAY	50.9'
90	LARGE HANGAR		69.3'
91	LARGE HANGAR		67.7'
96	RW14R GLIDE SLOPE EQUIP. BLDG.		27.4'
97	FAA EQUIP. BLDG.		32.0'
98	RW14R LOCALIZER EQUIP. BLDG.		32.9'

(TBR) TO BE REMOVED

* TOP ELEVATIONS FROM AGIS SURVEY BY WOOLPERT, INC. (AUGUST 2016)

REVISIONS

NO.	DATE	BY	DESCRIPTION

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA	RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA	ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	TSA
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
ILS CRITICAL AREAS		N/A
AIRPORT PROPERTY LINE		
FENCE (8')		
AIRFIELD PAVEMENT		
AIRFIELD SHOULDER PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE		
PART 77 APPROACH SURFACE	P77	P77
THRESHOLD SITING SURFACE	TSS	TSS
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
FUEL STORAGE	F	F
BEACON	★	N/A
WINDSOCK		N/A
PRECISION APPROACH PATH INDICATOR (PAPI)		N/A
TAXIWAY HOLDLINES AND SIGNS		
SURVEY MONUMENTS	MON. A	N/A
AIRPORT SUPPORT VEHICLE ACCESS LANES		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		
ACCESS CORRIDORS (THROUGH-THE-FENCE)		
FUTURE DEVELOPMENT AREAS		

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KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

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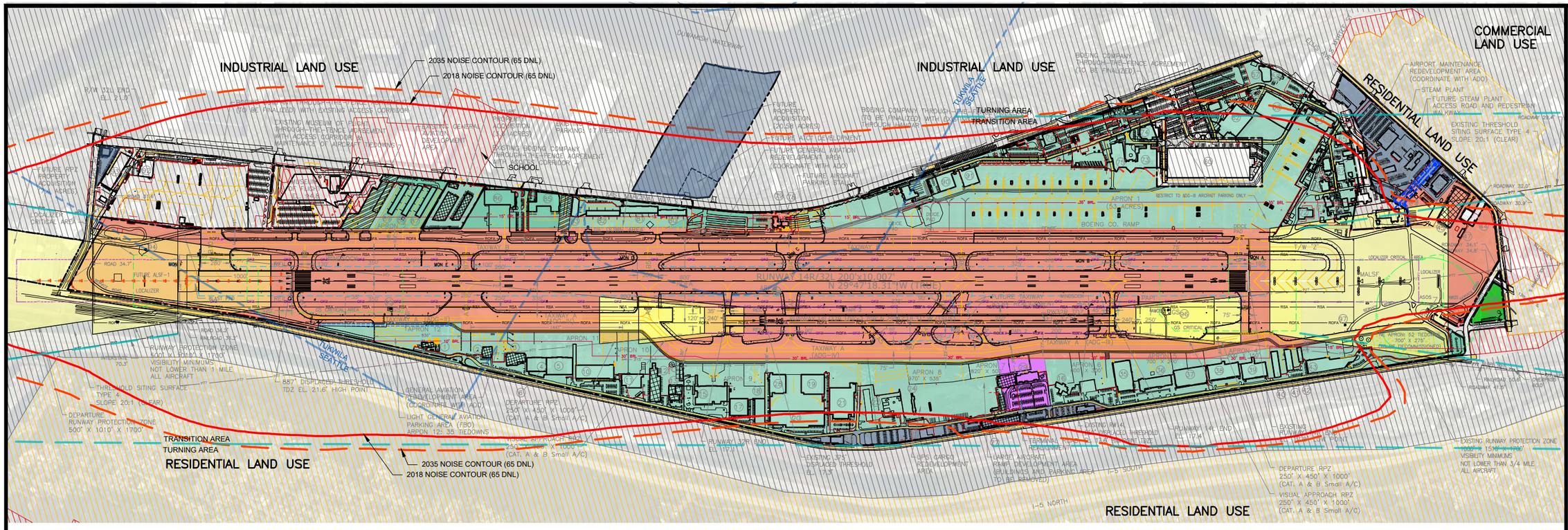
Figure ES20

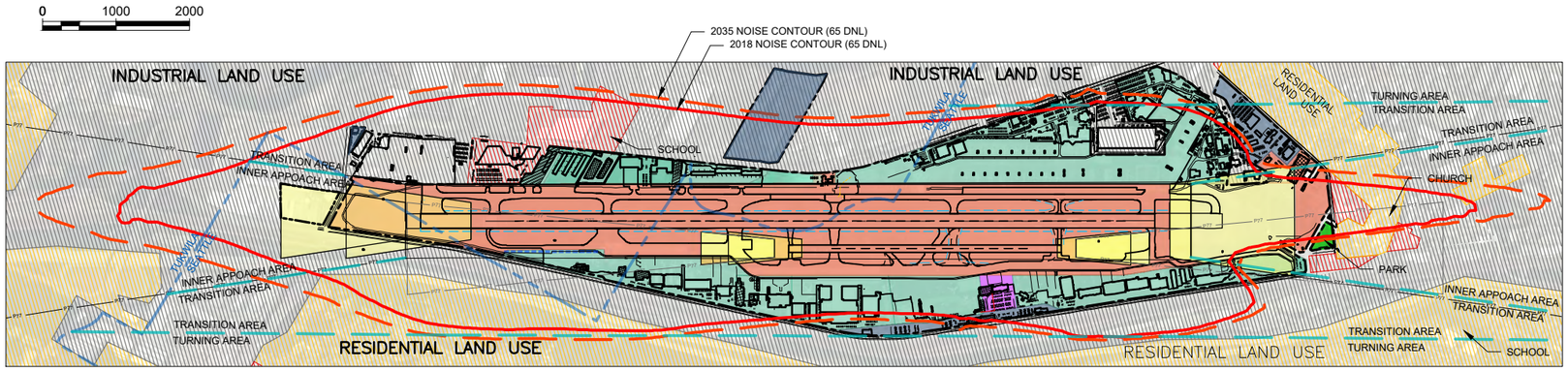
Area Plan North



0 500 1000

15°35' E
± 0°22'
CHANGING BY
0°9' W / YR
(OCT. 11, 2018)

0 1000 2000



REVISIONS

NO.	DATE	BY	DESCRIPTION

OFF-AIRPORT LAND USE LEGEND

- COMMERCIAL
- INDUSTRIAL
- RESIDENTIAL
- CITY LIMIT BOUNDARIES
- CITY OF SEATTLE - AIRPORT HEIGHT OVERLAY DISTRICT
- 2018 NOISE CONTOUR (65 DNL)
- 2035 NOISE CONTOUR (65 DNL)

AIRPORT LAND USE LEGEND

- PASSENGER TERMINAL
- AIRFIELD OPERATIONS
- AVIATION FACILITIES
- RUNWAY PROTECTION ZONES
- AVIATION RELATED
- PARK/OPEN SPACE

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		
RUNWAY SAFETY AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	RSA	RSA
RUNWAY OBJECT FREE AREA (RUNWAY 14R/32L, RUNWAY 14L/32R)	ROFA	ROFA
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
TAXIWAY SAFETY AREA	TSA	TSA
TAXIWAY OBJECT FREE AREA	TOFA	TOFA
ILS CRITICAL AREAS		N/A
AIRPORT PROPERTY LINE		
FENCE (8')	X	X
AIRFIELD PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE		
PART 77 APPROACH SURFACE		
THRESHOLD SITING SURFACE		
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
FUEL STORAGE	F	F
BEACON	★	N/A
WINDSOCK		N/A
PRECISION APPROACH PATH INDICATOR (PAPI)		N/A
TAXIWAY HOLDLINES AND SIGNS		
SURVEY MONUMENTS	MON. A	N/A
AIRPORT SUPPORT VEHICLE ACCESS LANES		N/A
RUNWAY END IDENTIFIER LIGHTS (REILS)		
ACCESS CORRIDORS (THROUGH-THE-FENCE)		

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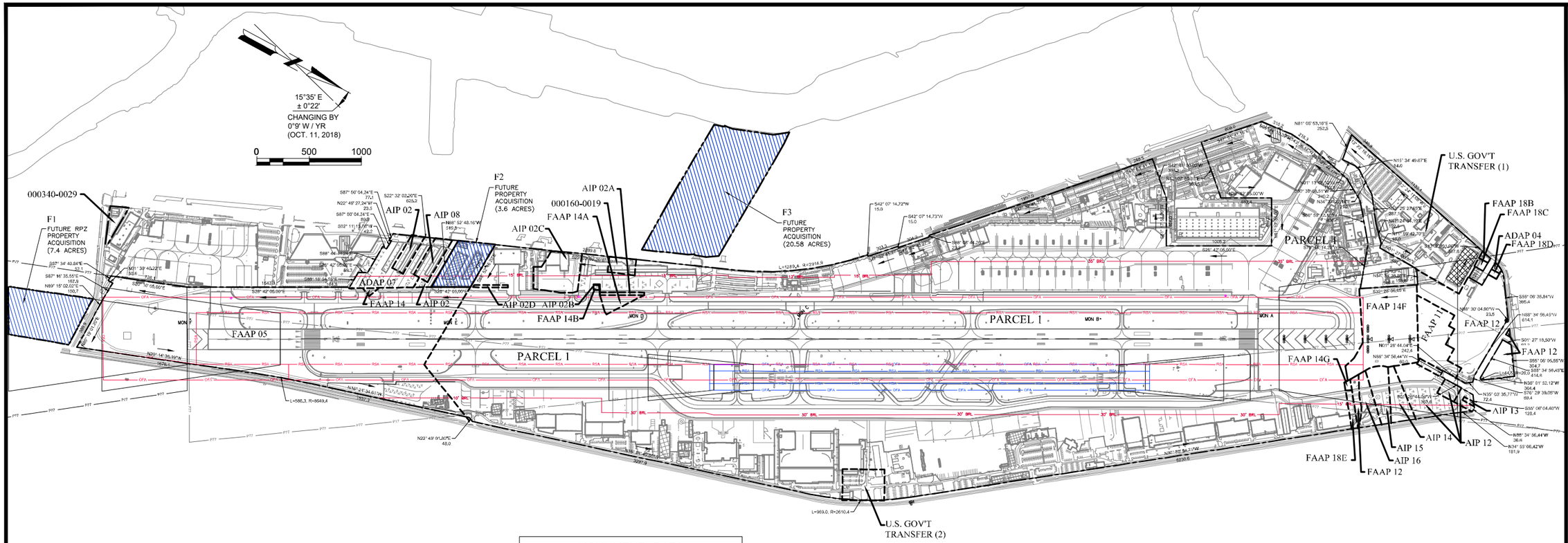
Figure ES21

Airport Land Use Plan



NOTES

1. This drawing reflects planning standards applicable to KCIA/Boeing Field to the greatest extent possible.
2. Coordinate data is NAD83. Elevation data is NAVD88. Survey dated 02/02/15.
3. Prior Permission Required (PPR) Special Use Pavement only available for south departures with airport approval.
4. Runway elevations from Woolpert, Inc. survey dated 02/02/15.
5. Roadway, interstate, and railroad spot elevations within approach surfaces include traverseway adjustment per P77.
6. Meets and Bounds generated by CAD estimates and not from detailed boundary survey.

MONUMENT DATA

ID	NORTHING	EASTING	ELEVATION
MON A	200583.24490	1275193.96709	15.03'
MON B	199146.84255	1275980.90980	12.66'
MON C	196765.08879	1277284.97755	14.35'
MON D	195472.65682	1277992.66081	16.42'
MON E	193940.83455	1278831.39276	16.14'
MON F	191668.97132	1280075.33067	18.54'

NAD 83 STATE PLANE WASHINGTON NORTH, NAVD 88

PARCEL DATA

DRAWING REFERENCE	PARCEL TAX #	GRANTOR	GRANTEE	INTEREST	CONVEYANCE INSTRUMENT	PURPOSE	ACRES	BOOK & PAGE/RECEPTION NO.	DATE OF RECORDING	FAA GRANT NO.
PARCEL 1	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	614.53	**	1928	
U.S. GOV'T TRANSFER (1)	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	17.2	**	1948	
FAAP 05	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	70	**	1951	FAAP 05
FAAP 11	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	4.5	**	1958	FAAP 11
FAAP 12	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	13.2	**	1960	FAAP 12
FAAP 14	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	11.4	**	1957-1962	FAAP 14
FAAP 14A	000160-0049	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.92 *	**	**	FAAP 14A
FAAP 14B	332404-9011	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.05 *	**	**	FAAP 14B
FAAP 14F	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	10.22 *	**	1957-1962	FAAP 14F
FAAP 14G	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.12 *	**	1957-1962	FAAP 14G
FAAP 18	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.9	**	1967	FAAP 18
ADAP 04	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.1	**	1976	ADAP 04
ADAP 07	542260-0124	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	5.6	**	1977-1979	ADAP 07
AIP 02	542260-0124	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	5.7	**	1957-1962, 1977-1979	AIP 02
AIP 02A	000160-0049	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.24 *	**	**	AIP 02A
AIP 02B	332404-9011	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.01 *	**	**	AIP 02B
AIP 02C	000740-0032	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	3.42 *	**	**	AIP 02C
AIP 02D	542260-0160	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.18 *	**	**	AIP 02D
AIP 08	542260-0124	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	1.5	**	1986	AIP 08
AIP 12, 14, 15, 16	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	10.04	**	1990	AIP 12, 14, 15, 16
AIP 13	282404-9007 SEC. 28 T24 R4E	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	0.09	**	1990	AIP 13
U.S. GOV'T TRANSFER (2)	**	**	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	2.75 *	**	**	
000160-0019	000160-0019	MUSEUM OF FLIGHT	KING COUNTY AIRPORT	FEE SIMPLE	BARGAIN AND SALES DEED	AIRPORT	0.89 *	**	12/19/2003	
000340-0029	000340-0029	MICHIGAN PROPERTIES	KING COUNTY AIRPORT	FEE SIMPLE	STATUTORY WARRANTY DEED	AIRPORT	0.76 *	INSTRUMENT NO. 20210315001470	3/15/2021	

** INFORMATION TO BE INCLUDED IN FOLLOW-UP AS-BUILD PLANNING EFFORT

* ESTIMATED (CALCULATIONS BASED ON DIGITAL AIRPORT LAYOUT PLAN)

FUTURE PARCEL DATA

DRAWING REFERENCE	PARCEL TAX #	GRANTOR	GRANTEE	INTEREST	CONVEYANCE INSTRUMENT	PURPOSE	ACRES	BOOK & PAGE/RECEPTION NO.	DATE OF RECORDING	FAA GRANT NO.
F1	0323049024	PROLOGIS	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT/RPZ	7.4	**	FUTURE	**
F2	5422600150	WOODS MEADOWS	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	3.68	**	FUTURE	**
F3	0001600023	JORGENSEN FORGE	KING COUNTY AIRPORT	FEE SIMPLE	**	AIRPORT	20.58	**	FUTURE	**

** INFORMATION TO BE INCLUDED IN FOLLOW-UP AS-BUILD PLANNING EFFORT

REVISIONS

NO.	DATE	BY	DESCRIPTION

LAYOUT LEGEND

ITEM	EXISTING	FUTURE
AIRPORT REFERENCE POINT (ARP)		N/A
RUNWAY SAFETY AREA RUNWAY 14R/32L / RUNWAY 14L/32R	RSA / RSA	N/A
RUNWAY OBJECT FREE AREA RUNWAY 14R/32L / RUNWAY 14L/32R	ROFA / ROFA	N/A
BUILDING RESTRICTION LINE (HEIGHT ABOVE R/W CL)	35' BRL	N/A
PART 77 APPROACH SURFACES	P77	P77
AIRPORT PROPERTY LINE		
FENCE (8')	X	N/A
AIRFIELD PAVEMENT		
AIRFIELD PAVEMENT REMOVED	N/A	
RUNWAY PROTECTION ZONE/APPROACH SURFACE		
BUILDINGS		
BUILDINGS TO BE REMOVED	N/A	
ROADS		
SURVEY MONUMENTS	MON. A	N/A

Mead & Hunt

Mead and Hunt, Inc.
Cherry Street Building
1616 East 15th Street
Tulsa, OK 74120
phone: 918-585-8844
meadhunt.com

KING COUNTY INT'L/BOEING FIELD
AIRPORT LAYOUT PLAN

7277 Perimeter Rd S
Seattle, WA 98108

ISSUED

NOT FOR CONSTRUCTION

M&H NO.: 3231200-162066.01
DATE: OCTOBER 2021
DESIGNED BY: M&H
DRAWN BY: JWB
CHECKED BY: CF
DO NOT SCALE DRAWINGS

Figure ES22

Airport Property Map - 'Exhibit A'

lxv

A Inventory of Existing Conditions

INTRODUCTION. Following approval for construction in 1928 as the region's first municipal airport, King County International Airport/Boeing Field (BFI or Airport) has grown to be one of the busiest primary non-hub airports in the nation and the primary general aviation reliever airport to Seattle-Tacoma International Airport (SEA). BFI also ranks among the most successful public investments in state history and is a major contributor the region's economic stability and sustainability. According to the recently completed *High-Level Economic Impact of King County International Airport* study, BFI's economic impact for 2019 was $2.97 billion in terms of local business sales that support 18,412 jobs and generates $1.2 billion in labor income to King County. The Airport's 150 tenant businesses, which includes the Boeing Company's various civilian and military aircraft Flight Test and Delivery Center operations, directly support 6,705 jobs in the local economy.

On a regional/national level, information provided by the King County Aerospace Alliance identifies King County as the largest center for aerospace activity in the country with over 45,000 industry employees and more than 400 aerospace companies. BFI is also the home of the Museum of Flight, with its wide variety of aircraft and exhibits showcasing aviation history, and frequently the "airport of choice" for celebrities, dignitaries, and corporate aircraft operators because of its proximity to downtown Seattle. In 2001, BFI was named by the National Air Transportation Association as one of the "100 Most Needed Airports" in the United States.

BFI serves a wide variety of aviation users that include small commercial passenger airlines, large and small air cargo carriers, commercial general aviation Fixed Base Operators (FBOs), corporate general aviation flight departments, private aircraft owners, helicopters, and military aircraft. In 2015, BFI recorded 20,214 enplanements, 165,571 aircraft takeoffs/landings, and 390 based aircraft. For 2019, enplanements increased to 30,568, with total operations increasing to 186,228. Also, in 2015 BFI ranked as the 27th busiest cargo airport in the country, recording a cargo landed weight of 416,737 tons. This compares to a slight decline of the recorded landed weight of 377,034 tons for 2019, which ranks 38th in the country.

The previous Airport Master Plan was completed/adopted in 2004 and has been recognized as an accurate representation of the overall concepts that drive operations and development of the Airport. However, in consideration of the significant changes in local, regional, and national aviation industry considerations, the document is in need of a comprehensive update. This Master Plan Update (MP Update) will assist in documenting the current state of the aviation industry at BFI, and ultimately support the modernization and improvement of existing Airport facilities.

The study process shall revalidate, refine, and propose various adjustments to the current Airport build-out program, and the findings will serve as the strategic guide for overall economic development opportunities and sustainability recommendations. The planning recommendations will identify milestones and phasing strategies, including a finance program to guide both landside and airside development over a 20-year planning horizon. The County's Strategic Plan Goals and Objectives, as defined in the *King County Strategic Plan* and the *King County International Airport Strategic Plan*, will inform the development of the MP Update and serve as an Airport Management business decision-making tool (i.e., the roadmap) for the development of capital projects, sustainability, and customer service. The MP Update will also provide a framework to maintain and enhance the Airport as a major regional economic and employment center. A listing of the planning goals and supporting objectives defined in the *King County International Airport Strategic Plan* are presented in the following text:

- ***Goal 1: Support Economic Vitality in the Region***
  - *Boeing Retention.* Continue to work with Boeing to ensure that their property and business needs are integrated into the Airport's long-term property plans.
  - *Property Development and Redevelopment.* Conduct assessments of key strategic properties, both on and off the Airport footprint to determine the uses that best align with BFI's long-term vision.
  - *Decision Tools.* Develop decision tools that will provide the necessary information to support critical policy choices and clearly show how individual decisions relate to the dual mandates to maximize economic impact and financial capacity to invest.
  - *Economic Development.* Collaborate with other County departments to ensure that BFI's efforts are appropriately aligned with broader County economic development goals and initiatives.

- ***Goal 2: Financial Performance***
  - *Value Pricing.* Develop a comprehensive pricing structure that will appropriately reflect the value that customers and tenants are receiving. The pricing structure should bring into alignment all of BFI's fees and charges to ensure that customers and tenants are paying in proportion to their use of facilities and the value they derive from that use.
  - *Cost Containment.* Aggressively manage costs to support net operating income.
  - *Cost recovery.* Identify opportunities for BFI to allocate costs to tenants and customers, where such pass-throughs are authorized by County code and can be justified using appropriate cost allocation methods.
  - *Financial Targets.* Develop specific financial performance targets that will support current investment plans and ensure that BFI is generating an appropriate rate of return on its assets.

- ***Goal 3: Maintain a World Class Facility***
  - *Facility Investment.* Invest in capital replacement based on needs identified using appropriate asset management standards and based on life cycle costs of Airport facilities.
  - *Customer service.* Ensure that there is a customer-oriented focus throughout the organization and that customer and tenant needs are factored into operational and policy decisions.
  - *Security and safety.* Provide for the security and safety needs of the Airport, including customers, tenants, employees, and the broader community.

- ***Goal 4: Organizational Development and Capacity***
  - *Invest in Organizational Capacity.* Identify organizational capacity needs to support an enhanced focus on business development and strategic investment decisions.
  - *Organizational Structure.* Align the organizational structure and core competencies to support implementation of the strategic plan and to maximize cost effectiveness of BFI's operations.
  - *Continuous Improvement.* Build the efficiency and core competencies of the organization through application of continuous improvement and application of Lean principles.

- ***Goal 5: Environmental Stewardship***
  - *Noise Impacts and Mitigation.* Continue to implement and enhance the noise mitigation program.
  - *Climate Change.* Align BFI programs and services with County climate change goals.
  - *Environmentally Sensitive Design.* To the maximum extent possible, incorporate environmentally sensitive design into BFI capital projects.

- ***Goal 6: Communications and Community Partnerships***
  - *Transparency.* Operate in an open and transparent way to build trust with customers, tenants, stakeholders, decision makers, and the broader community.
  - *Stakeholder engagement.* Ensure appropriate level of consultation with key stakeholders and work collaboratively to foster mutually beneficial solutions.
  - *Industry leadership.* Increase BFI's influence within the aviation industry through effective participation in select membership and trade organizations.
  - *Neighborhood & community.* Act as a partner to neighboring residents, businesses, and organizations.

In addition, the MP Update must provide an updated on-airport land use plan that is compatible with the environment and land uses adjacent to the Airport, as well as other modes of transportation and the surrounding airports in the region. The requirement of future facilities is evaluated not only from an aviation standpoint, but also the relationship of airport facilities to the surrounding land uses, and the community as a whole. The focus is on the total aviation facility and its environs, with the overall planning goal being the development of an aviation facility that can accommodate future demand, which is not significantly constrained by its environs and strives to mitigate any potential adverse impacts to its surroundings.

Public Outreach/Communication Plan

The MP Update includes a Public Involvement Plan that defines the proposed communication and community engagement process for the project, including overall goals; key community audiences, information needs and messages; and proposed community engagement activities.

Communication and Outreach Goals. Throughout the MP Update process, King County and the project team strived to:

- Consult with BFI partners, stakeholders and the broader community about the master planning process, establishing the purpose of the work, the schedule and process by which the plan will be developed.
- Ensure that the public knows how they can be involved and understands how their input will be considered.
- Collaborate with Airport partners and a stakeholder working group to identify feedback for consideration in the master planning process.
- Solicit substantive and meaningful public input at appropriate milestones and incorporate these ideas into the plan to the maximum extent possible.
- Conduct a public outreach process that is transparent, accessible, and reflective of the County's commitment to equity and social justice.

King County's 2011 guidance on community engagement[1] builds on the county's Strategic Plan, as well as the Equity and Social Justice Ordinance. It identifies several levels of potential engagement, depending on project conditions and objectives. The MP Update is categorized within the "consult" level of engagement, whereby activities focus on informing the community and gathering information to shape project outcomes.

An Airport Work Group (AWG) was established for the MP Update to provide meaningful input on technical issues and related development policies by reviewing prepared working papers developed as part of the airport planning process. AWG membership included tenant representatives, stakeholders from the Airport Roundtable and representatives from other business, labor, economic development, community, and environmental interests. The working papers were discussed in a series of AWG meetings, and members provided comments and other input to address their constituents' interest and/or concerns. The AWG's feedback was considered by the Planning Team and incorporated into the MP Update documentation. In addition to the AWG, an Airport Partners group was established to gain access to jurisdictional perspectives, technical and community relations resources, coordination across policy and land use regulations, and other emerging issues related to the MP Update. King County convened these partners at project milestones and distributed working papers to keep them informed of project progress; however, this group did not represent the community at large.

KCIA Staff also created a Community Working Group and worked with thirteen different community groups every other week for six months to understand the larger community needs and perspectives, as well as to educate community partners on the complex aspects of the airport master planning process. With the

[1] See King County Community Engagement Guide (2011).

Community Working Group, KCIA Staff developed a community-focused KCIA MP Update summary that was translated into eleven different languages. Through this group the summary was distributed to over 1600 community members explaining the KCIA MP Update, requesting feedback, and publicizing public meetings.

KCIA attended over fifty meetings with the Community Working Group, community councils, other local communities, and aviation groups to discuss the MP Update. KCIA also expanded the use of the public-facing MP Update website to include all the draft Mater Plan update chapters, the MP Update summary document, videos explaining the Master Plan update projects, Frequently Asked Questions, and all public comment logs created to document all the public feedback. KCIA hosted three virtual public meeting in October 2020 to discuss the MP Update and received feedback with in-person interpretation available in Spanish, Chinese and Vietnamese.

Regular project updates were also provided to the Department of Executive Services, the County Executive, and King County Council, as well as other jurisdictional partners, and any resulting policy guidance was shared with AWG members to support their ongoing reviews.

Airport Role and Facilities

As illustrated in **Figures A1** and **A2**, BFI is located in King County, approximately four miles south of downtown Seattle, adjacent to the regional transportation network that connects State Highways to Interstate Highways.

BFI is owned by King County, but operated, managed, and administered as a division of the County's Department of Executive Services. This management structure includes the King County Executive, King County Council, and the Director of the King County Department of Executive Services. The Airport Director and his staff of aviation professionals are responsible for the Airport operations and maintenance to meet required federal safety standards and serve as the Airport's public relations representative. The Airport Division is also served by an airport advisory board (i.e., Airport Roundtable) that consists of community representatives, airport tenants, Pilot's association, off-site businesses, and labor representatives. The Roundtable makes recommendations on airport matters to airport administrators, the King County Executive, and King County Council.

BFI, which is classified as a non-hub, primary commercial service airport by the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS), is also one of five general aviation (GA) reliever airports to Seattle-Tacoma International Airport (SEA), within the Puget Sound Airport System that includes 20 public-use general aviation airports and two military airfields. The close proximity of BFI to both SEA and Renton Municipal Airport (RTN) (i.e., BFI is separated from the two airports by approximately four miles) imposes some unique air traffic control challenges with regard to airspace constraints/congestion and instrument approach procedure management that will be described in later sections of this document.

BFI is the busiest GA reliever to SEA but has recorded a significant drop in annual operations performed by the smaller GA aircraft fleet (e.g., local GA operations have declined 55 percent at BFI between 2006 and 2015). This operational decline is not unique to BFI, with GA activity decreasing at many of the regional airports and around the country, due to the steadily rising costs of owning and operating an aircraft.

FIGURE A1 **Airport Location Map**

Mead &Hunt

King County International Airport/ Boeing Field

FIGURE A2 **Airport Vicinity Map**

Mead & Hunt

King County International Airport/ Boeing Field

However, the Airport continues to be a prime location for the basing of corporate GA aircraft and air cargo operations, due to the close proximity with the Seattle Central Business District and the adjacent network of regional transportation facilities.

Airside Facilities

BFI is operated with two runways that are parallel, oriented in a general northwest-southeast direction, and supported by a system of parallel and connecting taxiways. **Figure A3** provides a graphic presentation of the existing airport facilities. Additional Airport information includes:

- ***Airport Reference Point:*** Latitude N 47° 31' 48.00" and Longitude W 122° 18' 7.10" (estimated)
- ***FAA Site Number:*** 26396.A
- ***Airport Elevation:*** 21.0 feet above mean sea level (AMSL)
- ***Acreage:*** 594.0 acres
- ***Mean Normal Temperature of hottest month:*** 75.3° F (July & August)

Runways

Runway 14R/32L (Primary). Runway 14R/32L, the Airport's primary runway, is 10,007 feet in length, and 200 feet in width and has an existing 880-foot displaced landing threshold to Runway 32L. This displaced threshold and associated application of declared distances criteria results in the published declared distance lengths that are presented in **Table A1**.

Table A1 **RUNWAY 14R/32L DECLARED DISTANCES**

Facility	TORA	TODA	ASDA	LDA
Runway 14R[1]	10,000'	10,000'	9,120'	9,120'
Runway 32L[2]	10,000'	10,000'	10,000'	9,120'

SOURCE: *2007 Airport Layout Plan & Mead & Hunt, Inc.*

Note: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available — TODA: Takeoff Distance Available
ASDA: Accelerate Stop Distance Available — LDA: Landing Distance Available
[1] The reduced ASDA and LDA lengths are dictated by RSA requirements at the departure end of runway (DER).
[2] The reduced LDA length is dictated by the existing displaced landing threshold.

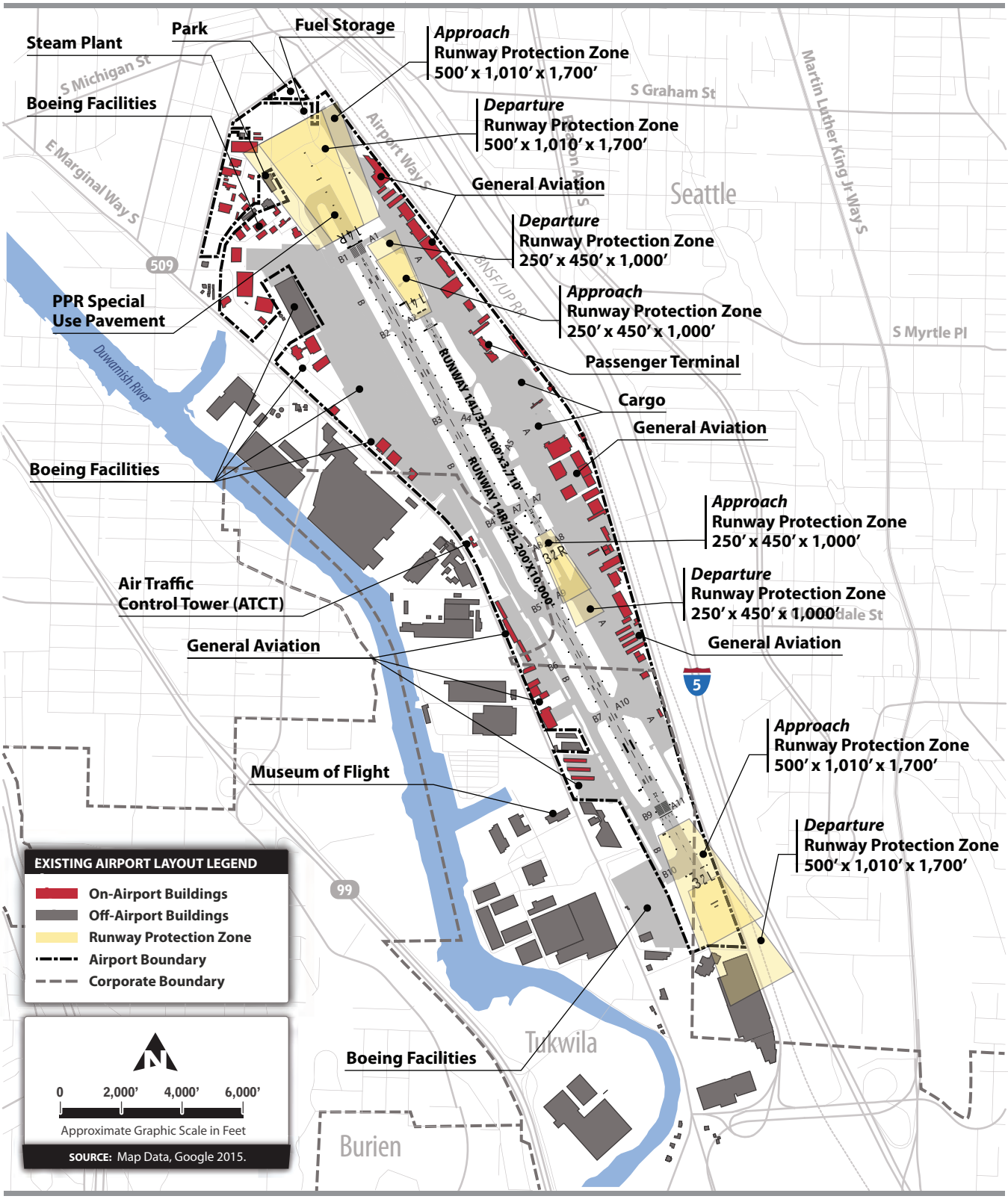


FIGURE A3 **Existing Airport Layout**

Mead & Hunt

King County International Airport/ Boeing Field

It should also be noted that an additional 880 feet of pavement is located at the north end of the runway, which is defined as Prior Permission Required Pavement (PPRP) runway on the current ALP. The PPRP runway, which is accessible via Taxiway Z, is available (with ATC permission) for Runway 14R departures to those aircraft[2] requiring an Accelerate Stop Distance Available (ASDA) runway length greater than 9,120 feet. **Table A2** presents the declared distance runway lengths using the PPRP.

Table A2 **RUNWAY 14R/32L DECLARED DISTANCES WITH PPRP**

Facility	TORA	TODA	ASDA	LDA
Runway 14R[1]	10,880'	10,880'	10,000'	9,120'
Runway 32L[2]	10,000'	10,000'	10,000'	9,120'

SOURCE: *2007 Airport Layout Plan & Mead & Hunt, Inc.*
Note: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available TODA: Takeoff Distance Available
ASDA: Accelerate Stop Distance Available LDA: Landing Distance Available
[1] The reduced ASDA and LDA lengths are dictated by RSA requirements at the departure end of runway (DER).
[2] The reduced LDA length is dictated by the existing displaced landing threshold.

The runway is constructed of grooved asphalt, and has a gross weight bearing capacity of 100,000 pounds single wheel, 200,000 pounds dual wheel, 500,000 pounds dual tandem wheel, and 800,000 pounds dual double tandem wheel main landing gear configuration. The runway is equipped with High Intensity Runway Lights (HIRLs), a four-light Precision Approach Path Indicator (PAPI) on the left side of each runway ends and is marked with precision approach runway markings. The Runway 14R end is served by an Instrument Landing System (ILS) approach that includes a glide slope, localizer, a Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF) and provides a *right-hand* traffic pattern. Runway 32L, which provides a *left-hand* traffic pattern, is also served by an ILS approach that includes a glide slope and localizer, including Runway End Identifier Lights (REILs).

Runway 14L/32R (Secondary). Located on the east side of the primary runway, the Airport's secondary parallel runway (Runway 14L/32R) is 3,710 feet in length, 100 feet in width and has existing displaced landing thresholds at each runway end. The Runway 14L landing threshold is displaced 250 feet, while the Runway 32R landing threshold is displaced 375 feet. The published declared distance lengths presented in **Table A3** are the result of these displaced landing thresholds.

Table A3 **RUNWAY 14L/32R DECLARED DISTANCES**

Facility	TORA	TODA	ASDA	LDA
Runway 14L[1]	3,710'	3,710'	3,710'	3,460'
Runway 32R[1]	3,710'	3,710'	3,710'	3,335'

SOURCE: *2007 Airport Layout Plan & Mead & Hunt, Inc.*
Notes: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available. TODA: Takeoff Distance Available.
ASDA: Accelerate Stop Distance Available. LDA: Landing Distance Available.
[1] The reduced LDA length is dictated by the existing displaced landing threshold.

[2] These are typically represented by Boeing aircraft deliveries that require departures to long-haul international destinations.

This runway, which is currently limited to use by aircraft weighing up to 12,500 pounds and not available for air carrier operations, is constructed of grooved asphalt, and has a gross weight bearing capacity of 120,000 pounds single wheel, 250,000 pounds dual wheel, 550,000 pounds dual tandem wheel, and 1,109,000 pounds dual double tandem wheel main landing gear configuration. The runway is equipped with Medium Intensity Runway Lights (MIRLs), two-light PAPIs on the left side of each runway end, as well as REILs on both runway ends. In addition, Runway 14L/32R is a visual runway with basic runway markings, while Runway 14L provides a *left-hand* traffic pattern and Runway 32R provides a *right-hand* traffic pattern.

Taxiways

Runway 14R/32L Taxiway System. The east side of the primary runway is served by partial parallel Taxiway A and eight of its eleven connector/exit taxiways that are designed to varying standards and dimensions. This taxiway system is constructed primarily of asphalt, with some concrete panels, that vary in width from 35 to 430 feet. Taxiway B is the west side parallel taxiway serving Runway 14R/32L. This taxiway, which is constructed of asphalt, is 75 feet in width and provided with eight connector/exit taxiways that are designed to varying standards and dimensions. **Table A4** summarizes the features associated with this taxiway system.

Table A4 **RUNWAY 14R/32L TAXIWAY SYSTEM**

Taxiway	Type	Location	Width	Lighting/Signage
Taxiway A	Partial Parallel[1]	East Side	50’ - 75’	Yes/Yes
Taxiway A1	Connector/Exit	East Side	70’	Yes/Yes
Taxiway A2	Connector/Exit	East Side	40’ - 135’	Yes/Yes
Taxiway A4	Exit	East Side	135’	Yes/Yes
Taxiway A7	Connector/Exit	East Side	130’	Yes/Yes
Taxiway A8	Connector/Exit	East Side	40’	Yes/Yes
Taxiway A9	Connector/Exit	East Side	200’	Yes/Yes
Taxiway A10	Connector/Exit	East Side	430’	Yes/Yes
Taxiway A11 [2]	Exit	East Side	35’	Yes/Yes
Taxiway B	Parallel	West Side	75’	Yes/Yes
Taxiway B1	Connector/Exit	West Side	200’	Yes/Yes
Taxiway B2 [2]	Exit	West Side	30’	Yes/Yes
Taxiway B3	Connector/Exit	West Side	90’	Yes/Yes
Taxiway B4	Exit	West Side	90’	Yes/Yes
Taxiway B5	Connector	West Side	365’	Yes/Yes
Taxiway B7	Exit	West Side	100’	Yes/Yes
Taxiway B9	Exit	West Side	125’	Yes/Yes
Taxiway B10	Connector/Exit	West Side	275’	Yes/Yes
Taxiway Z [3]	Parallel/ Connector	West Side	75’	Yes/Yes

SOURCE: *2007 Airport Layout Plan, 2015 Airport Imagery, & Mead & Hunt, Inc.*

[1] Full length extension of Taxiway A is not feasible due to proximity of existing airport boundary, adjacent public roadway and railway.

[2] Taxiway use is restricted Airplane Design Group (ADG) II/Taxiway Design Group (TDG) 2 aircraft.

[3] Taxiway Z is defined as PPRP which serves the PPRP runway at the north end of Runway 14R/32L.

Runway 14L/32R Taxiway System. The east side of the primary runway is served by parallel Taxiway A and

six of its eleven connector/exit taxiways that are designed to varying standards and dimensions. This east side parallel taxiway system is constructed primarily of asphalt, with some concrete sections, that vary in width from 35 to 430 feet. Taxiway B is the west side parallel taxiway serving Runway 14L/32R. This taxiway, which is constructed of asphalt, is 75 feet in width and provided with eight connector/exit taxiways that are designed to varying standards and dimensions. A description of the features associated with this taxiway system is presented in **Table A5**.

Table A5 **RUNWAY 14L/32R TAXIWAY SYSTEM**

Taxiway	Type	Location	Width	Lighting/Signage
Taxiway A	Partial Parallel[1]	East Side	50' - 75'	Yes/Yes
Taxiway A2	Connector/Exit	East Side	40' - 135'	Yes/Yes
Taxiway A3	Connector/Exit	East Side	35'	Yes/Yes
Taxiway A4	Exit	East Side	135'	Yes/Yes
Taxiway A5	Connector/Exit	East Side	60'	Yes/Yes
Taxiway A7	Connector/Exit	East Side	130'	Yes/Yes
Taxiway A8	Connector/Exit	East Side	40'	Yes/Yes
Taxiway B	Parallel	West Side	75'	Yes/Yes
Taxiway B2 [2]	Exit	West Side	30'	Yes/Yes
Taxiway B3	Connector/Exit	West Side	90'	Yes/Yes
Taxiway B4	Exit	West Side	90'	Yes/Yes

SOURCE: *2007 Airport Layout Plan, 2015 Airport Imagery, & Mead & Hunt, Inc.*

[1] Full length extension of Taxiway A is not feasible due to proximity of existing Airport boundary, adjacent public roadway and railway.

[2] Taxiway use is restricted Airplane Design Group (ADG) II/Taxiway Design Group (TDG) 2 aircraft.

Landside Facilities

Landside facilities are defined as those airport facilities that are outside of the runway/taxiway system. Therefore, landside facilities typically include the passenger terminal building, passenger terminal support facilities, airport support facilities, aircraft storage and maintenance facilities, Fixed Base Operator (FBO) facilities, aircraft storage and parking aprons, along with automobile access and parking facilities, and other on-airport structures/use areas. A brief listing/description of the major landside facilities for King County International Airport/Boeing Field is provided in the following narrative.

Aprons

There are five major apron designations at King County International Airport/Boeing Field for aircraft parking and storage. The aprons are generally categorized as follows:

- **Passenger Terminal Apron**
- **Air Cargo Aprons**
- **Boeing B-737 Flight Test Facility & Delivery Center Aircraft Apron**
- **Boeing Military Flight Center & Test Facility Aircraft Apron**
- **General Aviation Aprons**

Passenger Terminal Apron. Consisting of about 1.6 acres, the passenger terminal apron is located on the west side of the passenger terminal building. The primary user of this apron is Kenmore Air, providing commercial passenger service with Cessna 208 Caravans, but also includes international aircraft operations that require Federal Inspection Services provided by the U.S. Customs Service. This apron area is in excellent condition, with existing pavement strengths that are comparable to the various taxiways that serve it.

Air Cargo Aprons. There is one designated air cargo apron located at BFI that is primarily utilized by United Parcel Service (UPS). It consists of about 11.6 acres and is located on the east side of the Airport (southeast of the passenger terminal building and identified as Apron 8 on the ALP). It is in fair condition, with existing pavement strengths that are comparable to the various taxiways that serve it and is also provided with direct roadway access to Airport Way South.

Boeing Aircraft Apron. There are two large apron areas associated with existing Boeing facilities that are located on the west side of the Airport. The first, consisting of about 33.8 acres accommodating approximately 27 aircraft parking positions and supporting taxilanes, extends from the north end of the Runway 14R/32L to just south of the Taxiway B3 connector taxiway, and is utilized by Boeing to support their B-737 Flight Test Facility & Delivery Center operations. This area is identified as Apron 1 on the current ALP. The second Boeing apron area, consisting of about 15.7 acres that accommodates approximately nine aircraft parking positions and supporting taxilanes, is located adjacent to the Runway 32L threshold) and utilized to support their Military Flight Center & Test Facility operations. It should be noted that this second area is located outside the existing Airport boundary, but airside access is provided to the west side parallel taxiway (Taxiway B) via the Taxiway B10 connector. Each of the apron areas are in good to excellent condition, with existing pavement strengths that are comparable to the various taxiways that serve them.

General Aviation Apron. There are several apron areas associated with the various commercial and corporate general aviation facilities located on the Airport. They are generally concentrated along the east side of the Airport in conjunction with the existing FBO facilities (i.e., Signature Flight Support at Aprons 4-6, Modern Aviation at Apron 9, and Leading Edge Jet Center at Apron 11), but also includes the Northeast Apron, Apron 12 at the south end, and Apron 2 on the west side of the Airport (located just north of the Museum of Flight). In addition, there are a total of 11 aircraft de-icing/wash pads located on the various apron areas at BFI. Four of the pads (two located on each side of the Airport) are identified for public use. In addition, there are seven tenant-controlled pads, five located on the east side of the Airport and two located on the west side of the Airport that are controlled by the Boeing Company. The location of these various de-icing/wash pads and the primary apron areas are presented in **Figure A4**.

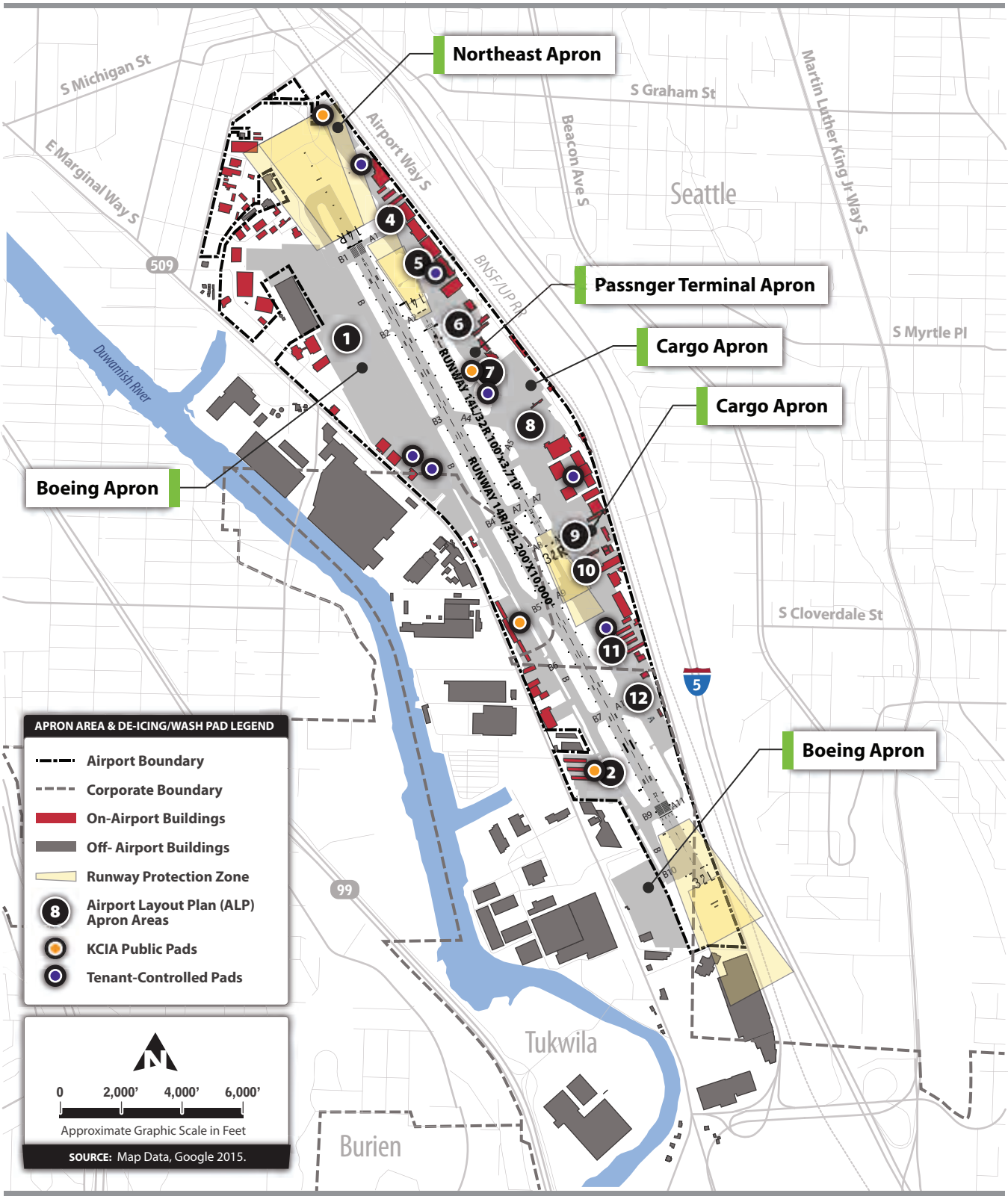


FIGURE A4 **Existing Apron Areas & Aircraft De-Icing/Wash Pads**

Mead & Hunt

King County International Airport/ Boeing Field

Hot Spots

The FAA defines a "hot spot" as a safety-related problem area on an airport (generally represented by a complex or confusing taxiway system, runway system, or runway/taxiway intersection) that poses an increased risk for runway incursions or incidents during aircraft surface operations. The typical causes of hot spot-related runway incursions or incidents can be attributed to airfield layout, traffic flow, airport marking/signage/lighting, situational awareness, and training.

According to FAA's current *Runway Safety Hot Spots List*, there are three documented hot spots at BFI. Hot Spot #1 is located at the intersection Taxiway B1 and is associated with the restricted access to the Taxiway Z PPRP. Hot Spot #2 is located at the intersection of Taxiway A9 and Runway 14R/32L and has been identified as a risk for wrong way departures. Hot Spot #3 is located at the Taxiway B and Taxiway B5 and is identified as an area of extensive helicopter training activity. Each of these existing hot spot locations are identified on **Figure A5**.

Passenger Terminal Area Complex

The passenger terminal complex at BFI is located on the east side of the Airport, and southeast of the Runway 14L landing threshold. The passenger terminal building underwent a comprehensive rehabilitation project in 2002 and complies with the design provisions set forth in the Americans with Disabilities Act of 1990. The remainder of the terminal complex is composed of access roadways, public/employee surface parking. The existing layout of the passenger terminal building is presented on **Figure A6**.

Passenger Terminal Building. The passenger terminal building consists of two levels. The lower level, which consists of over 15,000 square feet, is occupied by various tenants, which include one commuter airline operator - Kenmore Air, U.S. Customs & Immigration facilities, and a small coffee shop/deli. The upper level, consisting of over 10,000 square feet, is utilized by King County Airport Management and Operations Staff, which includes offices and conference room facilities.

The terminal's existing airline facilities include airline counters, departure and arrival lounges, baggage make-up and claim areas, and airline offices. Since Kenmore Air provides commercial passenger service with aircraft that do not exceed the 12,500 pound weight classification or loadings in excess of 30 passengers, the airline and Airport are not required to provide a security program that is administered by the Transportation Security Administration (TSA).

The terminal curb is approximately 250 linear feet in length and is served by a one-way, looped roadway (King County Airport Access Road) that is linked with the Airport Perimeter Road. The terminal parking facilities (serving both passengers and employees) are located directly northeast of the terminal building and provide ground level parking for 207 vehicles. The existing parking area is currently uncontrolled and free to airline passengers and employees of the terminal.

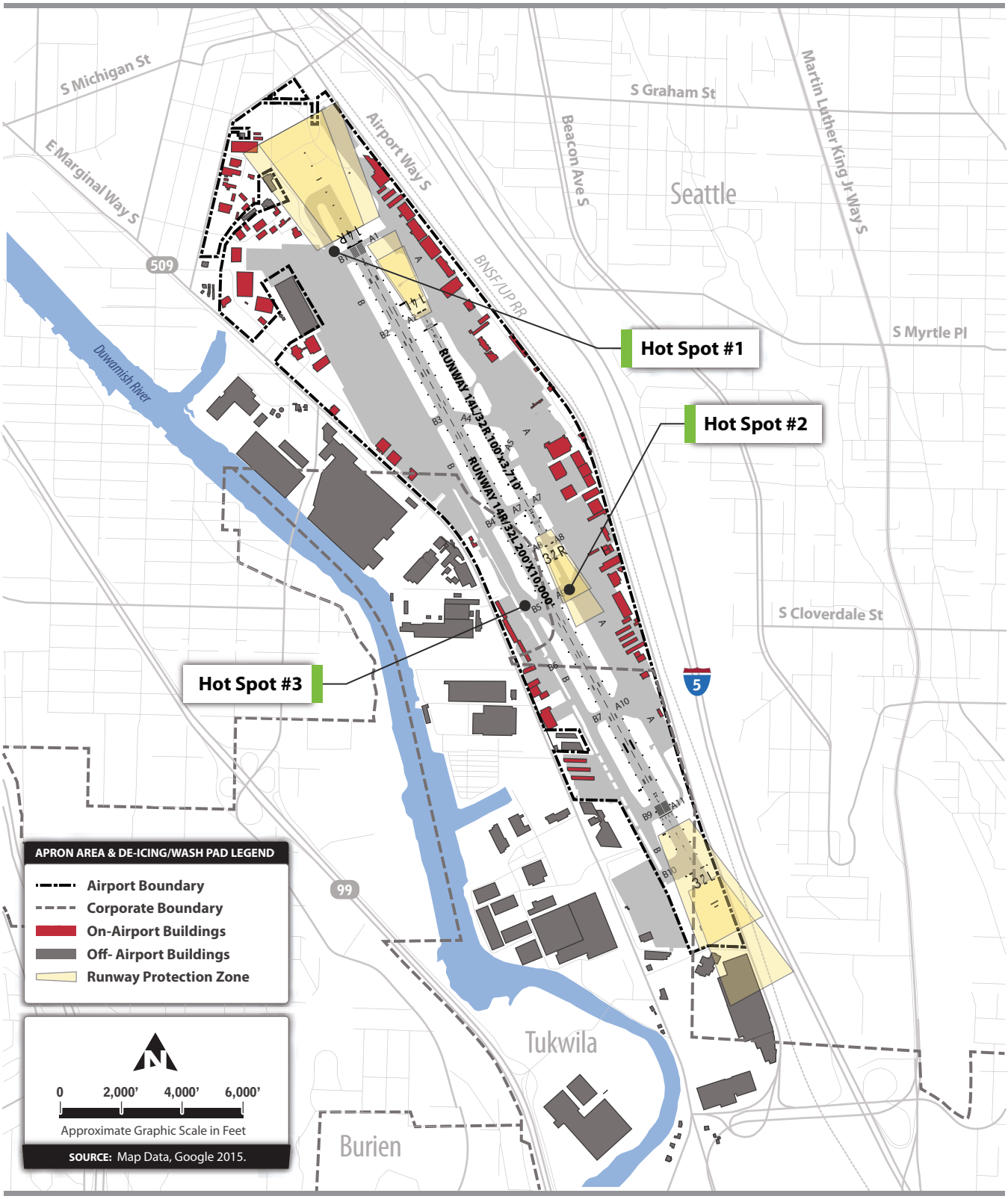


FIGURE A5 **Existing Airport Hot Spots**

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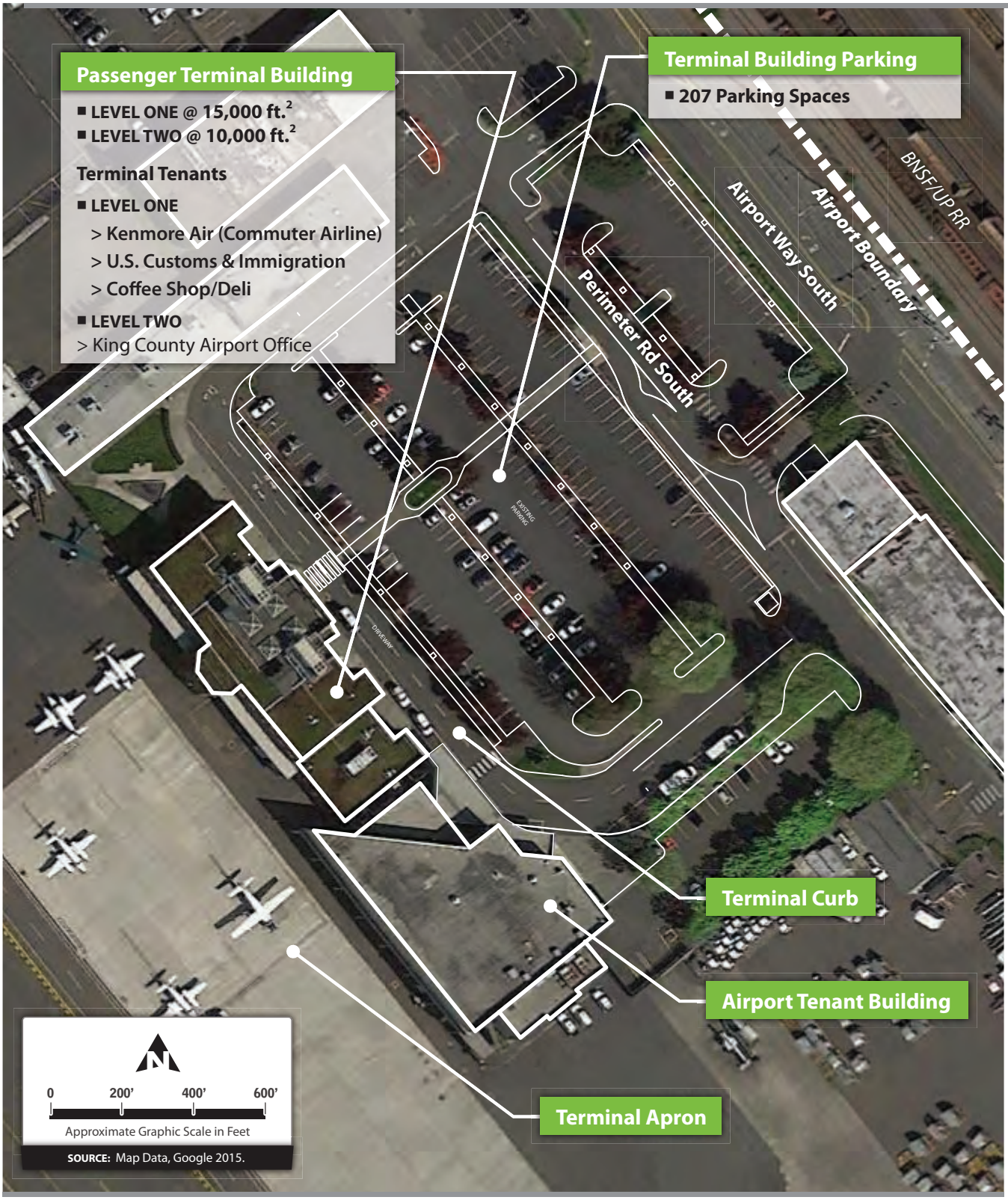

FIGURE A6 **Existing Passenger Terminal Area Site Plan**

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U.S. Customs Service and Border Protection Facilities. Federal Inspection Services (FIS) are provided by the U.S. Customs Service and their offices at BFI are located in the lower level/southern portion of the Passenger Terminal Building, with the U.S. Customs apron area located adjacent to the west side of the building. Facilities include queuing/waiting areas, holding areas, stainless steel inspection counters, restrooms, and offices for Customs, Immigration and Naturalization Service (INS), and USDA inspection personnel.

U.S. Customs control the entry and clearance of aircraft arriving in the United States and inspect the crew, passengers, baggage, stores, and cargo carried thereon. Commercial carriers must request landing rights in advance in writing, post an international carrier's bond in an amount established by Customs, and transmit the crew and passenger data electronically to Customs. As an Airport of Entry (AOE), BFI Customs requires two hours of prior notification, and provides customs and immigration services for incoming flights, serving as an initial port of entry for foreign visitors arriving in the United States.

Aviation Industrial/Maintenance Facilities

These type of aviation facilities at BFI are currently highlighted by the Boeing Company's various civilian and military aircraft Flight Test and Delivery Center operations, but also includes a significant number of ancillary aviation manufacturing business that specialize in aircraft subassemblies and interiors. A brief description of the two primary Boeing facilities/operations at BFI is presented in the text below.

Boeing 737 Flight Test Facility & Delivery Center. The Boeing Commercial Airplane Group assembles all lines of the B-737 aircraft at a large manufacturing facility located adjacent to the Renton Municipal Airport, which is located less than five miles to the southeast of BFI. Following an initial first flight from Renton, all the B-737s land at BFI to undergo final flight testing/finishing, and ultimately delivered to the customer via the newly expanded B-737 Delivery Center. Additional facilities include a large apron area, hangars, and various support facilities. In 2016, Boeing was producing approximately 42 B-737 aircraft a month, or 504 aircraft a year, at the Renton facility. According to company forecast projections at that time, this production rate was programmed to increase to 52 aircraft per month, or 624 aircraft per year by 2018. Following the grounding of the B-737 Max in March of 2019, production of aircraft was later halted in November, but was resumed in May of 2020. In addition, Boeing has resumed aircraft deliveries, but a revised forecast for monthly delivery counts has not yet been provided.

In addition, Boeing is the major lease holder at the Airport with approximately 106 acres located in the northwest quadrant of the Airport (consisting of apron, hangars, and offices) that are associated with the B-737 facilities and operations. However, Boeing also has existing facilities located adjacent to the BFI apron, but outside the Airport boundary (i.e., approximately 16 acres), which are accessed via a "through-the-fence" agreement with the Airport. An additional 95.85 acres of Boeing property, with office and parking support facilities, is located on the west side of E. Marginal Way S.

Military Flight Center & Test Facility. The Boeing Company also operates a separate Flight Center and Test Facility, located at the southwest corner of the Airport, to serve various military versions of the aircraft they manufacture [e.g., the Boeing P-8 Poseidon, Boeing E-3 Sentry (AWACS), the new Boeing KC-46 Pegasus, etc.]. The facilities include a large apron area, hangars, and various support facilities. In 2016, Boeing conducted an extensive nine-month testing program at BFI for the KC-46 Pegasus (a widebody, multi-role tanker aircraft) that included daily operations by two Navy F-18 jets that are part of the refueling training exercise.

As with a portion of the B-737 facilities at the north end of the Airport, a portion of these military facilities, consisting of approximately 20.2 acres, are provided airfield access using the Taxiway B10 connector via a "through-the-fence" agreement with the Airport. An additional 98.4 acres of Boeing property in this area is located on the west side of E. Marginal Way S., and provided with large hangar, office, and parking support facilities. The Airport also maintains a separate aircraft access lease with Boeing for the occasional movement of aircraft from Airport property, via the Taxiway B6 connector, west across E. Marginal Way S. to existing off-airport Boeing facilities.

Air Cargo Facilities

The BFI air cargo activity is currently represented by three carriers that operate a variety of aircraft, ranging in size from smaller general aviation (e.g., the Piper Chieftain PA-31) operated by AIRPAC Airlines to large widebody air carrier aircraft (e.g., B-767-300F) operated by UPS. Based upon calendar year data for 2019, BFI ranked as the 38th busiest cargo airport in the country, with a recorded air cargo landed weight of 754,068,467 tons, representing an increase of 1.22 percent from 2018 data.

Air cargo freight and mail facilities are currently concentrated on the east side of the Airport property, located just south of the passenger terminal. This area, which is utilized exclusively by UPS and Ameriflight, consists primarily of apron area, accommodating parking positions for four large air carrier aircraft and several smaller aircraft, as well as a variety of small storage/office buildings and vehicle parking/cargo transfer areas.

Washington Army National Guard Facilities

There is one Washington National Guard (WANG) Unit (i.e., the 81st Brigade Combat Team) that is located and operates from BFI property. A brief description of their operation is provided in the following text.

81st Brigade Combat Team. Headquartered in Seattle, but with units spread across the state, the 81st Brigade Combat Team (BCT), is recognized as the premier separate brigade in the Army, meeting or exceeding all readiness goals and fully prepared to deploy and execute federal and state mission requirements. Units of the 81st Brigade Combat Team:

- 1-161st Infantry Regiment
- 3-161st Infantry Regiment
- 2-146th Field Artillery Regiment
- 181st Brigade Support Battalion
- 898th Brigade Engineer Battalion
- 1-185th Armor Regiment (California)

The Federal Mission is to deploy to a post-mobilization training site and, upon validation, to a designated contingency area of operations by sea, land, or air; and prepares for combat. On order, the Brigade conducts combat operations as part of a designated contingency force headquarters. The State Mission is to support the civil agencies that have the primary responsibility to protect life and property, and preserve the peace, order, and public safety.

This WANG base at BFI, which consists of about 7.6 acres, is in the far northwest portion of the Airport and provided direct vehicular access from Ellis Avenue South via South Willow Street and South Warsaw Street. The Base includes a variety of parking areas for both civilian autos and military vehicles, as well as administrative buildings, industrial/service buildings, and numerous base support facilities. The existing land lease for the WANG property expires in the year 2023.

General Aviation Facilities

The majority of existing general aviation facilities at BFI are located on the east side of the Airport and represented by a combination of commercial and corporate hangar development areas that are provided with direct access to the east side parallel taxiway system (Taxiway A).

The Airport is served by three full service Fixed Base Operators that provide aircraft fuel, maintenance, aircraft storage, and charter services. These include:

- **Signature Flight Support** (located near the north end of the Airport, just east of the Runway 14L threshold)
- **Modern Aviation** (located near the midfield of the Airport, just east of the Runway 32R threshold)
- **Leading Edge Jet Center** (located at the south end of the Airport, just east of Taxiway A10 connector)

The Airport is also home to several Aviation Service Operators (ASOs) that provide specialty aviation services/maintenance and charters, as well as numerous corporate aircraft operators that have existing hangar and flight department facilities at BFI.

Aviation-Related Commercial Facilities

Museum of Flight. The Museum of Flight (MOF) facilities are located on 20.8 acres of property adjacent to the Airport, with approximately 75 percent of the acreage being located just east of the approach end to Runway 32L, and the balance of the property being located on the west side of East Marginal Way South. The MOF currently leases approximately 1.5 acres of Airport property, but most museum facilities are located on property outside the boundary of the Airport. According to the MOF website, the mission of the Museum is "to acquire, preserve, and exhibit historically significant air and space artifacts, which provide a foundation for scholarly research, and lifelong learning programs that inspire an interest in and understanding of science, technology, and the humanities". Public automobile parking areas are located on the east and south side of the museum complex, which are accessed via East Marginal Way South. The existing museum apron area is also provided with airside access to Taxiway B (i.e., the west side parallel taxiway system serving Runway 14R/32L.

Airport Support Facilities

Fuel Storage Facilities. As noted previously, the Airport is currently served by three Fixed Base Operators (FBOs) that offer aircraft fueling services and products ranging from Avgas, Jet A, Military Jet fuel, unleaded, and diesel. The FBO fuel storage/dispensing facilities are sited at various locations on Airport property, which includes facilities for self-fuelers of corporate aircraft, as well as fuel storage for automobiles in support of the Boeing facilities and Airport maintenance operations.

The location of the various fuel storage/dispensing facilities located on Airport property are depicted in **Figure A7** and a summary of the fuel types and tank sizes are presented in **Table A6**. Historical fuel sales (2006-2015) are summarized in **Table A7**.

Table A6 **EXISTING BFI AVIATION FUEL STORAGE FACILITIES**

Fuel Type	Tank Size/Type									
	12,000/ UST	15,000/ UST	20,000 UST	30,000/ UST	100/ AST	5,000/ AST	12,000/ AST	15,000/ AST	30,000/ AST	Total (Gallons)
AVGAS	-	1	1	-	-	-	-	-	-	
Sub-Total (Gallons)	-	15,000	20,000	-	-	-	-	-	-	**35,000**
JET A	-	2	14	1	1	2	1	3	4	
Sub-Total (Gallons)	-	30,000	280,000	20,000	100	10,000	12,000	45,000	120,000	**517,100**
UNLEADED	1	-	-	-	-	-	-	1	1	
Sub-Total (Gallons)	12,000	-	-	-	-	-	-	-	-	**12,000**

SOURCE: *Airport Staff & Mead & Hunt, Inc., 2020.*

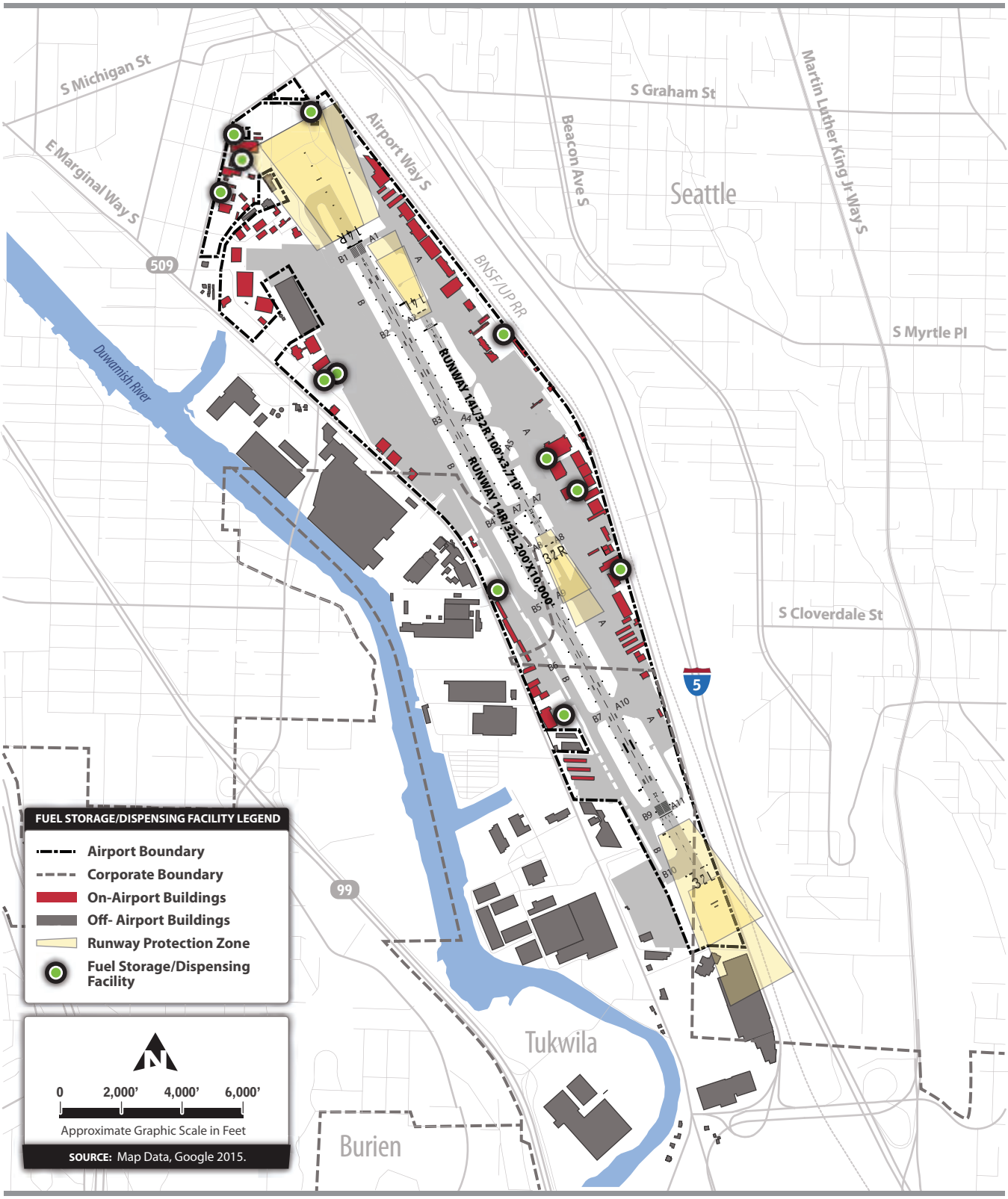

FIGURE A7 **Airport Fuel Storage/ Dispensing Facilities**

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Table A7 **BFI FUEL SALES, 2006 - 2015**

Annual Fuel Sales (2006-2014)		
Year	**AVGAS (Gallons)**	**JET A (Gallons)**
2006 Totals	780,345	20,723,831
2007 Totals	764,753	25,153,904
2008 Totals	761,345	26,108,019
2009 Totals	664,985	23,983,112
2010 Totals	657,641	26,197,243
2011 Totals	655,792	31,397,305
2012 Totals	518,126	22,937,964
2013 Totals	449,761	22,888,718
2014 Totals	416,558	26,042,174

Fuel Sales by Month (2015)		
Month	**AVGAS (Gallons)**	**JET A (Gallons)**
January	18,164	1,665,552
February	26,084	1,742,357
March	30,640	2,121,432
April	18,100	2,154,670
May	44,487	2,026,450
June	32,934	1,936,950
July	30,594	2,344,064
August	36,879	2,219,692
September	38,375	2,144,105
October	33,753	2,203,853
November	27,563	1,913,105
December	16,720	1,827,769
2015 Totals	354,293	24,299,999

SOURCE: *Airport Staff & Mead & Hunt, Inc., 2016.*

Aircraft Rescue and Fire Fighting (ARFF) Facilities. The existing ARFF facility at BFI, which was constructed in 2016, is located at mid-field, on the west side of the Airport (adjacent to the ATCT and across from the Taxiway B4 connector).

In accordance with FAA Part 139 guidelines, BFI is designated as a Class IV airport, which means an airport that is certificated to serve unscheduled passenger operations of large air carrier aircraft. Index A ARFF facilities and equipment are required at the Airport to serve the existing type and number of air carrier aircraft operations (i.e., five or more daily departures by air carrier aircraft with lengths less than 90 feet). However, the Airport currently offers equipment and staff to meet the higher Index B ARFF criteria. The ARFF facility site is provided with excellent access to the airfield via the west side parallel taxiway system (i.e., Taxiway B) and vehicular access to E. Marginal Way S.

Airport Traffic Control Tower (ATCT). The BFI Airport Traffic Control Tower (ATCT) is also located at mid-field, on the west side of the Airport (adjacent to the ARFF building described above). The ATCT is defined as a "Tower with Display (VFR)" with Class B airspace that is operated by FAA personnel 24 hours daily. It should

be noted that an ATCT Line of Sight Shadow Study was prepared for BFI in 2006 utilizing FAA's "ATC Visibility Tool". Based upon this assessment, it was determined that all areas of the airfield within the Airport Operations Area (AOA) defined "visibility zone" maintain a clear Line of Sight for the ATCT controller.

Weather Monitoring Equipment. BFI is served by an Automated Surface Observing System (ASOS), which is located at the north end of the field, just south of the BFI fuel storage facility and east of the Runway 14R localizer antenna. This facility measures the following weather parameters: visibility, sky condition (cloud amount and height up to 12,000 feet), obstructions to vision (haze, fog), wind (direction, character, and speed), precipitation accumulation, ambient and dew point temperatures, pressure, and basic current weather information (type and intensity for freezing rain, rain, and snow). The ASOS provides a minute-by-minute update to pilots by calling the station at (206) 763-6904.

Airport Maintenance Facilities. The Airport's maintenance facility development area is located at the northeast corner of the airfield, southwest of the Runway 14R localizer antenna. The development area, which consists of 3.75 acres, includes a large storage facility and an adjacent yard area for bulk storage of materials and equipment, as well as fuel storage and dispensing facilities. Public vehicular access is provided via South Warsaw Street, which extends east from Ellis Avenue South. Airside vehicular access is provided via the Airport's perimeter roadway system that connects directly to the east and west side parallel taxiway system.

On-Airport Utilities. The mapping of existing utilities at BFI was obtained from Airport Staff and reflects the location/service provider of existing electricity (Seattle City Light), water (Seattle Public Utilities/City of Tukwila), wastewater (City of Tukwila/King County Metro), natural gas (Puget Sound Energy), internet (Comcast), and telephone (CenturyLink). The location of these facilities, which are depicted on the following illustration, will be evaluated in consideration of the planning of future development projects resulting from this MP Update. The existing on-airport utilities at BFI are shown in **Figure A8**.

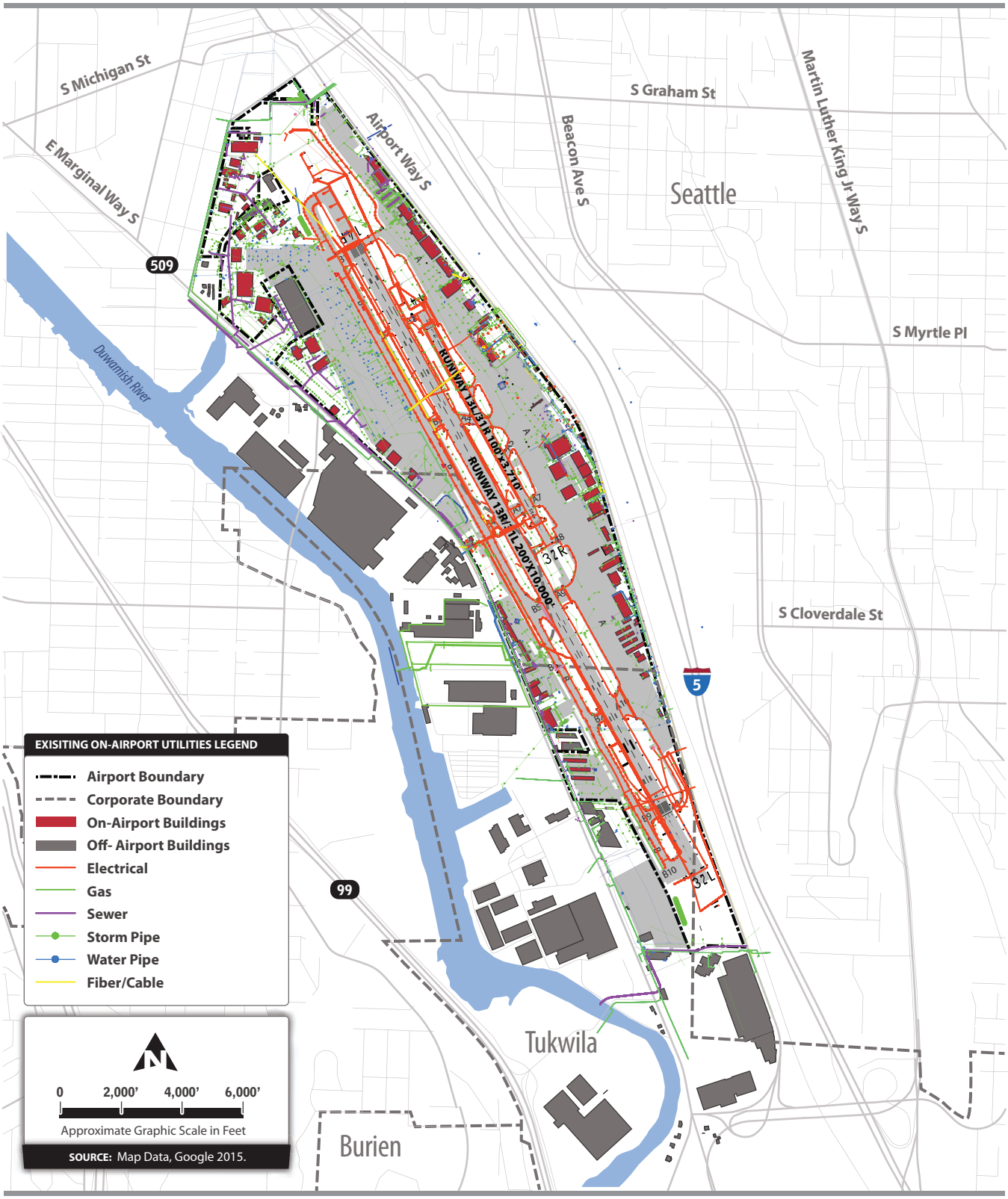

FIGURE A8 **Existing On-Airport Utilities**

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Transportation Facilities

Vehicular access is an important transportation component in the overall ability of an airport to function properly. Not only is it vital that passengers have easy access to and from the terminal area using ground transportation, but also surface transported freight must be easily shipped to and from cargo areas and other facilities located on airport property. Also, because many airports are major employment centers, proper access for people employed on airport property must be provided. This issue is of particular importance at BFI, with the areas designation as a Manufacturing Industrial Center (MIC), supporting an estimated more than 18,412 direct and indirect aerospace and manufacturing jobs in 2019 from data presented in the Airport's 2021 study, entitled *High-Level Economic Impact of King County International Airport – Boeing Field*. The existing system of ground transportation access supporting BFI is described in the following paragraphs and presented in **Figure A9**.

Highways. BFI is accessed by a network of state and federal highways. Interstate Highway 5 (I-5) extends along the full length of the eastern Airport boundary, with access to the Airport being provided from the South Boeing Access Road interchange that intersects both Airport Way South and East Marginal Way South approximately ½ mile south of the Airport. Also, an I-5 on ramp (providing both north and southbound access) is located approximately ¼ mile north of the Airport, which can be accessed from East Marginal Way South via South Michigan Street or Carson Avenue South.

On the west side of the Airport, access to State Highway 99/West Marginal Way is provided via East Marginal Way South, which intersects the highway approximately ¾ miles west from the north end of the Airport. A second connection between State Highway 99 and East Marginal Way South is provided via 16th Avenue South that crosses the Duwamish River at the South Park Bridge. East Marginal Way South also intersects State Highway 99/West Marginal Way again, about one mile south of the Airport, with State Highway 99 ultimately merging with I-5 about one and a half miles further to the southeast.

Arterial Streets. The existing roadways surrounding BFI (e.g., Airport Way South, East Marginal Way South, Ellis Avenue South, and South Albro Place) are classified as Principal Arterials by the Seattle Comprehensive Plan/Transportation Appendix. As defined in the Comprehensive Plan, Principal Arterials are "to serve as the primary routes for moving traffic through the city, connecting urban centers and urban villages to one another, or to the regional transportation network". Both Airport Way South on the east side of the Airport and East Marginal Way South on the west side provide access to Airport property along the full length of the Airport. According to 2014 vehicle volume/capacity data from the Transportation Appendix, both Airport Way South and East Marginal Way South are operating well below capacity (i.e., 38 and 34 percent respectively). Based on the 2035 projections, the vehicle volume/capacity are forecast to increase only slightly to 49 percent for East Marginal Way South. However, the 2035 projections for Airport Way South are forecast to exceed 100 percent of the roadway capacity, due in part to expected increases in vehicle volumes, but also based on current plans for potential bicycle improvements to the roadway that would reduce the throughput capacity for automobiles.

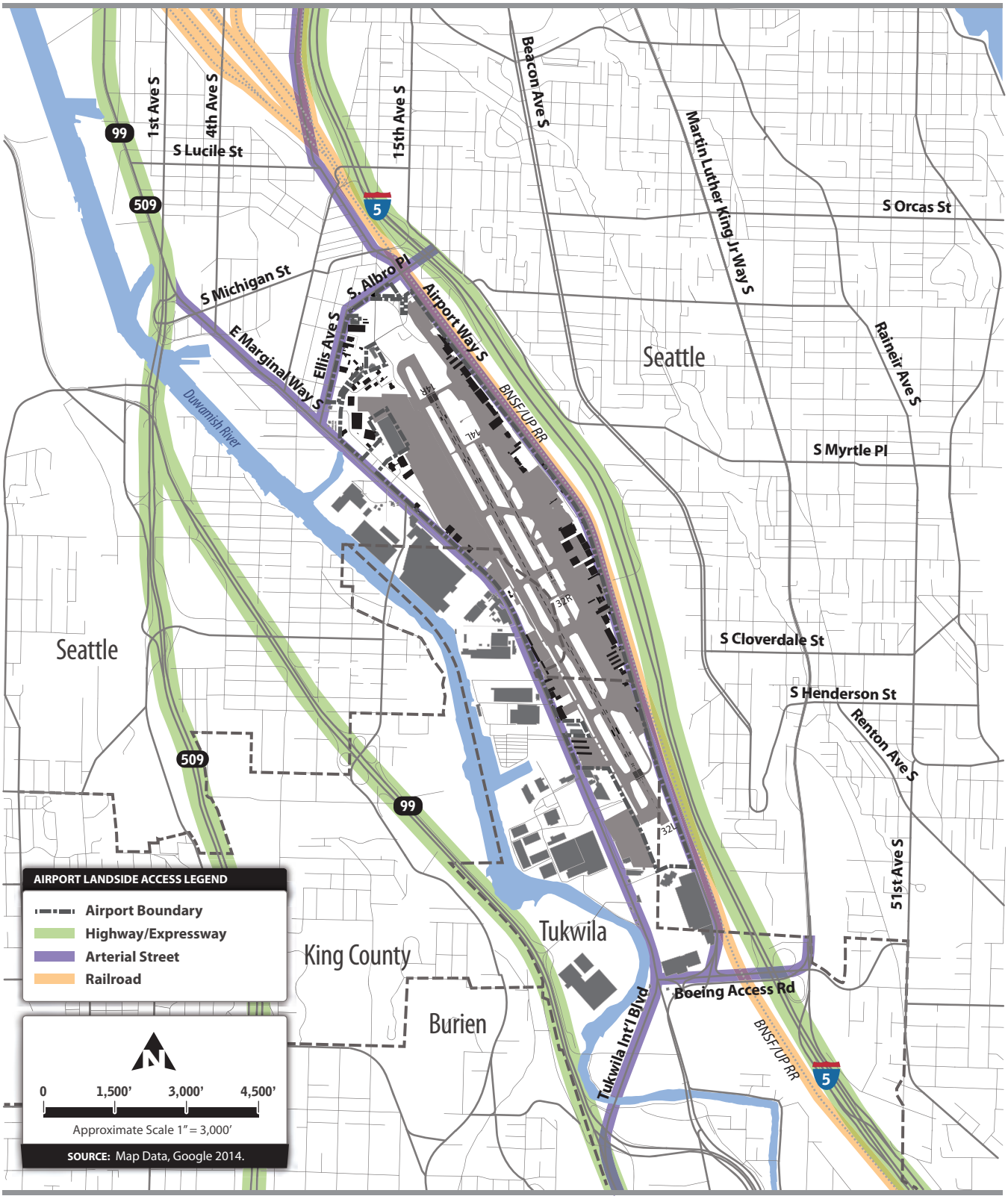

FIGURE A9 **Existing Airport Landside Access**

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Because the City of Seattle and City of Tukwila jurisdictional boundary line intersect BFI property, a portion of the roadways located south of the Airport are contained within the City of Tukwila. A portion of Norfolk Road, located along the southern boundary of the Airport, is classified as a *Local Access Corridor* in the 2015 Tukwila Comprehensive Plan, while South Boeing Access Road is classified as a Minor Corridor. Each of the roadways provide an east-west connection between Airport Way South and East Marginal Way South, as well as link I-5 to the east with Tukwila International Boulevard and State Highway 99 to the west. According to information presented in the *Transportation 2040 Appendix J: Regional Freight Strategy* prepared by Puget Sound Regional Council; Tukwila International Boulevard was also identified as "Arterial Constrained".

Given BFI's location in close proximity to two major highways and the areas designation as a Manufacturing Industrial Center, many of the roadways in the vicinity of the Airport, particularly East Marginal Way South, extending north from South Boeing Access Road and Airport Way South (due to the UPS air cargo operations) experience high truck volumes, and are designated as *Major Truck Streets* by the Seattle Department of Transportation.

Railroads. A major north-south railroad corridor is located just east of BFI, positioned between Airport Way South and I-5. The tracks are owned by the Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) Railroads, which transport international and domestic cargo to inland markets, as well as serve the Port of Seattle to the north and the Port of Tacoma to the south. BNSF operates a multi-modal storage/transfer yard located approximately two miles south of the Airport (on the extended runway centerline adjacent I-5), and both Amtrak and Sound Transit's Sounder Commuter Rail use the BNSF tracks. In addition, there are several industrial railroad spurs that are operated and controlled by the railroads and private property owners in the vicinity of BFI. The first is an abandoned spur that crosses Airport Way South, just south of the Airport, which previously served the large warehouse facilities located directly south of Airport property. A second spur is located on the west side of the Airport, extending along the west side of East Marginal Way South, which serves the numerous industrial facilities (e.g., the various Boeing properties). This spur extends south from a large marshalling yard that is located approximately one mile north of the Airport (on the extended runway centerline). Currently, there is no existing railroad spur that provides direct rail access to Airport property.

Airspace System and NAVAIDS

BFI, as with all airports, functions within a local, regional, and national system of airports and airspace. **Figure A10** and the following narrative provide a brief description the Airport's role as an element within these systems.

Air Traffic and Service Areas and Aviation Communications

FAA air traffic controllers, stationed in Air Route Traffic Control Centers (ARTCC), provide positive air traffic control within defined geographic jurisdictions. There are some twenty-two geographic ARTCC jurisdictions established within the continental United States. King County International Airport/Boeing Field is contained within the Seattle ARTCC jurisdiction, and includes the airspace in portions of Washington, Oregon, California, Nevada, Idaho, and Montana.

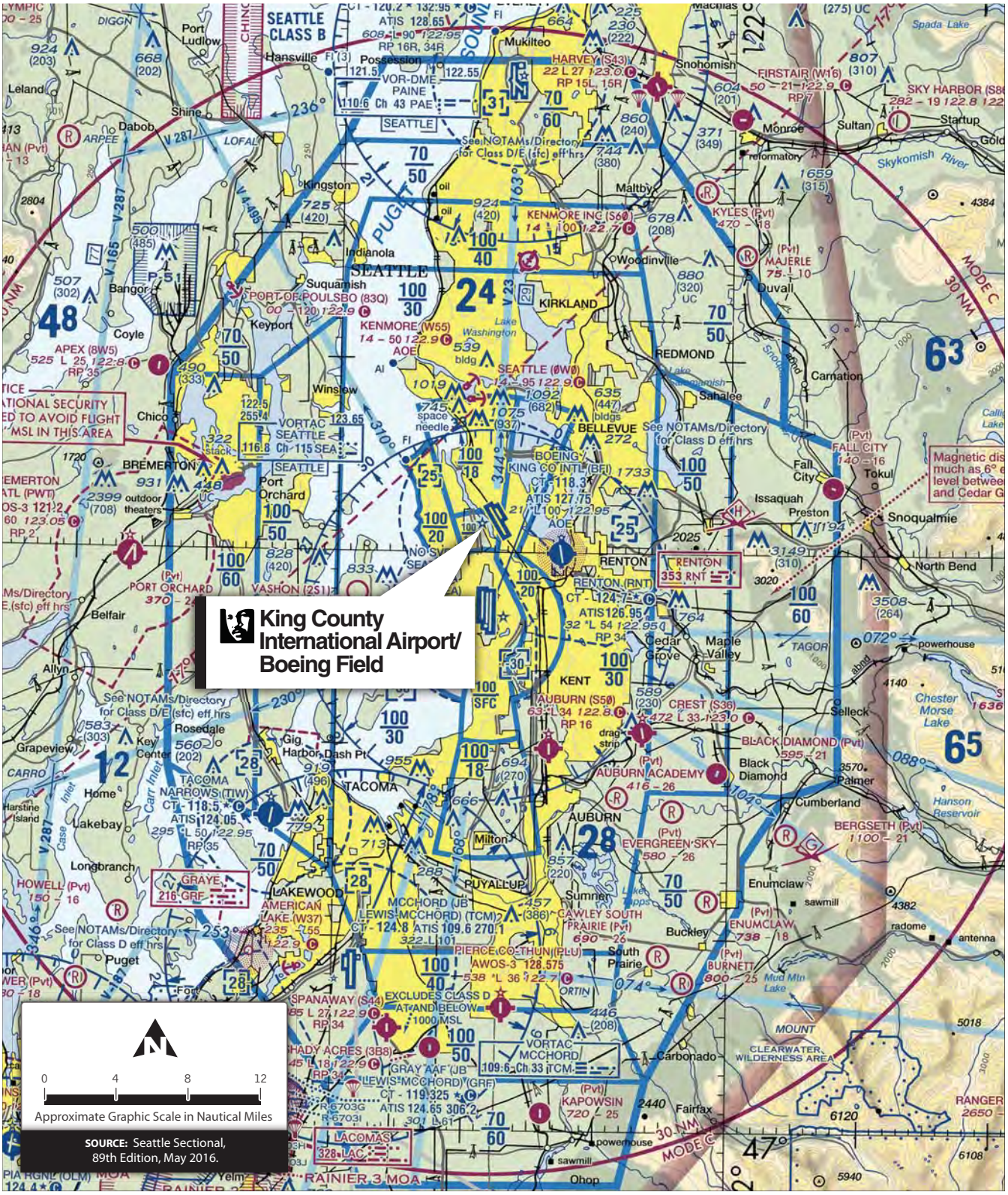

FIGURE A10 **Airspace/NAVAIDS Summary**

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Aviation communication facilities associated with the Airport include the Air Traffic Control Tower on frequencies 118.3 (VFR from the east) and 120.6 (all IFR), Ground Control on frequency 121.9, Seattle Approach/ Departure Control on frequencies 119.2, 120.1, 120.4, 125.9, and 126.5 (depending on runway and direction), Automated Terminal Information System (ATIS) on frequency 127.75, Clearance Delivery on frequency 132.4, and Aeronautical Advisory Station (UNICOM) frequency on 122.95. In addition, the Airport has a separate frequency for the Boeing Company at 123.55.

Airspace

BFI is a controlled airport with an airport traffic control tower (ATCT). Due to the Airport's proximity with Sea-Tac International Airport (SEA), the local airspace surrounding BFI is contained within a portion of the SEA Class B airspace. The configuration of Class B airspace is tailored to each individual airport, and generally includes an area extending from the surface to 10,000 feet above mean sea level (AMSL) that includes two or more layers around the nation's busiest airports in terms of operations and enplanements. BFI is located within the borders of three airspace layers that range in surface elevation from 1,100, 1,800, 2,000 feet AMSL, and extend upward to 10,000 feet AMSL. All aircraft must receive Air Traffic Control (ATC) clearance to operate within this airspace and they are provided separation services by ATC.

Military airports, military operations areas, and restricted areas can also impact airspace use in the vicinity of a civil airport. There are two Military Operations Areas (MOAs) in the vicinity of the Airport (i.e., the Chinook A & B MOAs located 25 NMs northwest of the Airport and the Rainier 1, 2, & 3 MOAs located 28 NMs southwest of the Airport). However, the utilization of these MOAs does not negatively impact airspace or operations at BFI.

Navigational Aids

A variety of navigational facilities are currently available to pilots in the vicinity of BFI, whether located at the field or at other locations in the region. Many of these navigational aids are available to en-route air traffic, as well. These include VORTAC facilities, VOR-DME facilities, and Non-Directional radio Beacon (NDB) facilities. A VORTAC (VHF Omnidirectional Range/Tactical Air Navigation) is a navigational aid providing VOR azimuth, TACAN Azimuth, and TACAN distance measuring equipment (DME) at a single site. A VOR-DME system is a Very High Frequency Omnidirectional Range Station with Distance Measuring Equipment transmitting very high frequency signals, 360 degrees in azimuth oriented from magnetic north. This equipment is used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigation aid. NDBs are general purpose low- or medium-frequency radio beacons that an aircraft equipped with a loop antenna can home in on or determine its bearing relative to the sending facility.

The Seattle VORTAC (116.8 SEA) is located roughly five NMs south of the Airport, the Paine VOR-DME (110.6 PAE) is located roughly twenty-two NMs north of the Airport, the Renton NDB (353 RNT) is located roughly four NMs southeast of the Airport, the Dondo NDB (224 ODD) is located approximately eleven NMs to the south of the Airport, and the Kitsap NDB (206 PWT) is located approximately nineteen NMs to the west of the Airport. There is also a network of low altitude published airways (Victor airways) in the vicinity of BFI also traverses the area, which spans between the regional ground based VOR/DME and VORTAC equipment. Victor airways include the airspace within parallel lines located four NMs on either side of the airway and extend from 1,200 feet AMSL up to, but not including, 18,000 feet AMSL.

When an aircraft is flying on a federal airway below 18,000 feet average mean sea level (AMSL), the aircraft may be operating within Class B, C, or E airspace. BFI also has several existing visual navigational aids that are available to pilots. These include a rotating beacon, which is co-located with the ATCT, and lighted wind cones. Each of the existing runway ends is also equipped with PAPIs, which provide descent guidance for the visual segment of the approach. The PAPIs at Runways 14R, 14L, & 32R PAPI are configured for a 3.0-degree glide path angle, while the Runway 32R PAPI is configured for a 3.1-degree glide path angle.

In addition, this complement of navigational aids (NAVAIDS) permit a variety of instrument approaches at the Airport. Presently, there are five instrument approach procedures published for BFI. These procedures are listed in **Table A8**.

Table A8 **INSTRUMENT APPROACH PROCEDURES**

Approach	Designated Runway(s)	Ceiling Minimums (AGL)	Visibility Minimums	Aircraft Category
Runway 14R/32L				
ILS	Runway 14R	308' AGL	¾-mile	A, B, C, D
ILS or LOC	Runway 32L	428' AGL	1 ½-miles	A, B, C, D
RNAV (RNP) Z (0.15 DA) *	Runway 14R	542' AGL	1 ½-miles	A, B, C, D
RNAV (RNP) Z (0.30 DA) *	Runway 14R	742' AGL	2 ½-miles	A, B, C, D
RNAV (GPS) Y	Runway 14R	680' AGL	¾/1 ¾-miles	A, B/C, D
LOC/DME	Runway 14R	580' AGL	¾/1 3/8-miles	A, B/C/D

SOURCE: *U.S. Terminal Procedures, Northwest (NW), Vol. 1, 28 March 2020.*
Notes: Circling approaches not included.
* Authorization Required.

The BFI ATCT also maintains counts on the number of instrument operations that are conducted at the Airport. An instrument operation is recorded by the tower for each arriving or departing aircraft that flies a specified flight plan, regardless of the existing meteorological conditions. For calendar year 2015, 75 percent of the Airport's total operations were recorded as instrument operations.

Fly Quiet Program

BFI management is committed to the promotion of aircraft operating procedures that minimize noise impact on Airport neighbors. This philosophy is implemented through voluntary compliance and pilot participation in its Fly Quiet Awareness and Incentives programs, which are critical to achieving successful noise management at BFI. In efforts to achieve universal compliance, BFI operates a comprehensive noise monitoring and flight tracking database information system that includes strategically located noise monitors to measure and report decibel levels of flights. A list of the various Fly Quiet procedures is presented in the following text and illustrated in **Figure A11**.

Fly Quiet Flight Procedures.

- Remain clear of Seattle Class Bravo airspace and at the highest possible altitude over noise-sensitive residential areas.
- When flying IFR procedures, use alternative approaches over Elliott Bay if authorized by approach control: RNAV GPS to RWY14R, RNAV RNP to RWY14R, or Harbor Visual.
- Use FAA-advised close-in departure for north flow flights. (Reference standard close-in flight procedure by aircraft type in FAA A/C 91-53A.)
- Honor voluntary restriction of nighttime engine maintenance run-ups and other activity between the hours of 10 p.m. and 7 a.m.

Preferred VFR Fly Quiet Flight Procedures

- Remain clear of Seattle Class Bravo at highest practical altitude on the approach until intercepting the PAPI (2 light) or glideslope unless directed otherwise by ATC.
- Runway 14L arrivals and departures should not cross the Runway 14R centerline and should remain well east of it.
- During run-up, reduce power as quickly as possible after mag check and prop cycling.
- Climb after take-off at best-angle-of-climb speed until crossing the Airport boundary to contain noise over runway; then climb at best rate. Make no turns until reaching end of runway, unless instructed otherwise.
- Reduce power and RPM when altitude is reached and remain high as practical over residential areas.
- Pilots are requested to operate their aircraft at the most reduced power settings in the traffic pattern.
- "Touch-and-Go" landings are not allowed between 10 p.m. and 7 a.m. (K.C.C. Title 15.16.150).
- Helicopter procedures:
    - Outbound from BFI, proceed via the northbound lanes of I-5 to the golf courses past the Martin Luther King Jr. Way interchange and then on course.
    - Inbound to BFI from the SE, proceed from Longacres to the gravel pit, then via the southbound lanes of Martin Luther King, Jr. Way.

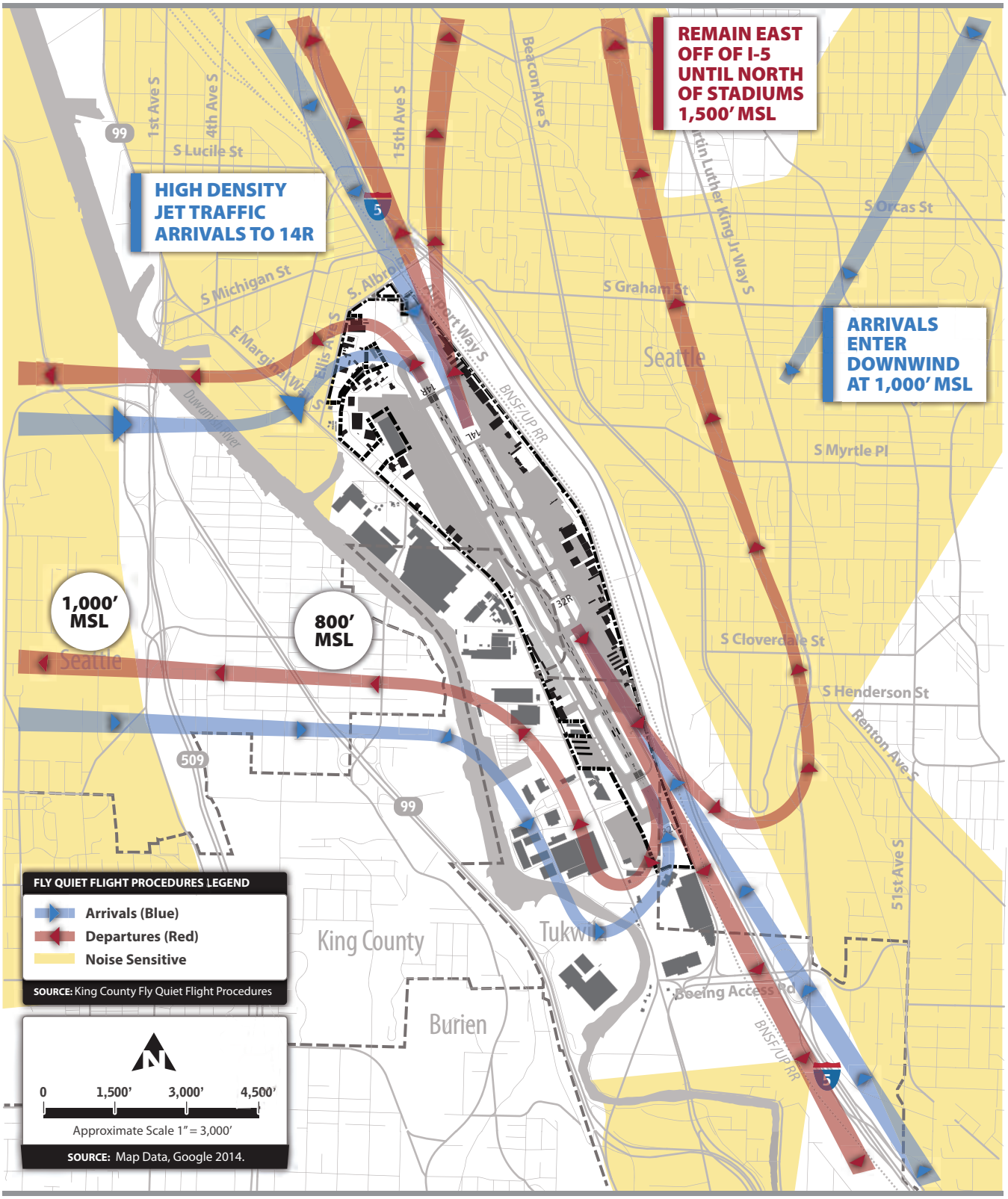

FIGURE A11 **Fly Quiet Flight Procedures**

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NextGen Airspace Optimization Study

In 2015, the Puget Sound Regional Council (PSRC), in conjunction with the FAA, completed a study (i.e., NextGen Airspace Optimization Study) to identify potential NextGen implementation options/strategies for the nine general aviation airports located within the Puget Sound Region that are impacted by operations at SEA. The Study airports included:

- BFI
- Snohomish County Airport/Paine Field (PAE)
- Renton Municipal Airport (RTN)
- Crest Airpark (Kent) (S36)
- Pierce County Airport/Thun Field (PLU)
- Tacoma Narrows Airport (TIW)
- Auburn Municipal Airport (S50)
- Bremerton National Airport (PWT)
- Harvey Field (S43)

The Study identified several existing airspace and instrument approach procedure constraints for the general aviation airports, which include specific issues and opportunities for enhancement at BFI.

The issue constraints for BFI include:

- Close proximity with SEA and RTN (less than five nautical miles of separation exists between the three airports)
- Poor weather access (BFI has relatively high existing Instrument Approach Procedure minima)
- Shared use of Standard Terminal Arrival Routes (STARs) with both SEA and RTN
- Shared use of departure airspace with SEA
- Terrain/obstruction constraints

The enhancement opportunities for BFI include:

- Implement RNAV Standard Instrument Departures (SIDs) for both north Flow and South Flow conditions at BFI, SEA and RTN to permit independent operations at the three airports.
- De-conflict airspace between BFI and SEA with development of new NextGen RNAV (GPS) approach for poor weather/north flow conditions (during Plan C) to permit simultaneous/independent operations.
- Mitigation of existing obstructions and completion of new AGIS obstruction survey will be required to accommodate potential implementation of new NextGen instrument approach procedures.

A new AGIS obstruction survey was prepared as an element of this MP Update and an update of existing obstructions was documented in the Airport Layout Plan Drawing Set. In addition, an obstruction removal/mitigation plan was prepared for BFI and an evaluation of this new obstruction data will be conducted by FAA Flight Procedures to determine if options exist to improve instrument approach procedure minima at BFI.

Land Use and Zoning Inventory

Existing Zoning

Zoning is the public regulation of the use of land. It involves the adoption of ordinances that divide a community into various districts or zones. Each district allows a certain use of land within that zone, such as residential, commercial, and industrial (and others). Typical zoning regulations address things such as the height of a building, number of people that can occupy a building, lot area, setbacks, parking, signage, and density. Given the Airport's location within the Seattle Metropolitan Area, the existing Airport boundary is contained within both the City of Seattle and City of Tukwila jurisdictional boundaries, as well as adjacent to the boundaries of King County to the southwest and the Cities of Burien and SeaTac to the south.

The location/proximity of these corporate boundaries to BFI are presented in **Figure A12**. However, in accordance with the Revised Code of Washington (RCW) 14.08.330, the "jurisdiction of municipality" (i.e., King County) has exclusive jurisdiction over the Airport and concurrent jurisdiction over adjacent territory. The specific language of RCW 14.08.330 is presented below for reference:

> *RCW14.08.330. "Every airport and other air navigation facility controlled and operated by any municipality, or jointly controlled and operated pursuant to the provision of this chapter, shall subject to federal and state laws, rules and regulations, be under the exclusive jurisdiction and control of the municipality or municipalities controlling and operating it. The municipality or municipalities shall have concurrent jurisdiction over the adjacent territory described in RCW 14.08.120(2). No other municipality in which the airport or air navigation facility is located shall have any police jurisdiction of the same or any authority to charge or exact any license fees or occupation taxes for the operations."*

A review of the existing zoning designations in the vicinity of BFI reveal that Industrial is the dominant zone. Virtually the entire Airport property is zoned Industrial, with the exception of an area of Commercial at north end of the Airport, located south of South Albro Place. In addition, the portion of Airport property located within the City of Tukwila and an area south of BFI is designated as an Industrial Center.

Directly north of the Airport, north of South Albro Place, there is a small area of Commercial that is bounded on the west by an area of Residential, which includes Industrial Buffer zoning (located within the Georgetown neighborhood). Further north, a large area of property that is bounded on the east by I-5 and on the west by Marginal Way SW (located within the Georgetown and Industrial District neighborhoods) is also zoned for Industrial.

East of the Airport, there is a narrow strip of Industrial that incorporates the railroad and I-5 rights-of-way. However, further to the east (east of I-5), the majority of property is zoned for Residential (within the North, Mid, and South Beacon Hill neighborhoods), but also includes some Commercial zoning along the Martin Luther King Jr. Way South corridor and Commercial/Office zoning along Beacon Avenue South.

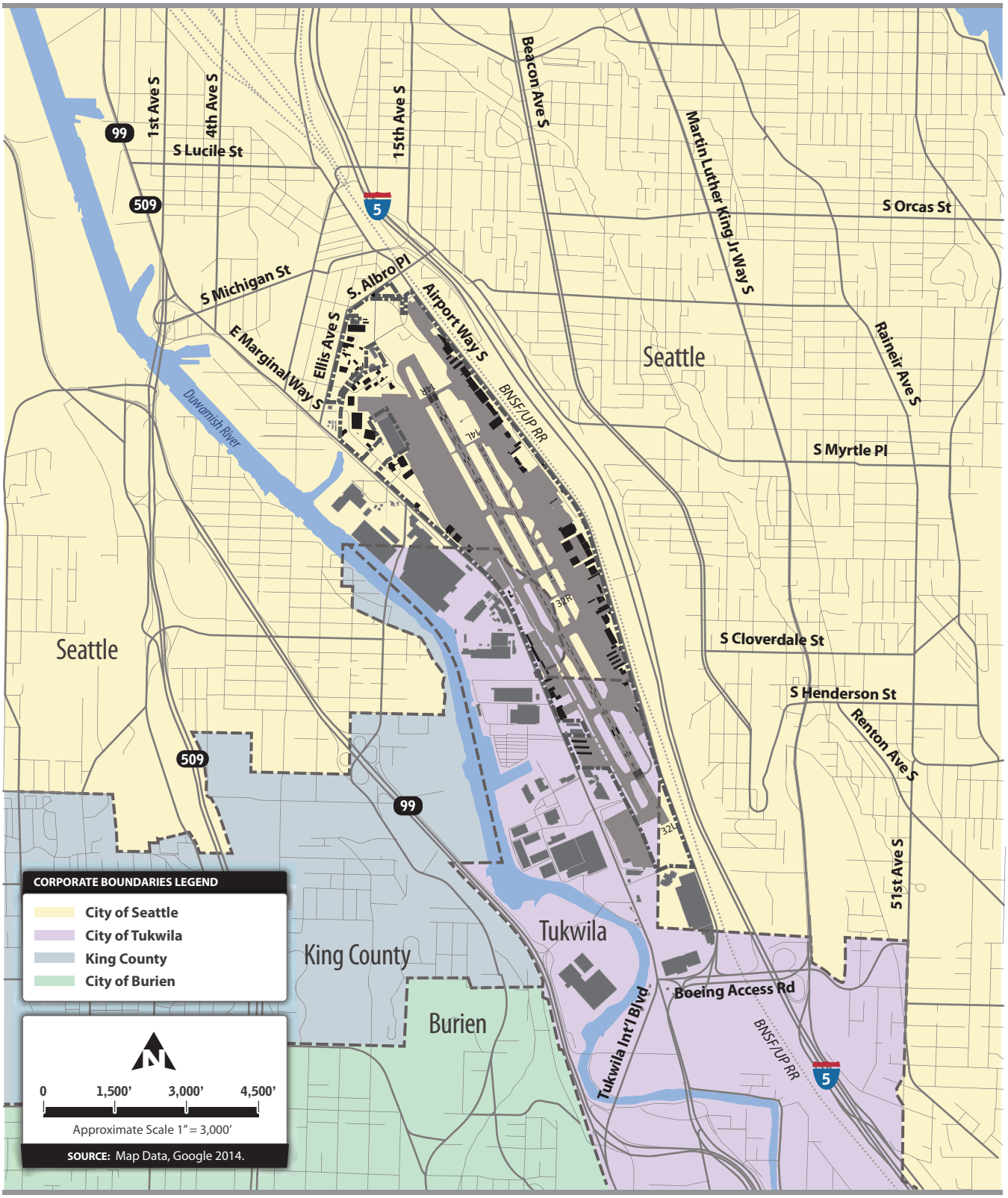

FIGURE A12 **Corporate Boundaries in Vicinity of BFI**

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South of the Airport reflects a continuation of the Industrial zoning that is associated with the City of Tukwila's Industrial Center overlay, but also includes a large area of Industrial near the intersection of I-5 and S.H. Highway 599. In addition, there are large areas of residential that are located within the Cities of Tukwila, Burien, and Seatac that include strips of commercial along the major thoroughfares.

West of the Airport, Industrial zoning dominates along the west side of East Marginal Way and along the Duwamish River corridor. Further west, the area is primarily zoned for Residential within the Delridge, South Park, and Glendale neighborhoods, but also includes areas of Commercial and Commercial/Office zoning. **Figure A13** provides a graphic summary of the land use zoning patterns in the area surrounding BFI.

The City of Seattle has also established airport overlay zoning regulations (i.e., see Chapter 23.64 - *Airport Height Overlay District*) that limit the height of objects within the vicinity of the Airport (applies to both Airport property and property adjacent to the Airport) to promote safe and unobstructed takeoff and landing approach paths. The Airport Height Overlay District is represented by five overlay areas that are related in part on the imaginary surfaces developed by the Federal Aviation Administration to establish height limits surrounding airports. These overlay zones, which are presented on **Figure A14**, include:

- Inner Approach Area (IA)
- Outer Approach Area (OA)
- Turning Area (TG)
- Conical Area (CA)
- Transition Areas (TN)

The Development Standards of the Airport Height Overlay District are defined as follows:

- No structure shall be erected, or altered, in any area defined in this section to a height more than the limits established in this chapter unless otherwise provided.
- The maximum height permitted for structures and trees in each area shall be as follows, and shall be known as the height limits of the Airport Height Overlay District:
    - In Inner Approach Areas (IA), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Inner Approach Surface. This shall not restrict heights in Inner Approach Areas to less than 37 feet (37').
    - In Outer Approach Areas (OA), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Outer Approach Surface.
    - In Turning Areas (TN), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Turning Surface. This shall not restrict heights in Turning Areas to less than 65 feet (65').

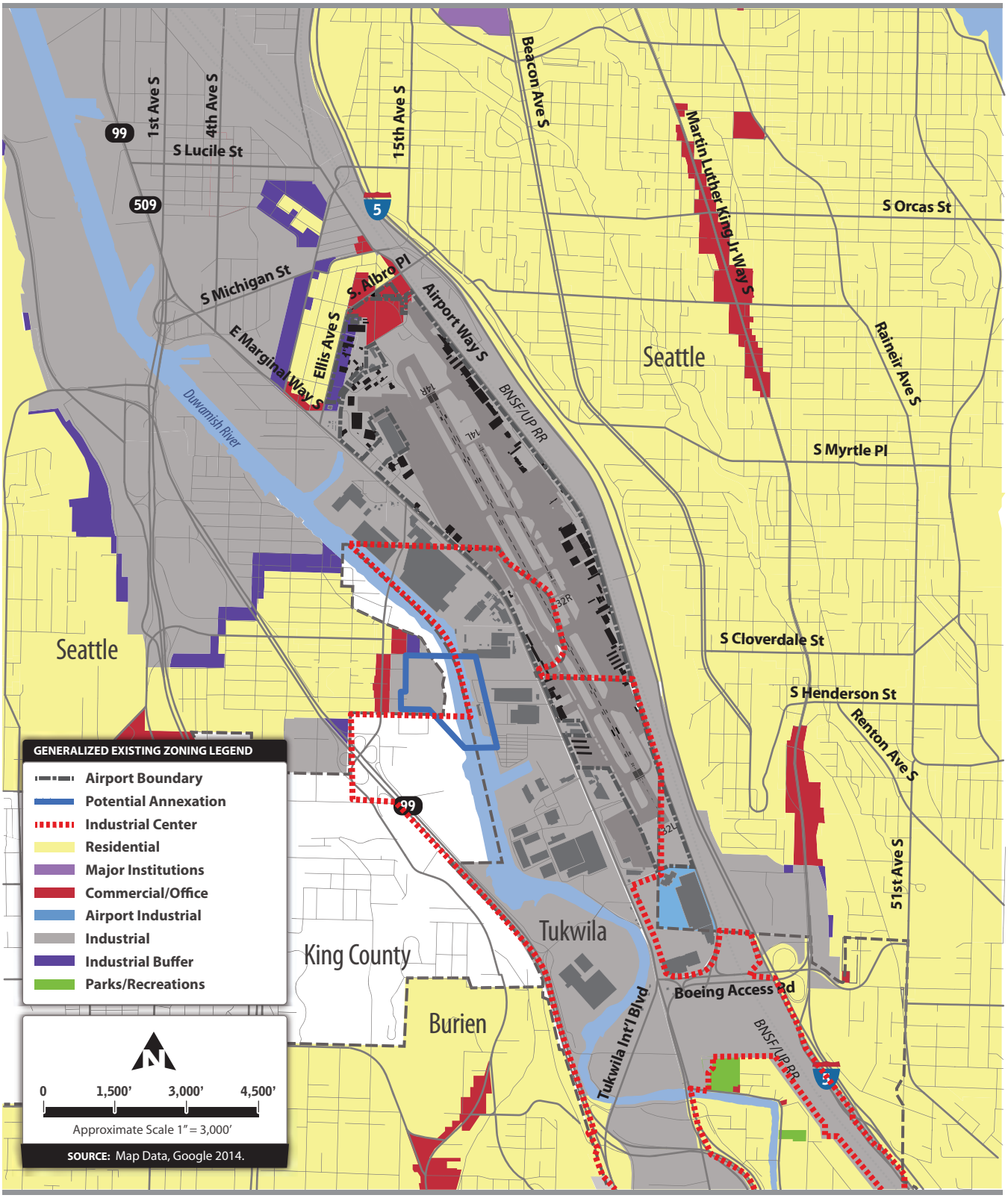

FIGURE A13 **Generalized Existing Zoning**

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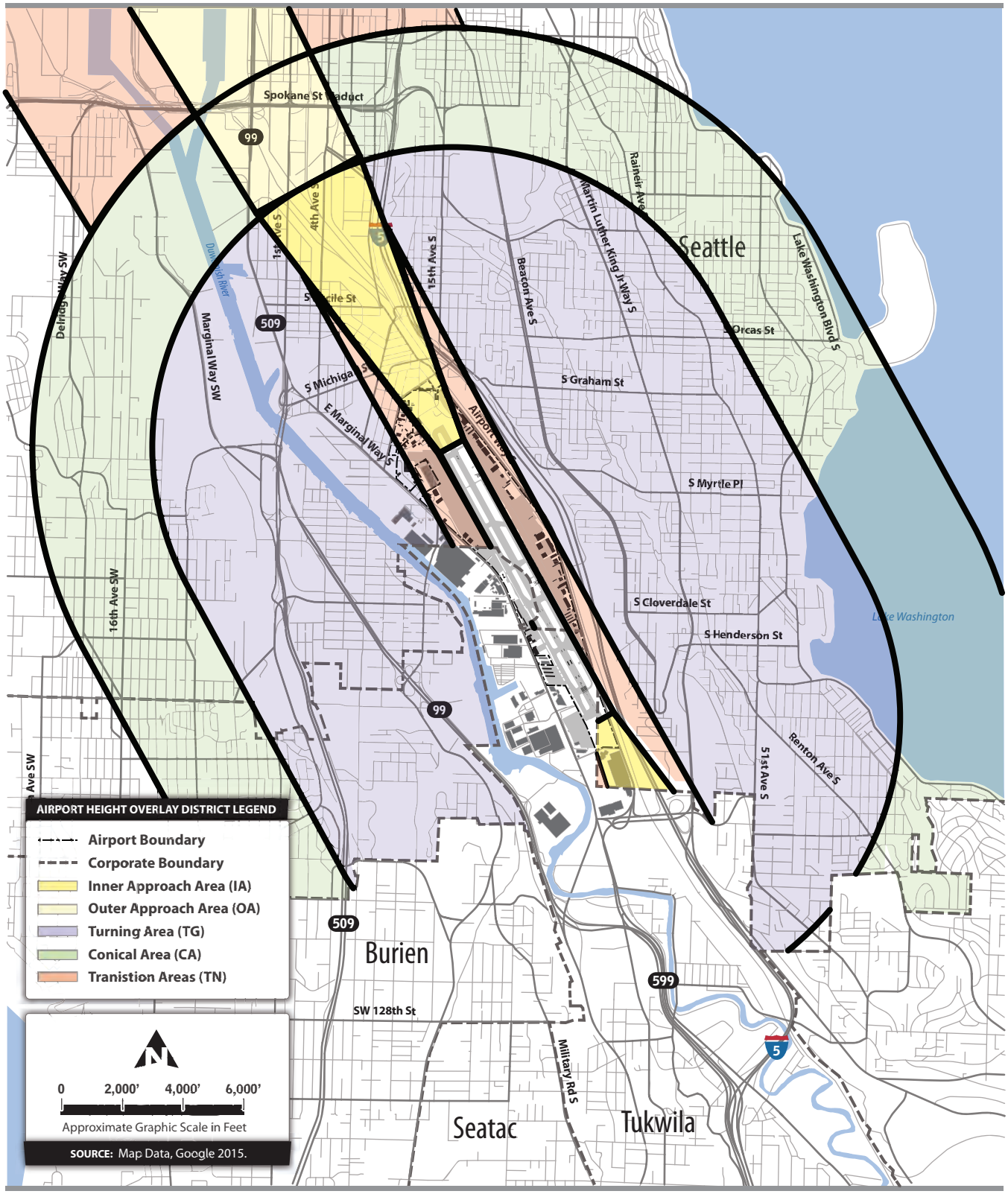

FIGURE A14 **Airport Height Overlay District**

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  - In Conical Areas (CA), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Conical Surface. This shall not restrict heights in Conical Areas to less than 65 feet (65').
  - In Transition Areas (TN), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the inclined Transition Surfaces. This shall not restrict heights in Transition Areas to less than 37 feet (37').
- Trees exceeding the height limits of the Airport Height Overlay District shall not be required to be cut or trimmed to conform to the height limits of the Airport Height Overlay District unless the Director is notified by the Federal Aviation Administration (FAA) that the trees are a potential hazard to aviation.

All properties located within the Airport Height Overlay District shall be subject to both the requirements of the underlying zone classification and to the requirements imposed for the Airport Height Overlay District. At no time shall the provisions of this chapter be read to modify the provisions of the underlying zoning, other overlay districts or special districts, except for height restrictions stated in this chapter. In any case where the provisions of the Airport Height Overlay District conflict with the provisions of the underlying zone, the more restrictive height limit shall apply. In addition, the Director may permit a structure to exceed the limits of the Airport Height Overlay District as a special exception pursuant to Chapter 23.76, Procedures for Master Use Permits and Council Land Use Decisions. Such an exception shall only be permitted if the Director finds that all the following conditions exist:

- The Federal Aviation Administration advises the Director that the exception to the height limits does not create a hazard to aviation
- The additional height is necessary for the successful physical function of the structure
- The exception will not result in re-routing of aircraft
- The structure is designed to minimize adverse impacts of lighting on surrounding uses while complying with the lighting requirements of the Federal Aviation Administration.

Existing Land Use

The existing lands uses in the general vicinity of the Airport, which primarily follow the existing zoning patterns, are defined by the current use of the property. The vast majority of existing lands north, south, and immediately surrounding the Airport are associated with Industrial land uses. There is a small area of Residential and Commercial land use directly north of Airport property, including a larger area of Residential land use along the extended runway centerline, approximately one mile south of Airport property.

Residential land uses dominate the properties located east I-5, with a mixture of some Commercial, Public, Parks/Open Space, and Mixed-Use land uses. The existing land uses located west of the Airport include Industrial uses along the Duwamish River corridor, but also includes large areas of Residential, Park/Recreation land use associated with existing golf courses and park land located west of S.H. 99, and Commercial/Office land uses along the Arterial roadways.

Due to the metropolitan location, there are numerous schools in the vicinity of the Airport, ranging from elementary, middle schools, and high schools, but also including post-secondary schools. Within the study area boundary of the land use base map, there are approximately six schools located north of the Airport, fifteen to the east, three to the south, and nine to the west of BFI. Many churches are also located in the vicinity of BFI, interspersed primarily throughout the residential developed areas. **Figure A15** provides a graphic depiction of the existing land uses in the vicinity of BFI.

It should be noted that there are several municipal solid waste facilities located within five miles of the Airport. However, each are operated as enclosed storage/transfer facilities that would not serve as wildlife attractants. Waste Management operates from facilities located approximately one mile west and less than two miles north of the Airport, while Republic Services operates from facilities located less than two miles north of the Airport and approximately three miles south of the Airport. In addition, a composting facility (i.e., Cedar Grove Composting) is located along East Marginal Way, near the north end of the Airport, but this facility too is operated in an enclosed structure to mitigate potential wildlife attractants.

Future Land Use

The future land use for the area surrounding BFI is depicted in **Figure A16**. The primary source of the information is from the 2035 Future Land Use Plan contained in the current Draft City of Seattle Comprehensive Plan and Future Land Use Plan from the 2015 City of Tukwila Comprehensive Plan. The plan presents a vision for the City "where growth benefits and increases opportunities for all residents while offering ways to enhance and preserve our natural environment". This vision is guided by four core values that will guide the goals and policies of the Comprehensive Plan:

- Race and Social Equity
- Environmental Stewardship
- Economic Opportunity and Security
- Community

As with the existing zoning and land use maps, the vast majority of the property surrounding the Airport will continue to be identified for Industrial land uses (i.e., Manufacturing/Industrial Centers) and retain the existing north-south industrial corridor that is generally defined between I-5 and the Duwamish River. The area to the east of I-5 will continue to be dominated by Residential uses, but also include the expansion of several Residential and Hub Village areas, including Commercial uses along the north-south arterial roadways. The area to the east of the Duwamish River will continue to be represented by a combination of Residential and Parks/Open Space, with the expansion of an existing Residential Village southwest of BFI and Hub Village/Commercial land uses along the north-south arterial roadway corridors.

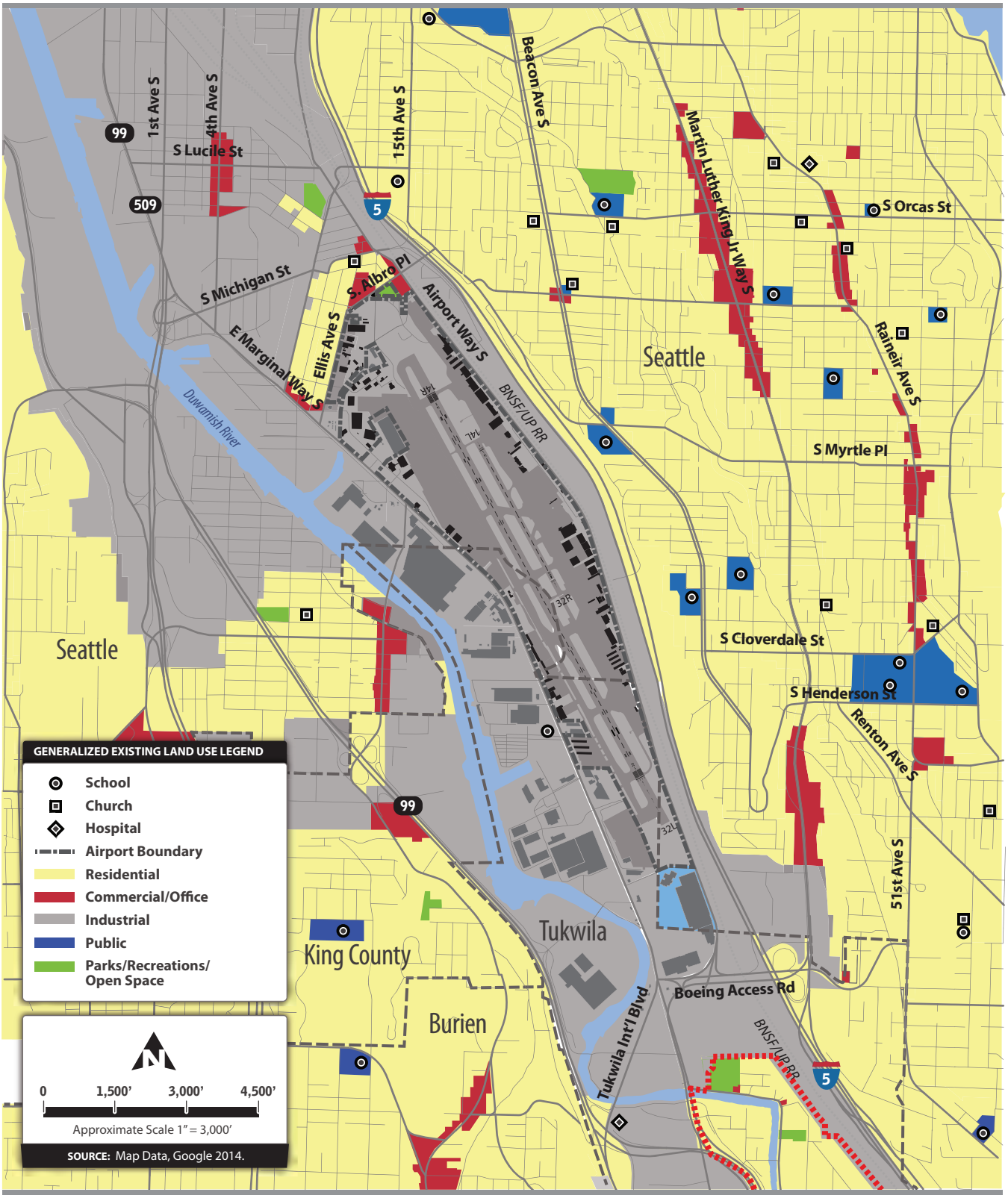

FIGURE A15 **Generalized Existing Land Use**

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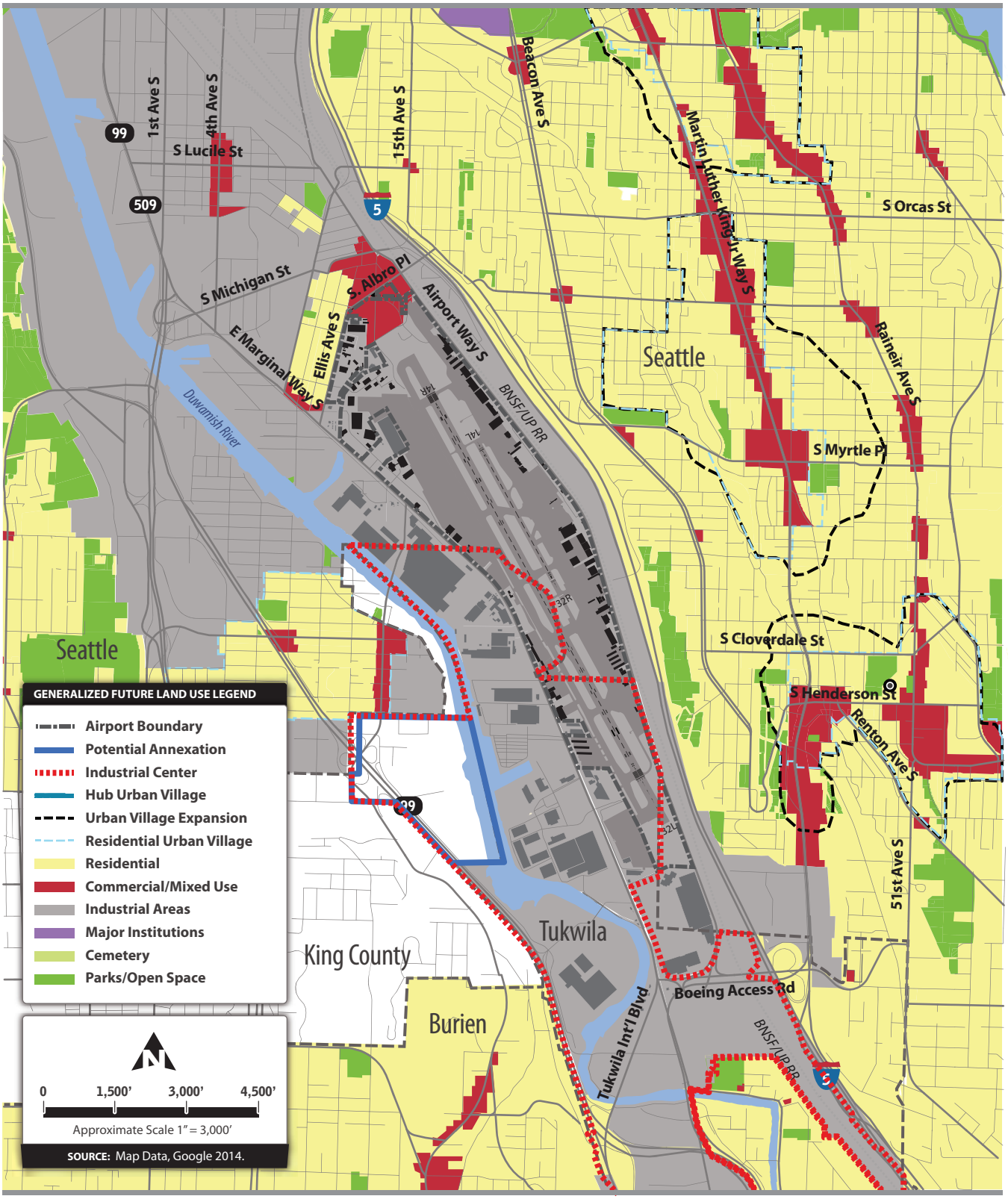

FIGURE A16 **Generalized Future Land Use**

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King County International Airport/ Boeing Field

Environmental Review

Environmental considerations and factors are important to review during the airport planning process when analyzing development alternatives and identifying preferred alternatives. It is necessary to provide the airport sponsor with the information needed to appropriately plan for the environmental processing that may be required in support of future airport development projects. The following sections provide a brief descriptions of environmental impact categories that are pertinent to airport planning, as well as airport-specific environmental information.

Earth

King County International Airport/Boeing Field (BFI) property consists of approximately 600 acres, of which approximately 435 acres (about 73 percent) are covered by impervious surfaces; the remaining acreage is covered by grass and landscaping. The topography of BFI is generally flat, with the operational area (e.g., runways and taxiways) averaging a one to two percent slope; other surface slopes at BFI range from zero to five percent. Previous studies describe the area soils as five to 10 feet of fill material, a 10-foot-thick (or less) layer of sandy silt/silty sand, and a layer of fine to medium fluvial sand extending to 40 feet below ground surface (BFI 2000, 2014). The Natural Resources Conservation Service Web Soil Survey identifies one soil series within the study area: Urban land, zero to five percent slopes (USDA 2019).

Air Quality

The federal government, and the state of Washington, have established health-based Ambient Air Quality Standards (AAQS) for six "criteria" air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SOx), particulate matter (course particles PM_{10} and fine particles $PM_{2.5}$), and lead. Regions receive "attainment," "nonattainment," and "maintenance" designations by the U.S. Environmental Protection Agency (USEPA) based on the status relative to the National AAQS (NAAQS). Attainment refers to geographic areas that meet the NAAQS, while nonattainment refers to areas that do not meet the NAAQS. Maintenance areas refer to geographic areas that were once nonattainment but have recently achieved compliance with NAAQS. **Table A9** lists the NAAQS and the State standards.

Table A9 **AMBIENT AIR QUALITY STANDARDS**

Pollutant	National		State of Washington
	Primary	Secondary	
Carbon Monoxide			
8 Hour Average	9 ppm	N/A	9 ppm
1 Hour Average	35 ppm	N/A	35 ppm
Particulate Matter (PM_{10})			
Annual Arithmetic Mean	NA	NA	50 mg/m^3
24 Hour Average	150 mg/m^3	150 mg/m^3	150 mg/m^3
Particulate Matter ($PM_{2.5}$)			
Annual Arithmetic Mean	15 mg/m^3	15 mg/m^3	NA
24 Hour Average	35 mg/m^3	35 mg/m^3	NA
Ozone			
8 Hour Average	0.075 ppm	0.075 ppm	NA
1 Hour Average	NA	NA	0.12 ppm
Sulfur Dioxide			
Annual Arithmetic Mean	0.03 ppm	N/A	0.02 ppm
24 Hour Average	0.14 ppm	N/A	0.10 ppm
3 Hour Average	N/A	0.5 ppm	N/A
1 Hour Average	N/A	N/A	0.40 ppm
1 Hour Average	N/A	N/A	0.25 ppm
1 Hour Average	75 ppb	N/A	N/A
5 Minute	N/A	N/A	0.80 ppm
Lead			
Calendar Quarter Average	1.5 mg/m^3	1.5 mg/m^3	N/A
Rolling 3-Month Average	0.15 mg/m^3	N/A	N/A
Nitrogen Dioxide			
Annual Average	0.053 ppm	0.053 ppm	0.05 ppm
1-Hour Average	0.110ppm	NA	NA

SOURCE: *United States Environmental Protection Agency (EPA), State of Washington Department of Ecology*

Notes: ppm = parts per million. ppb = parts per billion.
mg/m^3 = micrograms per cubic meter. N/A - Not Applicable.
The averaging times for each pollutant may vary relative to determining an exceedance of the standards. For example, the 8-hour ozone standard is a 3-year average of the annual 4th highest daily 8-hr maximum concentration. The 1-hour SO2 standard at 75 ppb is a 3- year average annual arithmetic mean to a 3-year average of the 98th percentile of daily maximum 1-hour. The carbon monoxide standard is not to be exceeded more than once in a calendar year.

BFI is located within a portion of the Central Puget Sound which is in attainment for all criteria pollutants, but because of past exceedances of the carbon monoxide standard and the course particle standard, is designated as maintenance and subject to a State Implementation Plan (SIP). The area was previously designated attainment/maintenance for ozone under the one-hour ozone standard; however, the one-hour standard was revoked by USEPA effective June 15th, 2005 and attains the current eight-hour ozone standard. Several sub-areas within the Central Puget Sound Area are classified as maintenance for the PM_{10} standards, including Kent, Duwamish (including King County International Airport), and Tacoma tide flats. The Central Puget Sound region is an attainment region for all other criteria pollutants.

There are four air quality measurement station in the regional air monitoring network that are closest to King County International Airport:

- Seattle-Duwamish
- Seattle-South Park
- Seattle-Beacon Hill
- Seattle-10th & Weller

The Seattle-Duwamish and Seattle-South Park sites measures $PM_{2.5}$ (fine particles) while the Seattle-Beacon Hill site measures nitrogen dioxide, ozone, carbon monoxide, sulfur dioxide and fine particles. The Seattle-10th & Weller measures nitrogen dioxide, carbon monoxide, and fine particles. The Puget Sound Clean Air Agency 2013 Air Quality Data Report[3] indicates that measured concentrations at all sites have been below the NAAQS and State Ambient Air Quality Standards shown in **Table A8**. However, the 2013 technical report, entitled Diesel Exhaust Exposure in the Duwamish[4], indicates that residents of South Park and Georgetown are likely exposed to higher levels of diesel exhaust than residents of the Beacon Hill and Queen Anne. Also, as presented in the 2013 Duwamish Valley Cumulative Health Impacts: Seattle, Washington[5], the communities of Beacon Hill, Georgetown, and South Park had the highest ranking for air pollution and for exposure to confirmed and suspected contaminated sites, as well as one of the highest rankings in the city for unhealthy environmental effects.

Climate

King County International Airport is located approximately five miles south of downtown Seattle. Because the prevailing winds are from the Pacific Ocean, the general meteorological conditions of the Puget Sound region are typical of a marine climate. The Cascade Range to the east serves as a partial barrier to the temperature extremes of the continental climate of eastern Washington. Average summer temperatures range from 54 to 73 °F, and average winter temperatures range from 36 to 41 °F. Average precipitation is 37.2 inches per year, with most of the precipitation occurring from October through April.

Research has shown that there is a direct correlation between fuel combustion and greenhouse gas emissions which have been shown to be altering the earth's climate. Therefore, sources that require fuel or power at an airport are the primary sources that would generate greenhouse gases. In terms of relative U.S. contribution, the U.S. General Accounting Office (GAO) reports that aviation accounts "for about three percent of total U.S. greenhouse gas emissions from human sources, according to EPA data" compared with other industrial sources, including the remainder of the transportation sector (20 percent) and power generation (41 percent).[6] The International Civil Aviation Organization (ICAO) estimates that greenhouse emissions from aircraft account for roughly three percent of all anthropogenic greenhouse gas emissions

[3] Puget Sound Clean Air Agency 2013 Air Quality Data Summary, August 2014.
[4] Diesel Exhaust Exposure in the Duwamish, October 2013 (research conducted by the University of Washington School of Public Health in collaboration with Puget Sound Sage)
[5] Gould L, Cummings BJ. Duwamish Valley Cumulative Health Impacts Analysis. Seattle, WA: Just Health Action and Duwamish River Cleanup Coalition/Technical Advisory Group. March 2013.
[6] IPCC Report as referenced in U.S. General Accounting Office (GAO) Environment: Aviation's Effects on the Global Atmosphere Are Potentially Significant and Expected to Grow; GAO/RCED-00-57, February 2000, p. 14; GAO cites available EPA data from 1997.

globally. Climate change due to greenhouse gas emissions is a global phenomenon, so the affected environment is the global climate.[7]

King County has been very proactive on climate change issues. As one of the first airports to prepare a comprehensive greenhouse gas inventory, the County identified emissions in 2007 from the following airport sources:

- Sources owned and controlled by the County - referred to as Scope One sources/emissions
  - Airport fleet vehicles
  - Stationary Sources
- Sources indirectly controlled by the County – referred to as Scope Two sources/emissions
  - Purchased electricity
- Sources not controlled by the County – referred to as Scope Three sources
  - Aircraft emissions
  - Aircraft related ground support equipment
  - Other tenant activities such as purchased electricity, stationary sources, etc.
  - Public vehicular access to the Airport

Table A10 shows the results of the 2007 greenhouse gas evaluation for BFI. That evaluation included two formats for presenting emissions: reference to the Scope One, Two, and Three as used by various greenhouse gas accounting protocols, but also the format recommended by the Airport Cooperative Research Program (ACRP) Report 11 Guidebook on Preparing Airport Greenhouse Gas Inventories. The 2007 evaluation included a backcast estimate of what emissions were in 1990 as well as a forecast of what emissions might increase to by 2020.[8]

Approximately 263,414 metric tons of CO_{2e} were emitted by Airport-related sources in 2007 (Scope One, Two, and Three). In contrast, about 187,472 metric tons of CO_{2e} were emitted in 1990, and 304,132 metrics tons are anticipated to occur in 2020 if no further reduction actions are undertaken (business as usual). Of total Airport-related emissions, King County owned or controlled less than one percent of the emissions in 2007 (686 metric tons of CO_{2e}). Over 98 percent of the emissions associated with the Airport were generated with aircraft operations, which the County does not own or have the authority to control.

The largest portion of greenhouse gas emissions that the County either owns or has substantial control at the Airport in 2007 was due to natural gas consumption at Airport facilities, while 38 percent of emissions were caused by gas/diesel fuel use in Airport fleet vehicles. While the County does not own the ground vehicles from users accessing their aircraft in tie-down locations (on airfield), they do control that activity, which represents less than one metric ton. In addition, King County's Strategic Climate Action Plan states the County's goal is to reduce county-wide emissions by 50% by 2030.

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[7] As explained by the U.S. Environmental Protection Agency, "greenhouse gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." Climate Change Division, Office of Atmospheric Programs, U.S. Environmental Protection Agency, Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act 2-3 (2009), available at http://epa.gov/climate-change.html.

[8] It is important to note that as of preparation of this inventory, aircraft operations in 2015 were about 50% of what they were in 2007 or the 2020 forecast used to forecast emissions. Thus, today, greenhouse gases would be expected to be lower than predicted back in 2007.

Table A10 **SUMMARY OF GREENHOUSE GAS EMISSIONS ASSOCIATED WITH BOEING FIELD ACTIVITY (2007, BACKCAST 1990 AND FORECAST 2020)**

User/Source Category	WRI Scope	2007			CO_2 Emissions	
		CO_2 (tons/ year)	Percent of User	% of Total	1990 Backcast	2020 Forecast
King County-owned/controlled						
Facilities/Stationary Sources						
Electrical	2	44	6.4%	0.0%	127	53
Other (oil, gas)	1	381	55.6%	0.1%	323	487
Facilities Total	½	425	62.0%	0.2%	449	541
County Fleet Vehicles (on- and off-road)	1	260	38.0%	0.1%	288	267
Ground Access Vehicles (on-airport travel)	3	0.3	0.0%	0.0%	0	0
King County-owned/controlled Total		**686**	**100.0%**	**0.3%**	**737**	**809**
Airlines/Aircraft Op/Tenants-owned/controlled						
Aircraft						
Approach	3	8,628	3.3%	3.3%	6,694	10,006
Taxi/Idle/Delay	3	21,837	8.3%	8.3%	15,557	25,102
Takeoff	3	10,343	3.9%	3.9%	7,318	12,077
Climb Out	3	5,945	2.3%	2.3%	4,592	6,733
Subtotal LTO	3	46,752	17.8%	17.7%	34,161	53,918
Residual/Cruise/APU	3	212,776	81.2%	80.8%	149,333	245,628
Aircraft Total	3	**259,528**	**99.1%**	**98.5%**	**183,494**	**299,547**
Airlines/Aircraft Op/Tenants-owned/controlled						
Ground Support Equipment	3	**2,001**	**0.8%**	**0.8%**	**2,211**	**2,055**
Ground Access Vehicles (on- and off-airport)	3					
Tenant Ground Access Vehicles	3	**308**	**0.1%**	0.1%	**340**	**316**
Tenant Employee Commute	3	**82**	**0.0%**	0.0%	**91**	**84**
Ground Access Vehicles Total	3	**390**	**0.1%**	**0.1%**	**431**	**401**
Stationary Sources	3	**-**	**0.0%**	**0.0%**	-	-
Airline/Tenant-owned/controlled Total		**261,919**	**100.0%**	**99.4%**	**186,136**	**302,002**
Public-owned/controlled						
Passengers (on and off airport)	3	378	46.7%	0.1%	122	651
County Employee Commute (on- and off- airport)	3	327	0.1%	0.1%	362	563
Tiedown users (off airport)	3	104	12.8%	0.0%	115	106
Public-owned-controlled Total		**810**	**100.0%**	**0.3%**	**599**	**1,321**
Total Metric Tons		**263,414**		**100%**	**187,472**	**304,132**
Operations		**300,184**			**331,643**	**308,242**
Enplanements		**27,352**			**8,837**	**47,060**

SOURCE: *Synergy Consultants, January 2011. Activity: FAA Terminal Area Forecast November 2010.*

Water Quality

Surface Water. BFI is located within the Duwamish- Green watershed Water Resource Inventory Area 9 (Ecology 2019a) and the Duwamish Estuary sub-watershed. The closest surface water to BFI is the Duwamish River, which is approximately 1,200 feet to the west. The Washington State Department of Ecology (Ecology) identifies water quality standards for the reach of the Duwamish River near the study area as not considered clean enough for domestic water supply, only for industrial and agricultural uses. The waters are considered safe for secondary contact, like fishing and boating, but not safe for direct contact, like swimming (Ecology 2019b).

The Duwamish River is listed as a 303(d) impaired waterbody for the following parameters: sediment bioassay, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h,)anthracene, indeno(1,2,3-cd)pyrene, 1,2-dichlorobenzen, 1,3-dichlorobenzen, 1,4-dichlorobenzen, 2,4-dichlorophenol, 2,4-dinitrophenol, 2,4,6-trichlorophenol, anthracene, antimony, benzo(a)anthracene, bis(2-chloroisopropyl)ether, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, diethyl phthalate, dimethyl phthalate, temperature, fluoranthene, fluorene, hexachlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, hexachloroethane, isophorone, mercury, nickel, nitrobenzene, n-nitrosodiphenylamine, pentachlorophenol, phenol, pyrene, and thallium (Ecology 2019b).

Stormwater generated at BFI is regulated primarily through the Airport's Industrial Stormwater General Permit (ISGP; no. WAR-000343) under the National Pollutant Discharge Elimination System (NPDES). As required by the NPDES, BFI prepared a Stormwater Pollution Prevention Plan in 2015. Some tenant facilities within BFI also have ISGPs. In these cases, the tenant has a direct relationship with Ecology regarding NPDES compliance. The stormwater infrastructure at the site has been developed for compliance with these permit requirements. In addition, stormwater quality standards, infrastructure, and activities (e.g., source control activities) are influenced by environmental cleanups or orders that have been initiated at BFI or by other parties in the immediate vicinity.

Source control activities performed as part of the Lower Duwamish Waterway Sediment Superfund Site may have an impact on the management of stormwater at BFI. King County's Source Control Implementation Plan 2014–2018 (King County 2016) has been developed with input from Ecology to summarize source control efforts for the basin that includes BFI. Source control implementation will continue at least until the commencement of sediment cleanup in the Lower Duwamish Waterway.

In addition, Boeing, King County, and the City of Seattle have entered into an Agreed Order with Ecology to perform a remedial investigation/feasibility study for potential contamination in soil, groundwater, stormwater solids, and downstream sediments for the North Boeing Field Georgetown Steam Plant site. The impact of the Agreed Order on stormwater management at BFI is not known at this time.

Examples of stormwater infrastructure and source control activities associated with operation of BFI include the following:

- **Aircraft Fueling.** Aviation fuel is brought to BFI via truck by a variety of vendors. Aircraft are fueled throughout BFI using fuel trucks that load fuel from a combination of aboveground and underground storage tanks. Based upon 2015 aviation fuel storage data provided by Airport staff, there is 517,000 gallons of Jet A, 35,000 gallons of Avgas, and 12,000 gallons of unleaded gasoline storage capacity located on or near Airport property.

  Aviation fuel loading into the storage tanks and from the tanks into the fuel trucks is done with a closed-hose transfer connection. Closed-hose connections are also used for fueling large aircraft, while smaller planes are fueled by a person with a hand-held nozzle. Fuel spills occur infrequently and are cleaned up with absorption material and vacuum pumps.

- **Aircraft Maintenance.** Aircraft and ground vehicles are stored and maintained by the majority of tenants at BFI. Most maintenance occurs in hangars; however, some aircraft are maintained while parked outside in a tie-down stall. Most of the hangars have floor drains, which feed to oil/water separators before discharging to the sanitary sewer system. Incidental spills of lubricating oils, hydraulic oils, degreasers, and other materials commonly used for aircraft maintenance are cleaned up with absorption materials (BFI 2004).

- **Aircraft Washing.** There are currently six designated wash pads for aircraft washing at BFI. Designated wash areas contain a wash rack and an oil/water separator to collect the runoff, which is then routed to the sanitary sewer system (BFI 2004).

- **De-icing Chemicals.** De-icing is performed on aircraft to minimize the ice build-up on the wings and body during cold weather. De-icing at BFI is relatively infrequent because of the moderate weather in Western Washington. All the pads used for washing and de-icing discharge to the sanitary sewer system. The primary aircraft de-icing material is ethylene glycol (BFI 2004).

Groundwater. Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. The term aquifer is used to describe the geologic layers that store or transmit groundwater. There are two group D groundwater wells found on BFI property; there is no water quality data available for these wells (King County 2019a). King County's Interactive Maps show that BFI is not in a critical aquafer recharge area, groundwater management area, wellhead protection area, sole source aquifer or an area susceptible to groundwater contamination (King County 2016b).

Noise

Noise is generally defined as unwanted sound and, as such, the determination of acceptable levels is subjective. The basic unit in the computation of day-night sound level (DNL) is the Sound Exposure Level (SEL). An SEL is computed by adding the decibels adjusted dB(A) level for each second of a noise event above a certain threshold. For example, a noise monitor located in a quiet residential area [40 dB(A)] receives the sound impulses of an approaching aircraft and records the highest dB(A) reading for each second of the event as the aircraft approaches and departs the site. Each of these one-second readings is then added logarithmically to compute the SEL.

The computation of DNL involves the adding, weighting, and averaging of each SEL to achieve the DNL level in a particular location. The SEL of any single noise event occurring between the hours of 10:00 p.m. and 7:00 a.m. is automatically weighted by adding 10 dB(A) to the SEL to account for the assumed additional irritation perceived during that period. All SELs are then averaged over a given period (day, week, year) to achieve a level characteristic of the total noise environment. DNL levels usually are depicted as grid cells or contours. Grid cells are squares of land of a specific size that are entirely characterized by a noise level. Contours are interpolations of noise levels based on the centroid of a grid cell and drawn to connect all points of similar level. Contours appear similar to topographical contours and form concentric "footprints" about a noise source. These footprints of DNL contours drawn about an airport are used to predict community response to the noise from aircraft using that airport.

It should also be noted that a Federal Aviation Regulation (FAR) Part 150 Study was completed/adopted for BFI in 2005 that generated a 2008 Noise Exposure Map, which included several Noise Compatibility Program recommendations that were documented in the FAA's Record of Approval. King County has implemented several of the recommendations over the past several years [e.g., update of the Flight Tracking and Noise Monitoring Program (i.e., the Fly Quiet Program), completion of the Sound Attenuation Program, purchase of avigation easements, and sales transaction assistance in the 65 and 70 DNL noise contours]. However, a new set of existing and future noise contours have been developed for this MP Update that utilize the most current aircraft operational data. These new contours are presented in the **Environmental Overview** chapter of this Study.

Plants and Animals/Biotic Communities and Endangered Species

BFI is a highly developed site, with a large amount of pavement and impervious surface. Vegetation around the runways consists mainly of mowed grass that is managed carefully to discourage wildlife use. The closest potential habitat for Endangered Species Act (ESA)-listed species is within the Duwamish Waterway, about 1,200 feet from the BFI boundary**.**

ESA, as amended, requires any federal agency to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction of adverse modification to habitat of such species.

A summary of ESA-listed threatened and endangered species potentially occurring within the vicinity of BFI under the jurisdiction of the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) (NMFS 2019; USFWS 2019a) is identified in **Table A11**. This table also identifies whether critical habitat has been designated by NMFS or USFWS for those species within the vicinity of BFI. It shows four ESA-listed species may occur within the vicinity of BFI. Of these species, three are aquatic (fish) and one is terrestrial (bird). No ESA-listed plant or insect species are identified as potentially occurring within the vicinity of BFI. Designated critical habitat for all four of the species is present within King County. The following discussion provides an assessment of the potential presence of ESA-listed species and habitats within the vicinity of BFI.

Table A11 **SPECIES AND CRITICAL HABITAT WITH FEDERAL ESA STATUS THAT MAY OCCUR IN THE VICINITY OF BFI**

Common Name (*Scientific Name*)	Jurisdiction	ESA Status	Critical Habitat
Fish			
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound ESU	NMFS	Threatened	Designated; occurs in Duwamish Waterway
Steelhead (*Oncorhynchus mykiss*) Puget Sound DPS	NMFS	Threatened	Designated; occurs in Duwamish Waterway
Bull trout (*Salvelinus confluentus*) Coastal-Puget Sound DPS	USFWS	Threatened	Designated; does not include reach of Duwamish Waterway in vicinity of BFI
Birds			
Marbled murrelet *(Brachyramphus marmoratus*)	USFWS	Threatened	Designated; does not include vicinity of BFI

SOURCE: *U.S. Fish & Wildlife Service, National Marine Fisheries Service, and Anchor Environmental.*
Notes: ESU = Evolutionarily Significant Unit. DPS = Distinct Population Segment.
NMFS = National Marine Fisheries Service. USFWS = U.S. Fish and Wildlife Service.

All three of the ESA-listed fish species are documented in the Duwamish Waterway (WDFW 2019a, 2019b). The reach of the Duwamish Waterway in the vicinity of BFI is within designated critical habitat for Chinook salmon and steelhead. Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) maps and Salmonscape websites identified the Duwamish Waterway as habitat for cutthroat trout; coho, fall chum, sockeye, pink, and Chinook salmon; steelhead; and bull trout (WDFW 2019a, 2019b).

Marbled murrelets forage in Puget Sound and could occur in the Duwamish Waterway. In King County, designated critical habitat for marbled murrelet includes old-growth forest with specific tree stand characteristics.

There are four additional ESA-listed or proposed species identified by the USFWS as potentially occurring in the vicinity of BFI based on the species' life history and habitat requirements; these species are listed in **Table A12**. However, habitat for these species (gray wolf, wolverine, streaked horned lark, and yellow-billed cuckoo) is not located within at least 10 miles of BFI, and these species are not associated with areas of human activity. Vegetation communities within BFI—mowed grass near runways that is managed to discourage wildlife use—is unlikely to provide potential suitable habitat for streaked horn lark. Potential habitat for yellow-billed cuckoo—densely vegetated deciduous forest habitat—is not present within BFI or the surrounding vicinity.

Table A12 **SPECIES AND CRITICAL HABITAT WITH FEDERAL ESA STATUS WITH LIFE HISTORY AND HABITAT REQUIREMENTS THAT DO NOT OCCUR IN THE VICINITY OF BFI**

Common Name (*Scientific Name*)	Jurisdiction	ESA Status	Critical Habitat
Mammals			
Gray wolf (*Canis lupus*)	USFWS	Proposed Endangered	None designated or proposed
Wolverine (*Gulo luscus*)	USFWS	Proposed Threatened	None designated or proposed
Birds			
Streaked horned lark (*Eremophila alpestris strigata*)	USFWS	Threatened	Designated; does not include vicinity of BFI
Yellow-billed cuckoo (*Coccyzus americanus*)	USFWS	Threatened	Designated; does not include vicinity of BFI

SOURCE: *U.S. Fish & Wildlife Service and Anchor Environmental.*
Note: USFWS = U.S. Fish and Wildlife Service.

Marine fish species, sea turtles, and marine mammals under NMFS jurisdiction that occur in Puget Sound are not identified because the Duwamish Waterway does not provide suitable habitat for marine species.

USFWS identifies the additional species of Canada lynx (Lynx canadensis), marbled murrelet (Brachyramphus marmoratus), yellow-billed cuckoo (Coccyzus americanus), and streaked horned lark (Eremophila alpestris strigata) as potentially occurring in the vicinity of BFI (USFWS 2016a). Suitable habitat for Canada lynx, marbled murrelet, and yellow-billed cuckoo is not present within the boundaries or the vicinity of BFI. Vegetation communities within the BFI, mowed grass near runways that is managed to discourage wildlife use, is unlikely to provide potential suitable habitat for streaked horn lark.

The Magnuson-Stevens Fishery Conservation and Management Act mandates that federal agencies consult with the Secretary of Commerce on all activities or proposed activities, authorized, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." In addition to species listed as threatened or endangered, EFH consultations are required for non-listed, federally managed fishery species, which include Puget Sound coho and pink salmon populations. As previously stated, WDFW PHS and Salmonscape websites identified the Duwamish Waterway as habitat for coho and pink salmon (WDFW 2019a, 2019b).

The Migratory Bird Treaty Act makes it illegal to pursue, hunt, take, capture, kill, attempt to take, capture, or kill any migratory bird or "any part, nest, or egg of any such bird ... by any means or in any manner," except as allowed by permit. Migratory birds that occur in King County include all birds except house sparrows, starlings, feral pigeons (rock doves), pheasant, quail, and domestic ducks, geese, and other exotic birds. Migratory birds could potentially occur in suitable habitat within or in the vicinity of BFI.

Energy and Natural Resources

BFI uses energy in the form of electricity, natural gas, aviation fuel, diesel fuel, and gasoline for the operation of the facilities, aircraft, and associated support equipment. The following text summarizes the providers and use of these energy sources:

- ***Aircraft and Surface Vehicle Fuel.*** Four types of fuel are used at BFI to power aircraft and ground vehicles: Jet A, avgas, unleaded gasoline, and diesel. In 2014, Airport users consumed about 13 million gallons of these types of fuel. The primary suppliers of fuels are Texaco, AvFuel, and Valley Oil (BFI 2014).
- ***Electrical Power.*** Puget Sound Energy and Seattle City Light provide electrical power to BFI and Airport facilities. In 1999, the combined metered use of electricity at BFI was approximately 877,000 kilowatt hours (BFI 2004).

Land Use Compatibility

BFI lies within the cities of Seattle and Tukwila. Land use in the BFI area is primarily industrial and commercial, consisting of two manufacturing/industrial centers (Duwamish and Tukwila) that were established to ensure that adequate accessible industrial land is available to promote a diversified employment base. There are also small residential neighborhoods near BFI: Georgetown in Seattle to the north and west, Allentown in Tukwila to the south, and Holly Park in Seattle to the east. General existing land uses were shown in **Figure A15**. Noise related to the Airport and surrounding area was presented in a previous section.

BFI and the surrounding area is zoned under the City of Seattle as IG2 U/85, General Industrial, with unlimited height for manufacturing and industrial uses, and with an 85-foot height limit for other uses (City of Seattle DCI 2019). Because BFI is owned, operated, and maintained by the County, the planning and land use activities are controlled through the King County Code (King County 2019c). Airport development is guided through the King County International Airport Master Plan and the Federal Aviation Administration approved Airport Layout Plan (King County 2012).

Social and Induced Socio-economic Impacts

The neighborhoods surrounding the BFI have a small residential component. The 2013 Regional Centers Monitoring Report prepared for the City of Seattle's Manufacturing and Industrial Centers estimates that approximately 85 percent of the land area is in industrial use, with the remaining 15 percent in commercial, institutional, residential, and undeveloped lands. As a collective group, the average population in the study area exceeds the threshold for minority populations but is within the threshold for low-income populations as defined by the U.S. Census Bureau (2019).

The Airport's 2021 *High-Level Economic Impact of King County International Airport* study[9] reports that BFI supports approximately $2.97 billion in local business revenues annually, and is associated with over 16,000 jobs and $1.24 billion in labor income. There were 6,705 people employed at the Airport in 2019, earning over $703 million in labor income. Direct revenues by businesses at the Airport were $1.5 billion, of which $1.39 billion was accounted for by aerospace activity. In addition, most business activity at KCIA is exported from this region, contributing significantly to the economic base of the region.

Public Services and Utilities

Electricity, water, wastewater, natural gas, telephone service, and emergency services are available at BFI. **Table A13** lists the utility and service providers.

Table A13 **UTILITY PROVIDERS AT BFI**

Utility/Services	Provider
Electricity	Seattle City Light
Water	Seattle Public Utilities/City of Tukwila
Wastewater	City of Tukwila/King County (Metro)
Natural Gas	Puget Sound Energy
Telephone	CenturyLink

SOURCE: *Anchor Environmental.*

DOT 4(f) Lands and Recreational Uses

Section 4(f) of the U.S. Department of Transportation Act (recodified at 49 USC, Subtitle I, Section 303), states that no publicly owned park, recreation area, wildlife or waterfowl refuge, or land of historic site that is of national, state, or local significance shall be used, acquired, or affected by programs or projects requiring federal assistance for implementation unless there is no feasible or prudent alternative. Additionally, no such projects will involve a constructive use of the Section 4(f) properties based on an FAA determination that the project would substantially impair the resource. Substantial impairment occurs when activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.

There are 12 public park and recreational sites identified in the vicinity of BFI. **Table A14** lists the various sites and the location from the center of BFI, and these are presented in the **Figure A17**.

[9] High-Level Economic Impact of King County International Airport, January 2021.

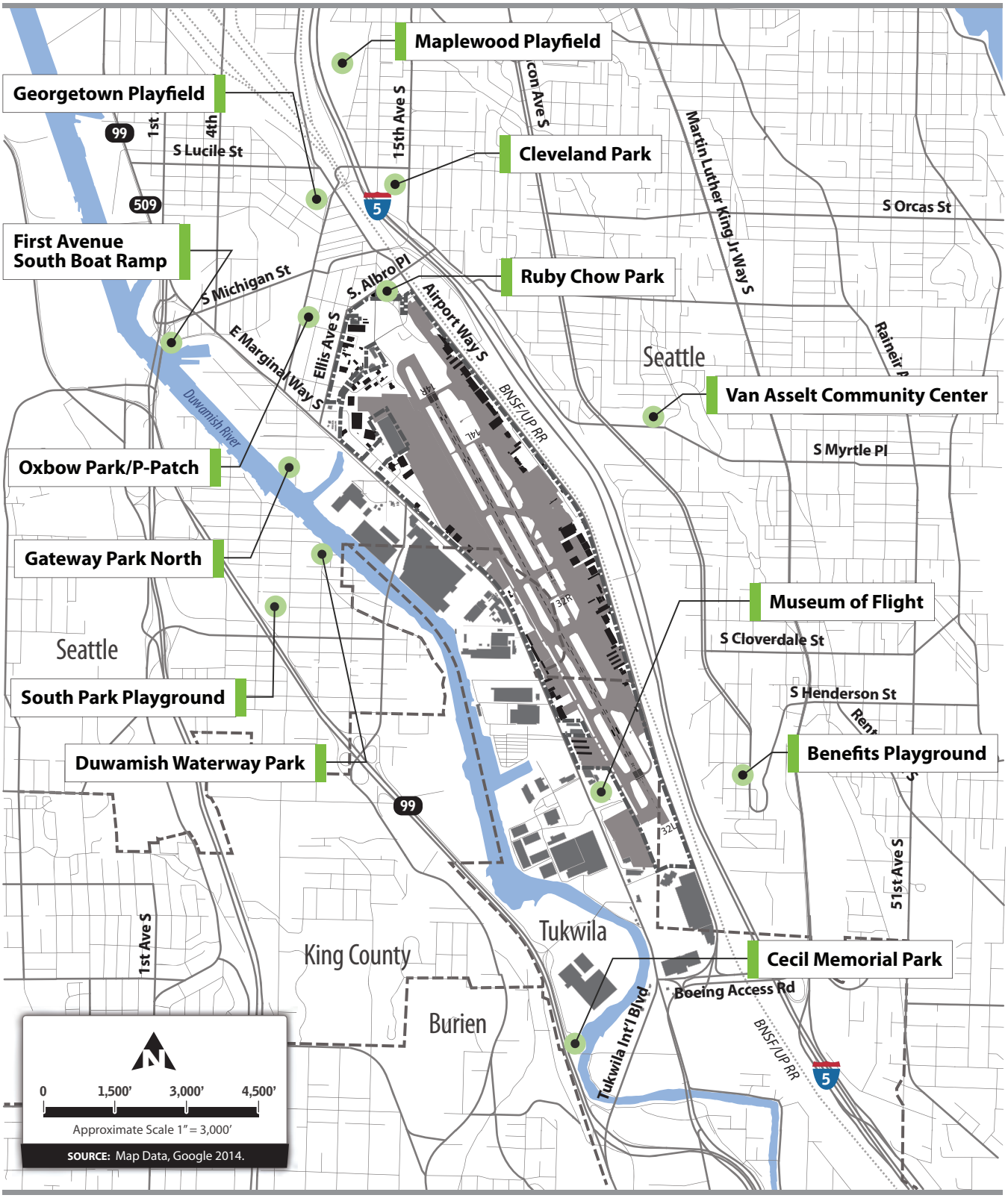

FIGURE A17 **Parks and Recreation Sites**

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Table A14 **PARKS AND RECREATION AREAS WITHIN THE VICINITY OF BFI**

Site	Location
Oxbow Park/P-Patch	North of BFI
Georgetown Playfield	North of BFI
Maplewood Playfield	North of BFI
Cleveland Park	North of BFI
Ruby Chow Park	North of BFI
First Avenue South Boat Ramp	Northwest of BFI
Van Asselt Playground and Community Center	East of BFI
Benefit Playground	East of BFI
Cecil Memorial Park	Southwest of BFI
Museum of Flight	Southwest of BFI
Duwamish Waterway Park	West of BFI
South Park Playground	West of BFI

SOURCES: *Google Maps, 2019; BFI, 2004.*

Historic, Cultural, and Archaeological Resources

Historic and Cultural. BFI is located adjacent to the Duwamish Waterway in Seattle's historic Georgetown neighborhood. Several historic and potentially historic properties are located near and within BFI (DAHP 2019; WHR 2019; WISAARD 2019). Four registered historic places are located near or within BFI, one of which also extends outside the BFI boundary (the Seattle Electric Company Georgetown Steam Plant[10]). Registered historic places that are within BFI are shown in **Table A15** and in **Figure A19**; those that are near BFI are shown in **Table A16** and in **Figure A19**.

Table A15 **REGISTERED HISTORIC SITES WITHIN BFI**

Site	Location
Boeing Airplane Company Building	West area of BFI
Maple Donation Claim Historic Marker	East area of BFI

SOURCE: *DAHP 2019, WHR 2019, WISAARD 2019.*

Table A16 **REGISTERED HISTORIC SITES LOCATED NEAR BFI**

Site	Location
Old Georgetown City Hall	North of BFI
Seattle Electric Company Georgetown Steam Plant[1]	North area of BFI and west of BFI

SOURCE: *DAHP 2019, WHR 2019, WISAARD 2019.*

[1] The Georgetown Steam Plant is designated as a National Historic Landmark.

Several structures within the boundaries of BFI are non-registered historic sites currently identified as eligible structures or structures with "no determination" (DAHP 2019; WHR 2019; WISAARD 2019). Eligible

[10] The Georgetown Steam Plant is designated as a National Historic Landmark.

structures are shown in **Table A17** and in **Figure A18**, and structures with no determination are shown in **Table A18** and in **Figure A18**.

Table A17 **ELIGIBLE HISTORIC STRUCTURES (NOT LISTED)**

Resource ID[1]	Resource Name	Common Name	Address
34456	Boeing Field Terminal Building	King County Airport Terminal Building	7277 Perimeter Road South

SOURCE: *DAHP 2019, WHR 2019, WISAARD 2019.*

Table A18 **NO DETERMINATION HISTORIC STRUCTURES (NOT LISTED)**

Resource ID[1]	Resource Name	Common Name	Address
33948	Boeing Field Apartments	—	6285 South Hardy Street
40839	Seattle Air National Guard Reserve Forces Training	143rd Combat Communications Building	6736 Ellis Avenue South
49391	Boeing Company's Building 3-323	—	6505 Perimeter Road
49392	Boeing Company's Building 3-346	—	6505 Perimeter Road
484941[1]	King County Administration Building	Former King County Administration Building	7233 Perimeter Road South
484915	Samuel and John Maple Burial and Memorial	Maple Memorial	7277 Perimeter Road South
484944	King County Airport Office Building	—	7300 Perimeter Road South
484940[1]	King County Airport Hangar 3	Hangar 3	7827 Perimeter Road South
484938[1]	West Coast Airlines Hangar	Quad 7 Hanger/Hangar 4	7777 Perimeter Road South
484945	King County Air Traffic Control Tower	Air Traffic Control Tower	8200 East Marginal Way South
484965	Norfolk Regulator	Norfolk Regulator	9900 East Marginal Way South

SOURCE: *DAHP 2019, WHR 2019, WISAARD 2019.*

[1] Structure was later removed following the preparation of this table information.

Archaeological. One archaeological site is recorded within the boundaries of BFI. Site 45KI538 is a segment of the Columbia and Puget Sound Railroad. It has not been evaluated but is potentially NRHP-eligible. Several archaeological surveys have been conducted within BFI boundaries, but are limited in extent. These surveys have indicated that there is fill across much of the property, as deep as 16 feet or deeper in areas, but that there is remaining potential for pre-contact and historic archaeological materials under the fill.

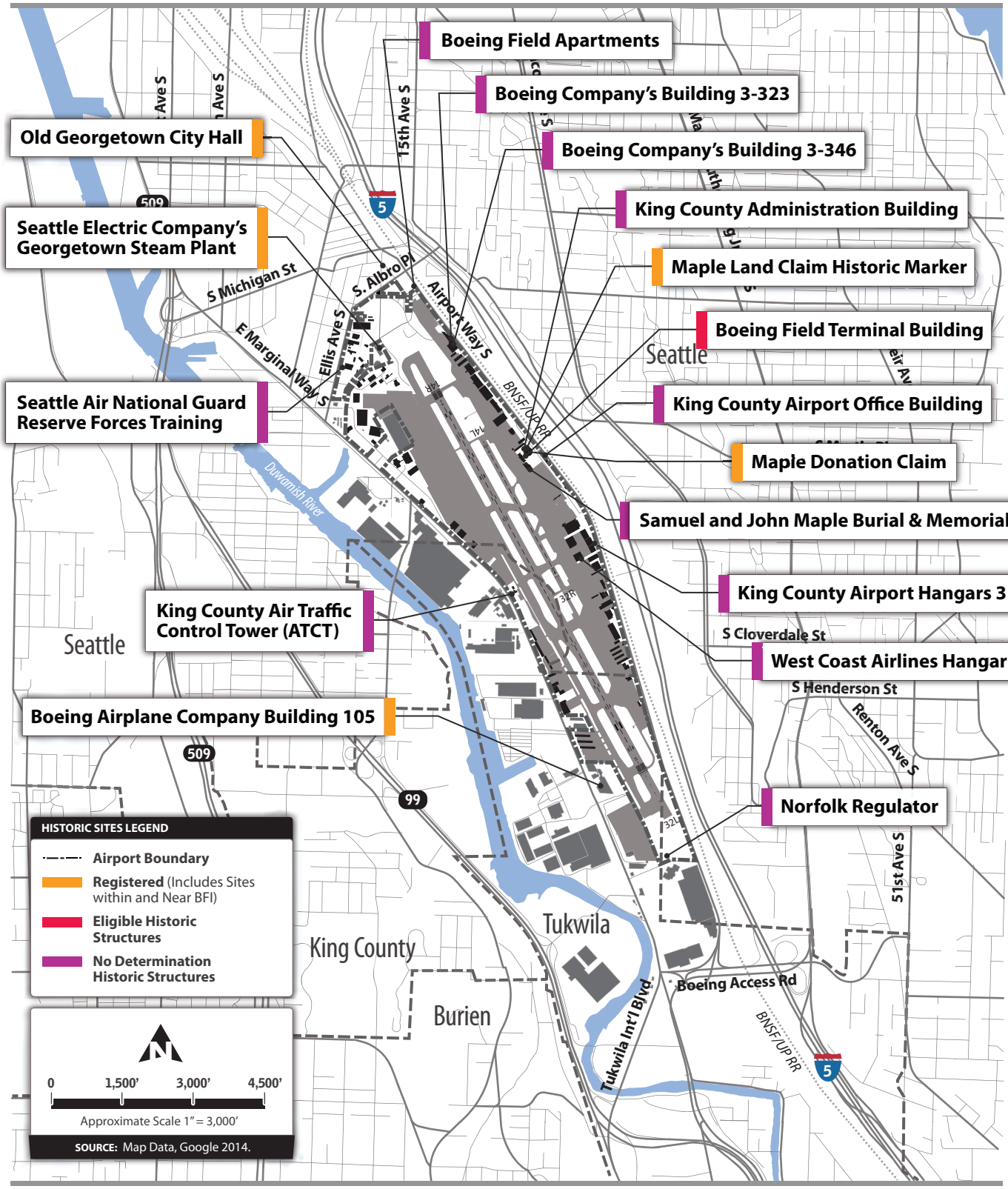

FIGURE A18 **Historic Sites**

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King County International Airport/ Boeing Field

Solid Waste

Solid waste services are available at BFI and provided by City of Tukwila and King County Metro. King County contracts two private firms, Waste Management, Inc., and Rabanco, to provide receiving facilities for non-recyclable construction, demolition, and land clearing (COL) wastes generated in King County. Waste handling services provided by Waste Management and Rabanco include transfer of mixed loads of COL wastes, removal of recyclable materials, and collection and disposal of COL wastes. The COL waste collected at transfer facilities is disposed of in landfills permitted, owned, and operated by these companies.

Limited recycling of COL materials is provided at the vendor facilities. King County also offers technical assistance to encourage recycling of COL wastes. All waste materials, whether recyclable or not, are tracked to their final disposal. A COL Material Management Resource Guide, published by the King County Solid Waste Division, lists local COL recycling facilities (BFI 2004).

Floodplains

Executive Order 11988 directs federal agencies to take action to reduce the risk of flood loss, minimize the impacts of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains.

According to Federal Emergency Management Agency (FEMA)-published floodplain maps, BFI is not within the FEMA-mapped 100-year floodplain of the Duwamish Waterway. BFI is also not within King County-mapped flood hazard areas (King County 2019b). The closest surface water to BFI is the Duwamish Waterway, located approximately 1,200 feet west of the BFI boundary (see **Figure A19**).

Wetlands

Wetlands are defined as areas inundated by surface or groundwater, with a frequency sufficient to support vegetation or aquatic life requiring saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands and other Waters of the U.S. may be classified as "jurisdictional" or "non-jurisdictional." Jurisdictional wetlands and designated Waters of the U.S. are under the authority of and are regulated by the U.S. Army Corps of Engineers (USACE). USACE must be consulted whenever jurisdictional wetlands and other Waters of the U.S. are present. Wetlands within the boundaries of BFI would also be protected under the jurisdiction of the King County Code (King County 2019c).

According to the National Wetlands Inventory maps maintained by the USFWS, there are six palustrine emergent wetlands located on BFI property (USFWS 2019b). These wetlands are also identified on the WDFW PHS maps (WDFW 2019a). King County environmentally sensitive areas maps do not identify any wetland features within the BFI boundary (King County 2019b). According to the USFWS and WDFW PHS, and Google (2019) maps, these wetlands are located within the mowed vegetated areas adjacent to the Airport runways. The location of wetlands on BFI property are shown on **Figure A19**.

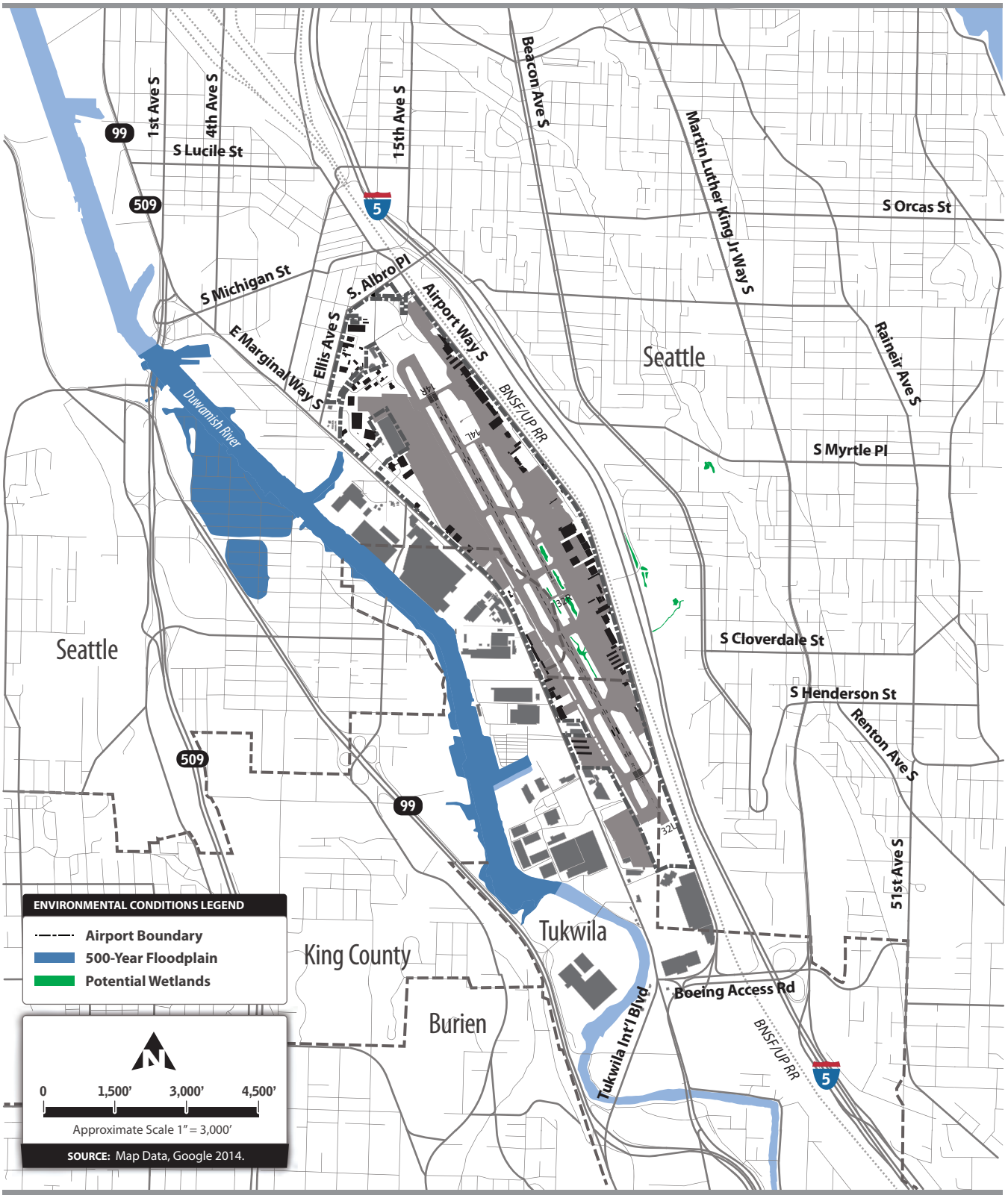

FIGURE A19 **Environmental Conditions**

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Coastal Zone Management and Wild and Scenic Rivers

All coastal counties within the State of Washington are subject to the Coastal Zone Management Program. The Coastal Zone Management Program is based primarily upon the Shoreline Management Act, as well as other state land use and resource management laws. Local shoreline master programs are approved and adopted by the State, which ensures consistency with the Coastal Zone Management Act. Ecology determines the consistency of a proposed development with the Coastal Zone Management Act and the Washington Coastal Zone Management Program. Within the BFI vicinity, the Duwamish Waterway is the only water body under the jurisdiction of a local Shoreline Master Program.

The Wild and Scenic River Act was created to preserve selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes. The Duwamish River is not protected under the Wild and Scenic River Act.

Farmland

The Farmland Protection and Policy Act was enacted to minimize the loss of prime farmland and unique farmland because of a federal action resulting in converting designated lands to nonagricultural use.

BFI is not identified as farmland and resides in a fully developed industrial area in Seattle and Tukwila (King County 2019d).

Aesthetics, Views, Light Emissions

BFI is located in a heavily industrialized area. Because of the industrialized nature of the surrounding area, the visual character of the Airport buildings and paved areas fits well with its surroundings. The airfield provides a large area of open space in a relatively densely developed area, which allows for breaks in the views from the water and land side of BFI.

Lighting systems at BFI supply the airfield (i.e., runway/taxiway edge lights, approach lighting systems, lighted visual landing aids, and rotating beacon), terminal buildings, access roadways, parking, and other on-airport buildings.

Airport Financial Inventory

The primary goal of a financial inventory is to gather information summarizing the financial management of the Airport. Additionally, it is important for developing an understanding of the financial structure, constraints, requirements, and opportunities for aviation and non-aviation activities, as related to the development of a capital improvement program. The information that has been gathered and reviewed will be used to formulate a reasonable and financially sound Capital Improvement Program (CIP) with which to fund projects identified in the master planning process.

With this goal in mind, revenue, expense, and management information for the Airport has been gathered for fiscal years 2010 through 2016. Federal and state capital improvement grant information has been

compiled, including current funding policies and a historical review of previous grants. The Airport's current five-year CIP has also been received and reviewed. Specific documents gathered include:

- 2004 KCIA Master Plan Capital Completion List, Annotated
- KCIA FAA Capital Project Request Update, FFY 2014 thru FFY 2021
- Documentation on KCIA capital & unmet needs, 2015 – 2020
- KCIA Capital Investment Needs 2015 – 2026
- 2013-2014 King County International Airport Line of Business Plan
- KCIA 2005 – 2014 FTEs, Personnel & CIP Costs
- 2015 Biennial Budget Finance Model
- King County International Airport Economic Impact Study 2013
- King County International Airport Strategic Plan, 2014 – 2020
- KCIA Leasehold Matrix and Map, 2016
- King County Strategic Plan, 2010-2014

As noted above, one of the documents reviewed was the 2004 KCIA Master Plan Capital Completion List, Annotated. This is the complete listing of capital projects identified in the 2004 Airport Master Plan which has been annotated to recognize those project which have been completed and those that remain as "still needed" but incomplete and still in the planning stage. By far, most of the capital improvement projects identified the 2004 Master Plan have been completed or are on-going capital needs, such as pavement rehab and maintenance. This indicates that the timing of this MP Update is critical. In later sections the MP Update, a new 20-year capital project list is identified which includes a realistic financial plan to pay for these project capital needs, in consideration of existing and potential income streams and ongoing operation expenses.

The current requested CIP for the Airport which has been submitted to the FAA (FFY 2021 thru FFY 2025) includes these projects:

- East Side Apron Expansion - Design & Construction
- Environmental Review for Master Plan projects – placeholder
- Stormwater System Rehabilitation (PH1) Design & Construction
- Airfield Electrical System - In-Pavement RGLs, ALCMS, Reg. Upgrade Design & Construction
- Runway 14L-32R Rehabilitation & Lighting Design
- Airport Master Plan Update
- Runway 14L-32R Rehabilitation & Lighting Construction
- Reconstruct Gate 21 Design & Construction
- Taxiway B TOFA Safety Corrections Design & Construction
- Upgrade Taxilane A to ADG III Taxiway Design & Construction

Perhaps the most important document gathered is the King County Strategic Plan. Specifically, the Economic Growth and Built Environment and the Financial Stewardship sections of the County's Strategic Plan will be used specifically to provide guidance in the preparation of the MP Update's financial plan and program. The goals and objective of these two sections are listed below.

Economic Growth and Build Environment

- **Goal:** Encourage a growing and diverse King County economy and vibrant, thriving, and sustainable communities
  - Objective One: Support a strong, diverse, and sustainable economy
  - Objective Two: Meet the growing need for transportation services and facilities throughout the county
  - Objective Three: Shape a built environment that allows communities to flourish
  - Objective Four: Preserve the unique character of our rural communities in collaboration with rural residents.

Financial Stewardship

- **Goal:** Exercise sound financial management and build King County's long-term fiscal strength
  - Objective One: Keep the county's cost of doing business down, including keeping growth in costs below the rate of inflation
  - Objective Two: Plan for the long-term sustainability of county services
  - Objective Three: Provide the public with choices about which services King County delivers within existing resources and for which services they would like to provide additional funding

In summary, this financial inventory section has been prepared as a precursor to the preparation of the Financial Plan and Program developed later in the planning process. Specifically, this section it is intended to provide a listing of the financial background information which has been gathered and which will be utilized as a basis in the preparation of the MP Update's capital improvement program funding recommendations.

Summary

The goal of this chapter is to provide general background information pertaining to BFI, its operating environment, and its physical surroundings. The **Inventory of Existing Conditions** chapter is vital from the standpoint that it will be used as a reference in the analysis and alternatives design process, which is required to prepare the Airport's future development plan.

The next step in the planning process is to formulate forecasts for the quantity and type of future aviation activity expected to occur at the Airport during the forthcoming 20 years.

B Forecasts of Aviation Activity

INTRODUCTION. This chapter identifies the 20-year aviation activity forecasts for the King County International Airport/Boeing Field (BFI or Airport). The MP Update forecasts provide an expectation of activity levels used to guide the analysis and evaluation of future airport facility needs, alternatives, and development strategies.

The aviation demand projections are documented in the following sections:

- **Historical and Exiting Aviation Activity**
- **Previous Forecasts**
- **Factors Affecting Aviation Forecasts**
- **Forecast Methodologies**
- **Forecast of Aviation Demand Activity**
  - Commercial Passenger Enplanement & Operations Forecast
  - Air Cargo Weight & Operations Forecast
  - General Aviation Operations Forecast
  - Military Aircraft Operations Forecast
  - Aircraft Operations Forecast (Mix, Peaking, Critical Planning Aircraft)
  - General Aviation Based Aircraft Forecast
- **Runway Design Code (RDC)/Critical Aircraft Analysis**
- **FAA TAF Comparison and Forecast Conclusion**

Aviation forecasts are time-based projections offering a reasonable expectation of future airport activity. The forecast of activity projections influences nearly every aspect of the MP Update process. The relationship between current activity and forecast demand is an indicator as to the type and timing of future airport infrastructure, equipment, and service needs, as well as funding resource allocation.

The forecasts are prepared annually for a 20-year planning period, from 2015 through 2035, identified in five-year increments, and segmented into three planning phases:

- 'Near-term' (2015-2020)
- 'Mid-term' (2021-2025)
- 'Long-term' (2025-2035)

The forecasts are developed consistent with FAA forecasting guidance, reflecting the current baseline of airport activity levels, user trends, and industry-wide activity patterns. The forecasts are considered "unconstrained", in that they assume the Airport is sufficiently able to accommodate the demand either through existing facilities or future improvements.

It should also be understood there are typically year-to-year fluctuations to forecast activity due to various unanticipated factors and unforeseen demand circumstances (e.g., changes in emerging airport markets and national aviation trends, including economic factors, both nationally and regionally. Although activity levels during individual years might vary above or below the forecast projections, the Airport's future development should correlate to the tracking of actual activity.

Historical and Exiting Aviation Activity

BFI is a complex facility that serves a wide variety of aviation users. These include a commercial commuter passenger airline[1] and air carrier passenger charter operators, large and small air cargo carriers, commercial general aviation Fixed Base Operators (FBOs), corporate general aviation flight departments, private aircraft owners, helicopters, and military aircraft that all require a high standard for both aviation facilities and services. The Airport also serves an important regional economic role by accommodating the aviation industrial/maintenance operations and activities related to The Boeing Company's various civilian and military aircraft Flight Test and Delivery Center operations that directly support over 5,200 jobs in the local economy.

Historical activity for the Airport provides the context from which future activity can be projected, and **Table B1** provides a snapshot of the aviation activity that has occurred at BFI over the past 15 years. While historical trends are not always indicative of future activity, historical data does provide insight into how local, regional, and national demographic and aviation-related trends may relate to, or influence future airport activity.

1 After FAA's approval of the MP Update forecasts, a second commercial commuter passenger airline (JSX) began operations at BFI. No attempt has been made to alter the approved commercial service enplanements and aircraft operations forecasts based on the entrance of the second commuter airline.

Table B1 **HISTORICAL AIRPORT ACTIVITY, 2000-2015**

Year	Itinerant					Local		
	Air Carrier	Air Taxi	General Aviation	Military	Total Itinerant	Civil	Military	Total Local
2000 [1]	11,526	46,811	179,682	1,764	**239,783**	119,552	291	**119,843**
2001 [1]	10,148	46,057	166,684	1,577	**224,466**	92,422	453	**92,875**
2002 [2]	9,279	49,494	145,862	2,406	**207,041**	78,909	294	**79,203**
2003 [2]	9,091	53,344	151,043	2,145	**215,623**	94,766	462	**95,228**
2004 [2]	10,404	58,994	135,865	1,417	**206,680**	92,116	263	**92,379**
2005 [2]	9,967	63,092	136,652	1,379	**211,090**	89,014	374	**89,388**
2006 [2]	9,790	62,060	134,117	1,669	**207,636**	91,278	879	**92,157**
2007 [2]	10,662	64,237	126,522	1,732	**203,153**	96,342	689	**97,031**
2008 [2]	9,543	64,305	127,003	2,141	**202,992**	91,934	821	**92,755**
2009 [2]	10,663	66,145	113,568	2,096	**192,472**	73,068	576	**73,644**
2010 [2]	10,458	67,164	107,263	1,669	**186,554**	72,080	762	**72,842**
2011 [2]	11,720	59,225	101,724	1,497	**174,166**	54,010	551	**54,561**
2012 [2]	9,014	39,306	96,563	900	**145,783**	46,955	422	**47,377**
2013 [2]	9,200	33,058	91,819	568	**134,645**	46,998	298	**47,296**
2014 [2]	10,094	32,816	90,233	935	**134,078**	45,017	299	**43,316**
2015 [2]	10,896	28,809	84,280	1,056	**125,041**	**39,770**	**760**	**40,530**

Year	Total Ops	Based Aircraft	Passenger Enplan. [3]	Cargo (Landed Wt. in lbs.) [3]
2000 [1]	**359,626**	478	10,582	856,064,310
2001 [1]	**317,341**	427	10,555	725,072,970
2002 [2]	**286,244**	443 [1]	10,069	781,775,040
2003 [2]	**310,851**	443 [1]	16,220	763,813,680
2004 [2]	**299,059**	472 [1]	28,458	892,135,450
2005 [2]	**300,478**	472 [1]	23,016	866,798,960
2006 [2]	**299,793**	491 [1]	31,418	784,084,940
2007 [2]	**300,184**	490 [1]	34,580	805,503,706
2008 [2]	**295,747**	438 [1]	34,597	835,114,481
2009 [2]	**266,116**	463 [1]	35,863	894,664,512
2010 [2]	**259,396**	470 [4]	33,656	906,716,494
2011 [2]	**228,727**	427 [4]	34,434	909,809,432
2012 [2]	**193,160**	427 [4]	23,078	791,928,576
2013 [2]	**181,941**	418 [4]	13,008	759,444,826
2014 [2]	**177,394**	396 [4]	20,418	815,258,980
2015 [2]	**165,571**	380 [4]	18,945	833,475,382

SOURCE: *BFI Airport Records, FAA OPSNET, ACAIS, & TAF databases.*

[1] FAA Terminal Area Forecast (TAF) data - Fiscal Year (FY).

[2] FAA Operational Network (OPSNET) data - Calendar Year (CY).

[3] FAA Air Carrier Activity Information System (ACAIS) data - CY.

[4] BFI Airport Records – CY.

Over the past 15 years the Airport has recorded a downward trend in total operations and based aircraft. The majority of the operational decline has occurred within the recreational and training sectors of the General Aviation category. This segment of the aviation industry was severely impacted by the 2008 financial crisis, which has resulted in an aging GA fleet, fewer pilots, and pilots in training, and increased operational costs. The national shortage of pilots seems to have stabilized this decline as more individuals enter the profession. However, at the same time the Airport has realized some growth in corporate and business-related general aviation activity, as well as stability in the commercial service, air cargo, and aviation industrial-related activity. These trends for each forecast category are examined in in the following sections of this chapter.

Commercial Service

Commercial service activity at BFI is currently conducted by scheduled 'commuter' and non-scheduled 'air carrier' service providers. The scheduled commercial service consists of an independent regional commuter airline (Kenmore Air), which is not affiliated with a major air carrier. Kenmore Air operates two to 12 passenger, single engine piston or turboprop-powered floatplane and fixed-gear aircraft to leisure-type destinations. Most BFI scheduled passengers are transported using nine-seat turboprop-powered aircraft. The non-scheduled service consists of a mix of air carrier charter operators and occasional diverted flights from SEA.

As presented in **Table B2** and illustrated in **Figure B1**, total BFI passenger levels have increased since 2002, representing a 5.0 percent Compound Annual Growth Rate (CAGR). Between 2004 and 2012, total passenger enplanements remained relatively stable, ranging between 20,000 and 35,000 passengers. Non-scheduled commercial service enplanements have increased by approximately 84.3 percent, representing a CAGR of 1.5 percent. Scheduled commercial service has accounted for an average of 68 percent of passenger enplanements during the historical time period, whereas the non-scheduled service has accounted for an average of 32 percent of the passenger enplanements.

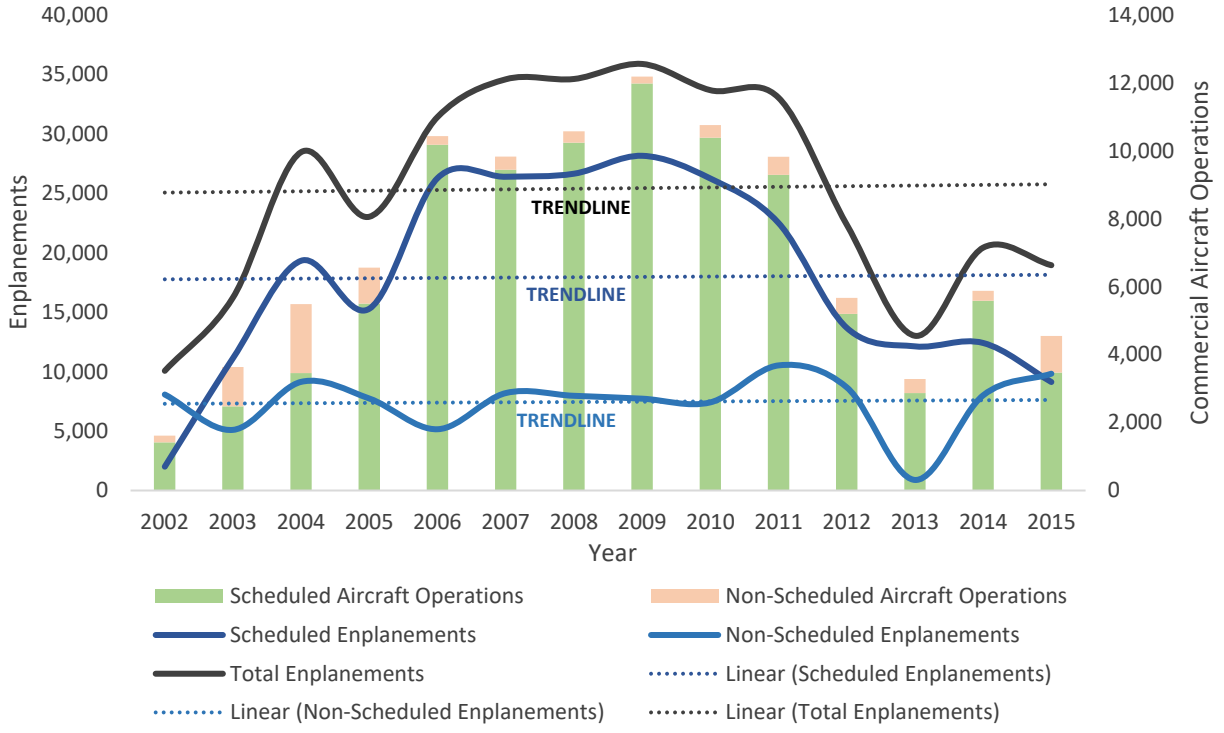
Total commercial aircraft operations have increased through the time period by an 8.0 percent CAGR, with historic highs mirroring passenger enplanements. Scheduled service has provided an approximate average of 88 percent of commercial service aircraft operations, with non-scheduled service providing an approximate average of 12 percent of commercial service activity.

Table B2 **HISTORICAL AND EXISTING COMMERCIAL SERVICE ACTIVITY**

Year [1]	Passenger Enplanements			Passenger Aircraft Operations		
	Scheduled	Non-Scheduled	Total	Scheduled	Non-Scheduled	Total
2002	2,003	8,066	**10,069**	1,414	199	**1,673**
2003	11,121	5,099	**16,220**	2,476	1,159	**3,635**
2004	19,321	9,137	**28,458**	3,455	2,030	**5,485**
2005	15,277	7,739	**23,016**	5,497	1,062	**6,559**
2006	26,271	5,147	**31,418**	10,172	255	**10,427**
2007	26,380	8,200	**34,580**	9,440	384	**9,824**
2008	26,638	7,959	**34,597**	10,234	334	**10,568**
2009	28,141	7,722	**35,863**	11,975	206	**12,181**
2010	26,238	7,418	**33,656**	10,383	371	**10,754**
2011	22,501	11,933	**34,434**	9,286	534	**9,820**
2012	13,679	9,399	**23,078**	5,196	470	**5,666**
2013	12,119	889	**13,008**	2,864	416	**3,280**
2014	12,410	8,008	**20,418**	5,584	290	**5,874**
2015	9,123	9,822	**18,945**	3,468	1,080	**4,548**
CAGR	**12.4%**	**1.5%**	**5.0%**	**7.1%**	**13.9%**	**8.0%**

***SOURCE**: FAA T-100, USDOT BTS Website (March 2016).*
[1] Calendar Year (CY) data.

Figure B1 **HISTORICAL AND EXISTING BFI COMMERCIAL SERVICE ACTIVITY**



***SOURCE**: Historical: FAA T-100, USDOT BTS Website (March 2016).*

Air Cargo

Air cargo at BFI represents a large sector and high-valued market of aviation activity. In 2015, BFI ranked as the 29th busiest cargo airport in the country, recording a landed weight of 416,737 tons, an increase of 2.2 percent from 2014 data. BFI's proximity to the Seattle Central Business District makes it a desirable location for the integrated express air cargo operations that predominate, and efforts by the Airport management to work with these cargo operators/tenants to meet their needs, despite tight physical constraints, have been beneficial to both the tenant and the Airport. The BFI international air cargo carriers are most commonly routed through west coast hubs or Anchorage.

The USDOT T-100 and FAA's Air Carrier Activity Information System (ACAIS) are the resource basis for the historical BFI and regional air cargo (freight and mail) activity. This activity is subdivided into enplaned, deplaned cargo, cargo operator, operations, and aircraft flight frequency (see **Table B3** and **Figure B2** below). BFI air cargo activity for both domestic and international destinations has generally continued to increase since 2005, as quantified in terms of enplaned/deplaned pounds, aircraft landing weights, and revenue ton miles. In the past 10 years, BFI has accommodated 2.3 to 3.4 million pounds of air cargo annually. On average, freight constitutes 97 percent of the total BFI cargo volume weight, compared to mail at 3.0 percent. Nearly 73 percent of the air cargo transport operations are conducted by wide-body aircraft, predominately the B-767-200 & 300 series aircraft, but also the MD-11 and the B-747 in previous years.

Table B3 provides a summary of the 2015 BFI 'scheduled' air cargo carriers, subdivided by type of aircraft for percent of cargo flights/operations and total annual landing weights. For 2015, UPS and ABX (formerly Airborne Express) were the largest cargo operators, representing over 85 percent of the total cargo landing weight (volume).

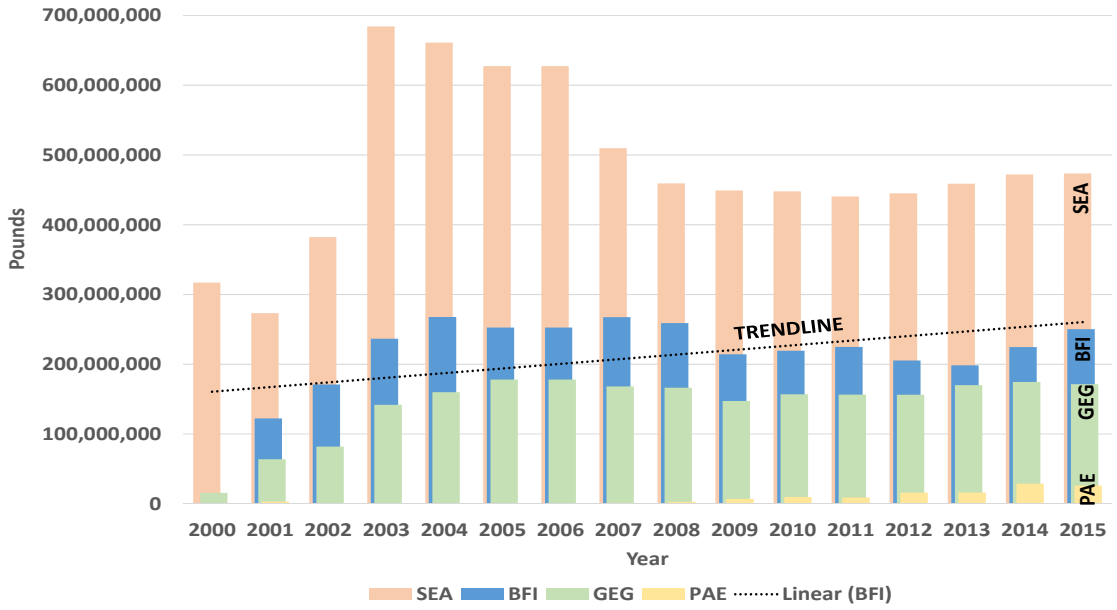
Table B3 **BFI SCHEDULED AIR CARGO OPERATORS AND ACTIVITY (2015)**

Cargo Carrier	Aircraft Weight	Total Landings	Percent Landings	Total Landing Weight	Percent Landing Weight
ABX	--	**789**	**12.8%**	**214,841,000**	**26.4%**
B-767	277,000	44	--	12,188,000	--
B-767-200	272,000	744	--	202,368,000	--
B-767-200ER	285,000	1	--	285,000	--
AIRPAC Airlines	--	**1,005**	**16.3%**	**6,168,000**	**0.8%**
Piper PA-31-350	7,250	588	--	4,263,000	--
Piper PA-31-34	3,470	417	--	1,905,000	--
Ameriflight	--	**1,985**	**32.2%**	**30,301,300**	**3.7%**
Beech B-99	10,400	198	--	2,059,200	--
Beech C-99	1,300	623	--	7,039,900	--
Beech 1900	16,100	482	--	7,760,200	--
EMB-120	25,794	335	--	8,640,000	--
F-227	14,000	339	--	4,746,000	--
Piper Navajo PA-31-350	7,000	8	--	56,000	--
BAX Global	--	**227**	**3.7%**	**44,946,000**	**5.5%**
B-767-200	198,000	227	--	44,946,000	--
Martinaire	--	**252**	**4.1%**	**2,142,000**	**0.3%**
Cessna 208	8,500	252	--	2,142,000	--
Nolinor Aviation	--	**171**	**2.8%**	**18,297,000**	**2.2%**
B-737-200	107,000	171	--	18,297,000	--
Northern Air Cargo	--	**31**	**0.5%**	**3,450,000**	**0.4%**
B-737-200	107,000	12	--	1,284,000	--
B-737-300	114,000	19	--	2,166,000	--
UPS	--	**1,708**	**27.7%**	**495,112,000**	**60.7%**
Airbus A300-600	315,000	16	--	5,040,000	--
B-757-200PF	210,000	576	--	120,960,000	--
B-767-300F	326,000	1,084	--	353,384,000	--
MD-11	491,500	32	--	15,728,000	--
Total/Average	**139,816**	**6,168**	**100.0%**	**815,257,300**	**100.0%**

SOURCE: *FAA T-100 Cargo Data; USDOT BTS Website (Obtained March 2016).*
Note: BAX Global relocated cargo operations from BFI to SEA during 2016.

Figure B2 also provides a comparison of BFI's historic cargo volumes over the past 15 years with the other Seattle regional airports (i.e., SEA, GEG, & PAE).

Figure B2 **TOTAL ENPLANED & DEPLANED FREIGHT AND MAIL – SEATTLE REGION AIRPORTS**



SOURCE: *FAA T-100 Cargo Data; USDOT BTS Website (Obtained March 2016).*

As shown in the figure, SEA handles the majority of the region's cargo with 785,005 tons being recorded at the Airport in 2015. However, the distribution of cargo between the four airports has remained constant over the past 10 years.

General Aviation

General aviation aircraft operations are defined as all civil aviation aircraft activity excluding air carriers and commercial aircraft. Between the years 2000 and 2015, total general aviation aircraft operations have declined at BFI by a CAGR of 5.7 percent. Itinerant GA operations have decreased by a CAGR 4.9 percent; local GA operations have declined by a CAGR of 7.1 percent. This general aviation trend is not unique to BFI and is reflective of the decline across much of the nation due to the continued economic weakness during the recession that began in 2007, high fuel prices, less flight training, and elevated insurance costs associated with owning and operating general aviation aircraft.

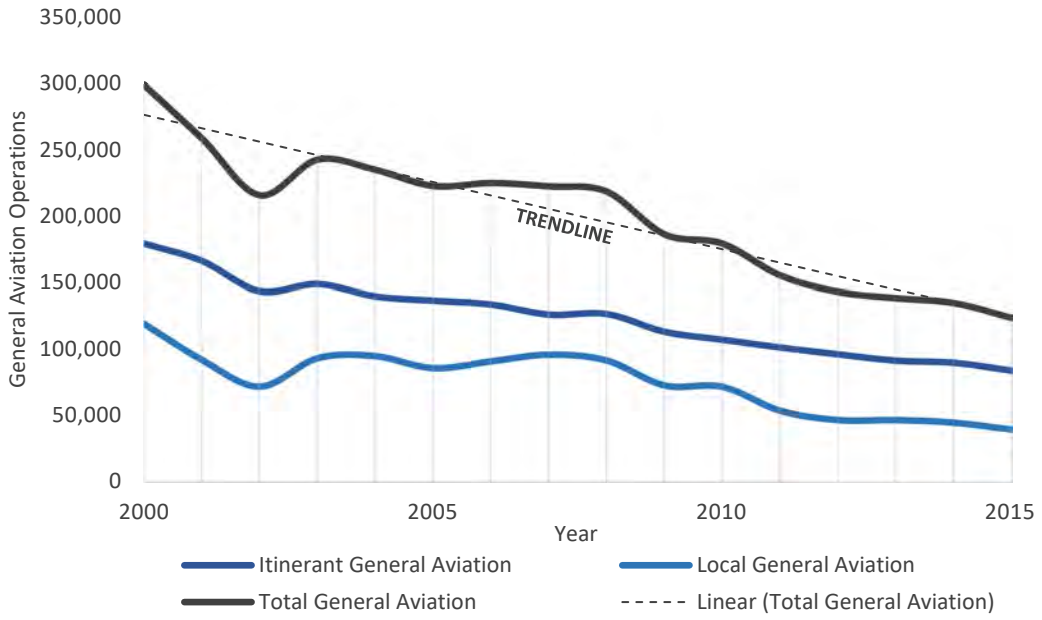
In addition, an analysis of BFI general aviation operations-per-based-aircraft (OPBA), the ratio between annual general aviation operations and based aircraft, indicates that BFI based aircraft, on average, are being operated less, and that activity by based aircraft has fallen, relative to the drop in BFI airport operations and in total based aircraft. During the past 10 years, the OPBA has declined from over 600 to less than 400. However, the occupancy rate for BFI hangar space for this same period has remained at nearly 100 percent. **Table B4** presents the historical and existing general aviation aircraft operations at BFI. **Figure B3** graphically presents this data.

Table B4 **HISTORICAL AND EXISTING GENERAL AVIATION AIRCRAFT OPERATIONS**

Year	Total General Aviation	General Aviation – Itinerant	General Aviation – Local	General Aviation – Based Aircraft/ OPBA[1]
2000	299,234	179,682	119,552	478/626
2001	259,106	166,684	92,422	427/607
2002	216,139	143,950	72,189	443/488
2003	243,032	149,359	93,673	443/549
2004	235,368	140,131	95,237	472/499
2005	223,122	137,009	86,113	472/473
2006	225,395	134,117	91,278	473/477
2007	222,864	126,522	96,342	472/472
2008	218,937	127,003	91,934	420/521
2009	186,636	113,568	73,068	439/425
2010	179,703	107,623	72,080	447/402
2011	155,734	101,724	54,010	424/367
2012	143,518	96,563	46,955	424/338
2013	138,817	91,819	46,998	417/333
2014	135,250	90,233	45,017	396/342
2015	129,292	86,816	42,476	380/340
CAGR	**-5.7%**	**-4.9%**	**-7.1%**	**-1.5%/-4.0%**

SOURCE: *FAA Terminal Area Forecast (TAF) – BFI Airport, Obtained January 2016.*
[1] OPBA: Operations Per Based Aircraft.

Figure B3 **HISTORICAL AND EXISTING BFI GENERAL AVIATION ACTIVITY**



SOURCE: *FAA Terminal Area Forecast (TAF) – BFI Airport, Obtained January 2016.*

Based Aircraft

Based aircraft are those aircraft permanently stored at an airport. As presented in **Table B5**, there has been a precipitous decline in total number of based aircraft since 2006, dropping from around 500 to 380, with an average loss of three based aircraft per year, with higher rates of 10 to 15 aircraft per year experienced recently. The most significant change is the proportional increase of based jets and the continued decline of single engine/civilian owned aircraft.

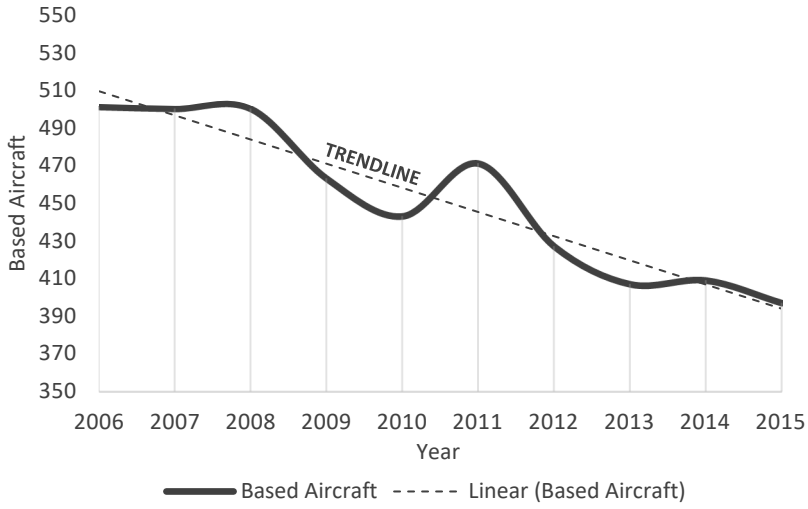
Since the airport's 76 hangars, ranging in size from small T-hangars to large executive hangars, have maintained an occupancy rate of over 95 percent between 2008 to 2015, it is recognized that the majority of the base aircraft loses were recorded from the aircraft tiedown apron areas. The BFI Airport staff foresees stability in hangar demand for all types of aircraft, with increasing demand for larger turbine aircraft. The property availability and economic returns for hangar space constraints will be an on-going challenge. **Figure B4** graphically presents the historical and existing BFI based aircraft.

Table B5 **BFI HISTORICAL AND EXISTING BASED AIRCRAFT BREAKDOWN - TYPE AND PERCENT (2006-2015)**

Year	Single Engine	Multi Engine	Jet	Rotorcraft	Military	Total Civilian	Grand Total
2006	269	72	90	42	18	473	491
2007	264	84	82	42	18	472	490
2008	189	107	82	42	18	420	438
2009	257	86	65	31	24	439	463
2010	254	105	59	33	19	447	470
2011	238	79	76	32	2	424	427
2012	238	79	76	32	2	424	427
2013	233	75	77	32	1	417	418
2014	217	63	82	34	0	396	396
2015	203	60	86	31	0	380	380
CAGR	**-3.1%**	**-2.0%**	**-0.5%**	**-3.3%**	**-100%**	**-2.4%**	**-2.8%**

***SOURCE**: BFI Airport Records & & FAA TAF database.*

Figure B4 **HISTORICAL AND EXISTING BFI BASED AIRCRAFT**



***SOURCE**: BFI Airport Records.*

Previous Forecasts

Aviation activity forecasting not only utilizes historical and existing data as an initial baseline, it is also supplemented with a comparison to previous forecasts. Previous aviation activity forecasts used for comparison purposes in this MP Update include the 1996 BFI Airport Master Plan (1996 AMP), the 2008 BFI Aviation Activity Forecast Update, the 2009 Washington (WSDOT) Long-Term Air Transportation Study (LATS), and the 2004 Puget Sound Regional Council Planning and Transportation Study (2004 PSRC Study).

Previous Enplanements Forecasts

Table B6 presents a comparison of the enplanement forecasts projected in the 1996 AMP and the 2008 Aviation Activity Forecast Update with the actual enplanements occurring between 2005 and 2015. A comparison of the enplanements forecast with actual enplanements indicates that the 1996 AMP and the WSDOT LATS were overly optimistic in their estimates. The 1996 AMP overestimated enplanements by an average margin of error of 163.6 percent; the LATS overestimated by an average margin of error of 119.4 percent. The 2008 Aviation Activity Forecast Update was much closer in estimating actual enplanements, in which it underestimated by an average margin of error of 12.9 percent.

Table B6 **BFI ACTUAL ENPLANEMENTS COMPARISON TO FORECASTS ENPLANEMENTS**

Year	Actual	1996 AMP	Variation from Actual	2008 Aviation Activity Forecast Update	Variation from Actual	WSDOT LATS	Variation from Actual
2005	23,016	38,200	9,724 (34.1%)				
2008	34,597			27,754	-6,826 (-19.7%)		
2009	35,563			28,725	-5,872 (-17.0%)		
2010	33,656	77,000	41,137 (114.7%)	29,817	-6,046 (16.6%)	53,600	17,737 (49.5%)
2011	33,434			30,950	-2,706 (-8.0%)		
2012	23,078			32,126	-897 (-2.7%)		
2015	18,945	89,300	69,086 (341.8%)			58,500	38,286 (189.4%)

***SOURCE**: 1996 BFI Airport Master Plan, 2008 BFI Aviation Activity Forecast Update, 2009 Washington (WSDOT) Long-Term Air Transportation Study (LATS) and the 2004 Puget Sound Regional Council Planning and Transportation Study (2004 PSRC Study).*

Previous Aircraft Activity Forecasts

Table B7 presents a comparison of the aircraft activity forecasts with actual activity occurring between 2000 and 2015. A comparison of the forecasted aircraft activity with actual operations indicates that only the forecasted commercial service operations were below actual levels, having a negative 26.7 percent average margin of error for the 20-year time period. General aviation aircraft operations were the highest overestimated category of activity levels, with a 20-year average margin of error of 90.1 percent. Air taxi operations were next highest, with an average margin of error of 72.1 percent, followed by air cargo aircraft operations (69.3 percent average margin of error) and military operations (51.6 percent average margin of error). Total aircraft operations were overestimated by an average margin of error of 78.2 percent for the 20-year period. The 1996 AMP was prepared over two decades ago during historic highs of airport activity and is thus overly optimistic and considered irrelevant for forecasting efforts today.

Table B7 **BFI ACTUAL OPERATIONAL ACTIVITY COMPARISON TO FORECAST OPERATIONAL ACTIVITY**

Aircraft Operations	2000	2005	2010	2015
1996 AMP Forecast Commercial Service	**5,000**	**7,200**	**9,000**	**10,200**
Actual Commercial Service	35	6,559	10,754	4,548
Variation from Actual	4,965 (14,185.7%)	641 (9.8%)	1,754 (-16.3%)	5,652 (124.3%)
1996 AMP Forecast Air Cargo	**25,658**	**29,387**	**33,904**	**38,184**
Actual Air Cargo	24,646	25,390	16,920	12,336
Variation from Actual	1,012 (3.9%)	3,997 (13.6%)	16,984 (50.1%)	25,848 (209.5%)
1996 AMP Forecast General Aviation	**323,274**	**339,608**	**356,600**	**374,275**
Actual General Aviation	299,234	223,122	179,703	129,292
Variation from Actual	24,040 (8.0%)	115.486 (52.2%)	176,897 (98.4%)	244,983 (189.5%)
1996 AMP Forecast Military	**3,000**	**3,000**	**3,000**	**3,000**
Actual Military	2,055	1,748	2,431	1,816
Variation from Actual	945 (46.0%)	1,252 (71.6%)	569 (23.4%)	1,184 (65.2%)
1996 AMP Forecast Air Taxi	**31,848**	**36,498**	**42,3141**	**49,051**
Actual Air Taxi	20,955	31,143	10,754	11,925
Variation from Actual	13,829 (66.0%)	9,255 (29.7%)	36,157 (336.2%)	42,626 (357.5%)
1996 AMP Forecast Total	**391,716**	**419,593**	**449,415**	**480,210**
Actual Total	359,626	298,257	259,913	165,571
Variation from Actual	32,090 (8.9%)	121,336 (40.7%)	189,502 (72.9%)	314,639 (190.0%)

***SOURCE**: 1996 BFI Airport Master Plan.*

Previous Air Cargo Activity Forecasts

Table B8 presents a comparison of the air cargo activity forecasts contained in the *2006 PSRC REGIONAL AIR CARGO STRATEGY* (2006 PSRC Study) with actual activity occurring in 2010 and 2015. As with most of the previous forecasting studies, the comparison indicates that the forecasted air cargo activity levels were overly optimistic, having overestimated air cargo tonnage by an average margin of error of 48.4 percent and air cargo operations by an average margin of error of 100.6 percent. The 2006 PRSC Study was conducted prior to the economic recession of 2007, which had a negative impact on air cargo activity not only at BFI, but nationwide.

Table B8 **BFI ACTUAL AIR CARGO COMPARISON TO AIR CARGO FORECASTS**

Year	Actual Air Cargo Tonnage (metric tons)	2004 PSRC Study (metric tons)	Variation from Actual (metric tons)	Actual Air Cargo Aircraft Operations	2004 PSRC Study	Variation from Actual
2010	106,576	156,900	50,324 (47.2%)	16,920	27,300	10,380 (61.3%)
2015	121,899	182,300	60,401 (49.6%)	12,336	29,600	17,264 (139.9%)

***SOURCE**: 2006 PSRC Regional Air Cargo Strategy.*

Factors Affecting Aviation Forecasts

The amount and kind of aviation activity expected at any airport is dependent upon many factors, but is reflective of general economic conditions prevalent within the airport's market area, the services available to aircraft operators, and the businesses located on the airport or within the community. Additionally, the expected aviation regulatory climate, national aviation trends and forecasts, and local issues also factor into the projections of airport activity.

Airport Service/Market Area Overview

Airport Service Area and Roles. The BFI aeronautical service area extends throughout the Seattle Metropolitan Area, conjoining and overlapping with multiple commercial service and general aviation public use airports in the surrounding vicinity (i.e., SEA, RNT, PAE, S50, PWT). It is estimated the BFI aeronautical service area, which is a function of drive distance/times in relation to surrounding airports and available services, is primarily concentrated within King County, serving a population of nearly 2.1 million residents. Existing planning standards for driving distance/travel times are generally defined by a minimum 20-mile driving distance between NPIAS airports, 30-minute travel times that are often cited in pilot surveys as the maximum travel time from home or work to based aircraft locations, and the time taken to transport cargo between an airport and the Central Business District (CBD) that is often defined in 30 minute travel time increments. The primary aviation-related user categories that are contained within the service area boundary are commercial passenger service, air cargo, and general aviation based aircraft.

A brief description of these categories is provided in the text below:

- **Commercial Passenger Service.** As noted on **Figure B5**, there are two commercial service airports that operate within the BFI aeronautical service area. SEA is the primary commercial service airport in the Pacific Northwest, which is located approximately four miles south of BFI. SEA recorded over 20 million enplanements in 2015 (ranks 13th in the United States) and is served by 23 airlines providing daily non-stop domestic and international flights. Scheduled commercial passenger service at BFI is provided by Kenmore Air that operates a nine-seat turboprop-powered aircraft as an independent regional commuter airline. Kenmore Air, which primarily serves a niche market of San Juan Island destinations and resort areas of British Columbia, recorded 9,123 scheduled enplanements in 2015.

- **Air Cargo.** Similar to the commercial passenger service category presented above, SEA and BFI are the two primary air cargo airports within the defined service area. SEA ranked 18th in the nation for cargo landed weight in 2015 with approximately 785,006 tons and is currently served by six dedicated freighter airlines and 19 air carrier passenger airlines that accommodate belly cargo. FedEx has operated at SEA since 1997 and maintains a leading 36.64 percent market share of total freight by airline. For comparison, BFI ranked 29th in the nation for landed weight with approximately 416,738 tons in 2015. UPS has operated at BFI since 1996 and continues to benefit from BFI's locational proximity to downtown Seattle, recording a leading 60.7 percent market share of total landed weight by airline in 2015.

- **Airport Based Aircraft Owner Locations.** The identification of based aircraft owner locations is one means to discern the Airport's geographical boundary of influence and concentration of based aircraft. **Figure B5** depicts BFI registered aircraft owners plotted by zip code density. Of the 309 listed aircraft owner addresses, 72 percent reside within a 20-mile radius of BFI, which generally corresponds to the 30-minute travel time planning standard, and east of Puget Sound, as largely amassed within the Seattle MSA, and mostly contained by the north and south King County boundary. The greatest owner concentrations are north and northeast, including north Seattle, Bellevue, Kirkland, Mercer Island, and Redmond. This service area analysis suggests, other than the Renton Municipal Airport (RNT), there is little based aircraft ownership overlap with the surrounding public use airport system. RNT currently has 267 based aircraft that includes 244 single engine aircraft and two jets, which compares to SEA that has two based aircraft (both jets).

Regional Demographics

Historically, aviation activity at the macro and micro scale have been influenced by national, regional, and local trends in population, income, and employment (socioeconomic conditions). Population is an indicator of the general number of persons served by an airport and, therefore, reflects the potential customer base. Employment levels are a gauge of economic activity and vitality of a region. Income levels indicate the degree to which the airport's customer base has sufficient disposable income to spend on aviation activities (e.g., airline travel, owning aircraft, and chartering or renting aircraft). Other, broader metrics presented include such characteristics as household income, net earnings, retail sales, and economic wealth index.

This section presents the historical and forecast socioeconomic characteristics for the BFI market area, roughly defined as the Seattle Metropolitan Statistical Area (MSA). Subsequent sections, providing individual aviation activity forecasts, will evaluate the degree to which these socioeconomic conditions have or will influence BFI's activity levels.

Table B9 provides a summary, by major socioeconomic category, of the historic and projected socioeconomic trends for the Seattle MSA. **Tables B10** and **B11** provide the same summaries for the State of Washington and the United States, respectively, to compare how the MSA compares in relation to state and national trends. The majority of economic indicators point to continued economic growth in the Seattle MSA over the 20-year BFI forecast horizon. As substantiated by the 2013 Puget Sound Regional Council (PSRC) long-range regional economic forecast, a favorable long-term economic outlook for the Seattle MSA is supported by its growing population, well-educated work force, high per capita income, diverse local economy, and popularity as a domestic and international tourist destination.

According to a 2013 Brookings Study, of the 100 largest nationwide MSA's, Seattle ranked sixth for exports and twelfth for output in 2012. Factors expected to contribute to Seattle's economic growth include:

- Diversity in the economic base, which lessens its vulnerability to weaknesses in certain industry sectors.
- Growth in the existing and emerging Seattle industry sectors described earlier.
- An educated labor force able to support the development of knowledge-based and service industries.

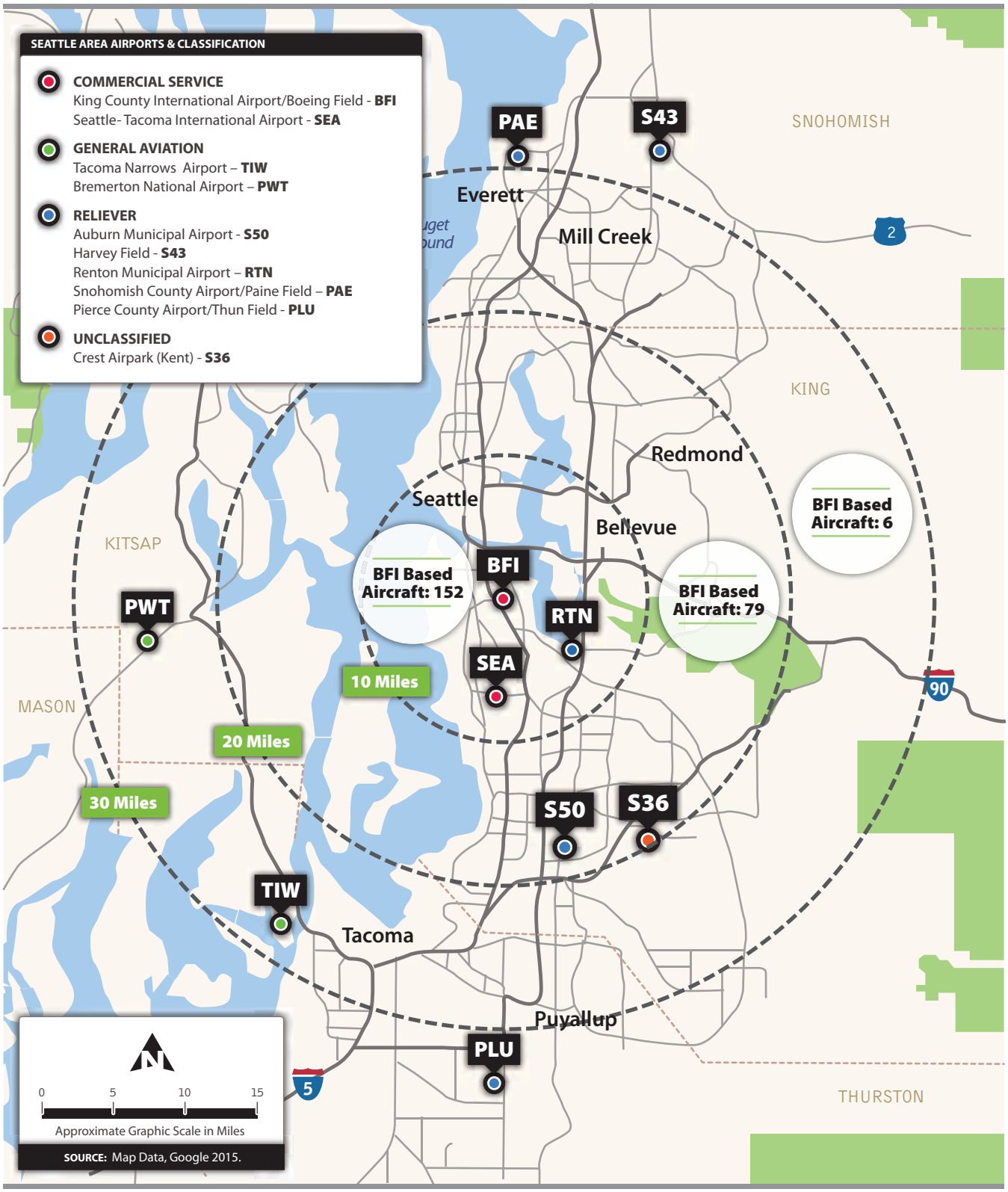


FIGURE B5 **Airport Service Area/ Based Aircraft Owner Locations**

Mead & Hunt

King County International Airport/ Boeing Field

- Continued reinvestment to support the development of tourism, conventions, and other businesses.

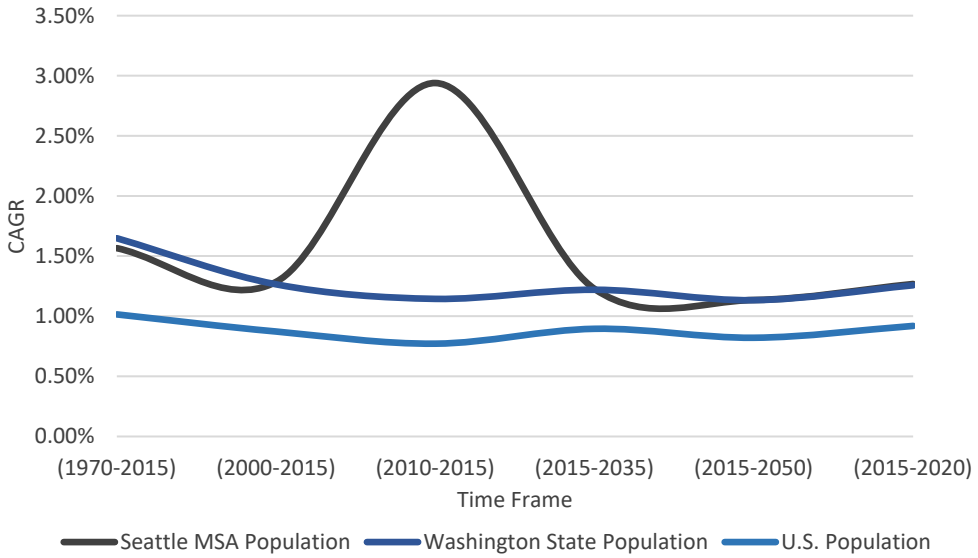
Table B9 **SUMMARY SOCIOECONOMIC TRENDS AND PROJECTIONS**

Economic Segment	CAGR - Historical Periods			CAGR - Forecast Periods		
	(1970-2015)	(2000-2015)	(2010-2015)	(2015-2035)	(2015-2050)	(2015-2020)
Seattle MSA						
Total Population	1.57%	1.29%	2.94%	1.23%	1.14%	1.27%
Total Employment	2.39%	1.03%	2.63%	1.44%	1.32%	1.61%
Total Earnings (2009 $)	3.60%	1.66%	4.45%	2.19%	2.08%	2.34%
Total Personal Income (2009 $)	3.64%	2.11%	5.05%	2.31%	2.13%	2.47%
Net Earnings (2009 $)	3.42%	1.69%	4.52%	2.15%	2.06%	2.22%
Economic Wealth Index	0.23%	-0.13%	-0.12%	-0.20%	-0.16%	-0.24%
Mean Household Income	5.28%	2.59%	5.79%	4.27%	4.49%	3.19%
Total Retail Sales	3.33%	2.62%	4.30%	1.80%	1.75%	2.05%
Composite Average	**2.93%**	**1.61%**	**3.69%**	**1.90%**	**1.85%**	**1.86%**
Washington State						
Total Population	1.65%	1.27%	1.14%	1.22%	1.13%	1.26%
Total Employment	2.29%	1.05%	1.84%	1.41%	1.29%	1.59%
Total Earnings (2009 $)	3.33%	1.74%	2.70%	2.17%	2.06%	2.33%
Total Personal Income (2009 $)	3.58%	2.24%	2.92%	2.37%	2.16%	2.56%
Net Earnings (2009 $)	3.23%	1.71%	2.66%	2.18%	2.09%	2.27%
Economic Wealth Index	0.07%	-0.02%	0.13%	-0.14%	-0.12%	-0.15%
Mean Household Income	5.12%	2.62%	2.76%	4.30%	4.50%	3.26%
Total Retail Sales	3.11%	2.31%	3.45%	1.79%	1.74%	2.03%
Composite Average	**2.29%**	**1.05%**	**1.84%**	**1.41%**	**1.29%**	**1.59%**
National						
Total Population	1.02%	0.87%	0.77%	0.90%	0.82%	0.92%
Total Employment	1.62%	0.86%	1.68%	1.26%	1.13%	1.44%
Total Earnings (2009 $)	2.61%	1.48%	2.33%	2.05%	1.93%	2.21%
Total Personal Income (2009 $)	2.89%	1.93%	2.51%	2.21%	2.00%	2.41%
Net Earnings (2009 $)	2.50%	1.45%	2.29%	2.07%	1.97%	2.16%
Economic Wealth Index	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Mean Household Income	5.04%	2.71%	2.76%	4.50%	4.68%	3.47%
Total Retail Sales	2.24%	1.43%	3.08%	1.47%	1.44%	1.70%
Composite Average	**2.24%**	**1.34%**	**1.93%**	**1.81%**	**1.75%**	**1.79%**

***SOURCE**: Woods & Poole Data.*
Note: Existing data is through CY 2015.

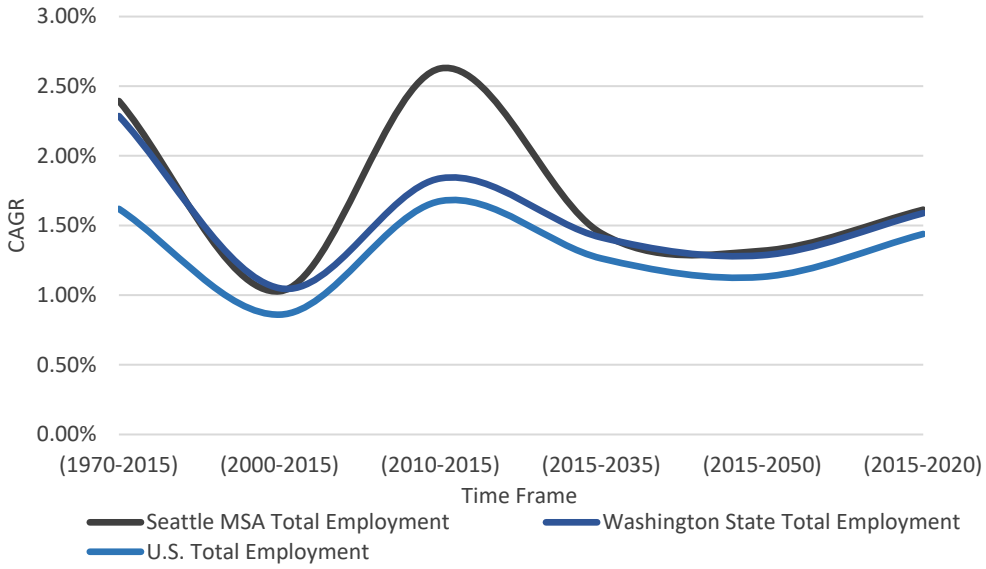
Figures B6, **B7**, and **B8** provide a graphic comparison of the population, employment, and personal income growth rates, respectively, during the time frames provided in the previous tables.

Figure B6 **HISTORICAL AND FORECAST POPULATION GROWTH RATES COMPARISON**



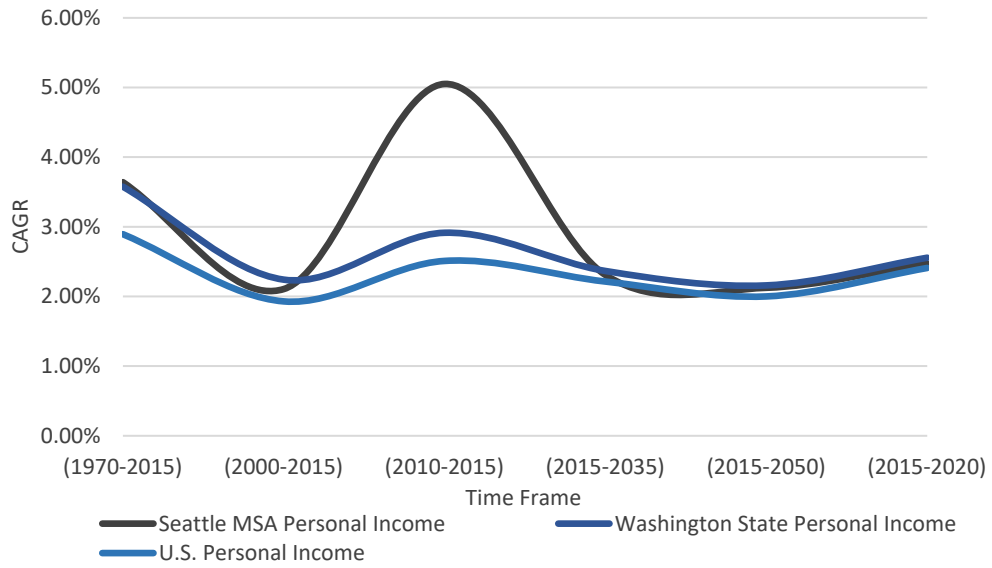
***SOURCE**: Woods & Poole Data.*

Figure B7 **HISTORICAL AND FORECAST EMPLOYMENT GROWTH RATES COMPARISON**



***SOURCE**: Woods & Poole Data.*

Figure B8 **HISTORICAL AND FORECAST INCOME GROWTH RATES COMPARISON**



***SOURCE**: Woods & Poole Data.*

As can be noted, the key indicators of population, employment, and personal income in the Seattle MSA have historically increased faster than nationwide rates, and closely mirrored the State's growth rates. Also substantiated by PSRC population growth projected, the Seattle MSA population is projected to increase an average of 1.0 percent per year between 2013 and 2034, compared with 1.3 percent for the State, and 1.0 percent nationwide. As noted by economic category in **Table B9**, when compiled as a composite socioeconomic average, the overall Seattle MSA market area is expected to grow socioeconomically at 1.8 to 1.9 percent annually, a similar rate as experienced since 2000 (1.6 percent), but lower than since 2010 (3.7 percent). Overall, these indicators suggest that BFI would be expected to grow at or above nationwide industry projections for aviation-related activity.

Aviation Industry Trends with Potential to Influence Airport Growth

To provide a broader perspective to the BFI forecasts, the following is an industry overview of the major aviation sector trends and patterns occurring on a local and national basis. National trends can provide insight into future aviation activity that often have a trickle-down effect on the regional and local levels.

Airline Service Industry Trends. As stated previously, the scheduled BFI airline service is provided by an independent regional commuter airline (Kenmore Air) operating nine-seat turboprop aircraft that is not affiliated with a mainline air carrier. Regional airlines are generally defined as those providing service primarily via aircraft with 89 or less seats and whose routes serve mainly as feeders to the mainline carriers. Mainline carriers are generally defined as those providing service primarily via aircraft with 90 or more seats.

At BFI, the scheduled air carrier airline provides a niche service in terms of providing service to and from leisure-type destinations in the San Juan Islands and Canada; it does not provide feeder service for mainline

carriers. Because Kenmore Air operates with nine-seat and smaller aircraft, they are not subject to the same Transportation Security Agency (TSA) security and screening requirements that larger airlines are subject. In this regard, they are more like an on-demand, air taxi service. This level/type of service is expected to continue throughout the forecast planning period, as Kenmore Air has successfully survived many competitors over the years and has demonstrated an ability to maintain a relatively stable market and passenger levels. Despite some interest from larger mainline air carriers in the past, further proliferation of mainline scheduled passenger service is not anticipated at BFI, due primarily to airfield constraints (i.e., no readily available or sufficient space to provide adequate aircraft parking apron and passenger terminal building) and landside constraints (i.e., limited capacity of the surrounding surface transportation infrastructure and auto parking positions to accommodate substantial increases in demand of passenger-related vehicles).

Air Cargo Industry Trends. Significant structural changes have occurred in the air cargo industry, with a maturation of the domestic express market, resulting in total national air cargo volumes declining over the last 10 years. The most notable changes have involved the global economy, increased jet fuel costs, more stringent FAA and TSA air cargo security regulations, a shift from air to truck modes and greater reliance on all-cargo air carriers for the transport of U.S. Postal Service mail, combined with the decline in mail due to electronic substitutes.

Additional factors affecting air cargo growth are fuel price volatility, movement of real yields, and globalization. It is for these reasons that the U.S. air cargo industry is not expected to sustain the high growth rates experienced in previous decades. However, for forecast purposes, air cargo is derived from demand resulting from economic activity, historically, tracking with gross domestic product. The air cargo market at BFI continues to show moderate and stable growth, a trend expected to continue into the forecast planning period. As the Airport builds increased ties to the integrated express carriers (e.g., UPS) that will benefit from the continued expansion of e-commerce, this trend may accelerate.

Aircraft Manufacturing Industry Trends. The Boeing Company conducts approximately 4,200 operations at BFI per year in support of their civilian and military aircraft manufacturing, testing, and customer delivery operations, with nearly 90 percent attributed to the B-737 Series aircraft, eight percent by the 787 Series, and two percent combined by the B-767 and B-777 Series. Each Boeing aircraft conducts an average of three to five test/readiness flights at BFI, prior to the final customer delivery. According to the Boeing *Current Market Outlook 2016-2035*, the Boeing Company plans to deliver 28,140 single-aisle airplanes during the next 20 years. For the past two years (2015 and 2016) Boeing produced approximately 41 B-737 aircraft per month at the Renton facility, totaling between 490 and 495 aircraft per year.

The majority of these B-737 aircraft conduct operations at BFI in support of the final testing, certification, and final delivery activities noted above. In addition, Boeing recently invested nearly $10 million in a new B-737 aircraft delivery center that is located in the northwest quadrant of the Airport. For forecast purposes, with strong demand and order backlogs with the B-737, B-767, and B-787 Series, the Boeing Company operations at BFI are expected to increase proportional to the production rates of these aircraft, nearly five to 10 percent, and potentially greater as other aircraft models or variants are developed in the future.

General Aviation (Business/Corporate) Industry Trends. The use of general aviation for executive business/corporate travel has continued to experience growth, as measured by turbine, business jet, and helicopter aircraft deliveries and utilization trends. This general aviation segment has moderately recovered year-to-year since the 2008-2009 economic recession and financial credit crises. This positive activity increase is largely attributable to a bolstered economy, and continued awareness and value in using private aircraft to conduct efficient company travel. All segments of the small, medium, and large cabin business jet fleet are undergoing recent manufacturing delivery gains. This overall upward business-class activity trend is apparent at BFI in recent years, as indicative of the net increase of based turbine aircraft, the proportional upgrade to larger-cabin business jets, and prospective tenant interest for basing business operations at BFI.

General Aviation (Recreational/Training) Industry Trends. The use of general aviation for recreational/training purposes has continued to experience an overall decline, as measured by aircraft production rates, pilot certifications, and operating utilization trends. Single and twin piston aircraft account for nearly 80 percent of the nationwide aircraft fleet. The 2008-2009 economic recession resulted in a sharp reduction of light general aviation activity nationwide, which has impeded sustained growth for this general aviation sector. This trend of decreased activity over the past ten years is largely attributable to escalating aircraft operating costs (e.g.; purchase, equipment, maintenance, insurance and fuel), more burdensome airman and aircraft regulatory requirements, safety liability, air carrier hiring challenges, and competing interests for personal income and leisure time. This downward trend in nationwide general aviation activity has occurred at BFI since 2008-2009, as confirmed through a decline of general aviation piston operations, flight training activities, number of piston based aircraft, based piston aircraft utilization, and Avgas fuel sales.

FAA Forecasts

Described below, the FAA provides a basis of forecasts for BFI in terms of reference for overall aviation industry trends and as a BFI forecast baseline. The FAA forecast data is developed from a high-level analysis of industry trends and projections, providing a top-down operational forecast for BFI generally using more aggregate forecast factors as compared with those identified as part of the MP Update.

FAA Aerospace Forecasts (FY 2016-2036). The FAA Aerospace Forecasts are aeronautical activity projections, by major industry sector, used to understand future demands on the national airport and airspace system. Each published forecast revisits previous aerospace forecasts and updates them after examining the previous year's trends in aviation and economic activity. Many factors are considered in the FAA's development of the forecasts. Some of the most important include U.S. and international economic forecasts and anticipated trends in fuel costs. The FAA Aerospace Forecasts are used for the BFI forecasts to assimilate nationwide industry patterns, comprehend the basis for the major forecast rationale and methodology, and to quantify growth patterns and rates of change relative to specific industry activity and utilization components. These FAA projections and rationale are important to BFI given the Airport's operational roles and diversity.

The projections found in the FAA Aerospace Forecast Fiscal Years 2016-2035 are summarized below:

- Between 2016 and 2036, worldwide real Gross Domestic Product (GDP) growth is assumed to grow at 2.9 percent annually, on average, while the U.S. real GDP is projected to grow at 2.4 percent annually. Real personal consumption expenditure per capita is also projected to grow at an annual rate of 1.7 percent over the same period.

- Over the long term, FAA sees a competitive and profitable overall airline aviation industry characterized by increasing demand for air travel and airfares growing more slowly than inflation, reflecting over the long term a growing U.S. economy.
- Growth in all-cargo revenue ton mile (RTM) is expected primarily from increased rates rather than increased tonnage.
- Domestic air cargo, quantified by revenue ton miles, is expected to increase approximately 0.5 to 1.0 percent annually over the next 20 years, with the strongest growth being international cargo movements, growing at 3.6 to 5.2 percent annually.
- The U.S. active general aviation aircraft fleet will grow from an estimated 203,880 aircraft in 2015 to 210,695 aircraft in 2036, equal to 0.2 percent annual growth.
- Active piston-powered fixed-wing aircraft are projected to decrease 0.7 percent annually. Active single-engine piston-powered aircraft are forecast to decline 0.7 percent annually, while active multi-engine piston-powered aircraft are projected to decline by 0.5 percent annually.
- Active turbine-powered fixed wing aircraft are expected to increase 2.0 percent annually. Turboprop aircraft are expected to increase 1.3 percent annually, while turbine aircraft are projected to increase 2.5 percent annually.
- Active rotorcraft are forecast to increase 2.2 percent annually, with piston-powered rotorcraft increasing 2.1 percent annually and turbine-powered rotorcraft increasing 2.5 percent.
- Active light sport aircraft (i.e., aircraft with weight, capacity, and performance restrictions) are projected to increase significantly by 4.5 percent annually.
- Anticipated general aviation aircraft operations will increase 0.3 percent annually through 2036. Hours flown by general aviation aircraft are expected to increase 1.2 percent annually.

FAA Terminal Area Forecast (TAF). The FAA Terminal Area Forecast (TAF) is the official forecast of aviation activity for airports in the National Plan of Integrated Airport Systems (NPIAS), which includes BFI. The TAF documents the year-by-year historical (1990 to 2015) and future (2016 to 2045) enplaned passenger, aircraft operational, and based aircraft activity levels, applying an unconstrained top-down forecast method prepared annually. The FAA TAF forecasts will be referenced and compared against the more analytical MP Update forecasts in the following individual forecast categories to demonstrate consistency with FAA forecast expectations. However, the following text summarizes a few highlights of the TAF projections for BFI:

- Passenger enplanements are forecast to increase 2.1 percent annually through 2035.
- Itinerant aircraft operations are expected to increase 0.7 percent annually.
- Local aircraft operations are projected to decreases 0.2 percent annually.
- Total aircraft operations are forecast to increase 0.5 percent annually.
- Total based aircraft are expected to increase 0.9 percent annually.

Local Factors Affecting Demand

The following section includes local industry trends, socioeconomic conditions, community support and other factors that may have either upward or downward influences on the amount of aviation activity and utilization at BFI for the next 20 years. Discussions with Airport Staff and the Airport Working Group (AWG), as supported by activity records collected from BFI operators and tenants (FBO's, based aircraft owners, air

traffic control), have been used to understand the Airport's general aviation preferences, aircraft utilization, and other factors that could reasonably influence the Airport's aviation activity projections.

The following data points support an understanding of the trends and conditions that impact the future growth or decline in each segment of the BFI aviation business activity:

BFI Upward Activity Influences (+):

- Commercial-class facility; runway dimension(s), pavement strength, lighting aids, approaches
- Central location within Seattle metropolitan area; close interstate access to Seattle downtown
- Serves growing metropolitan area: population, industry, and commerce
- On-Airport business growth; reflecting a net local economic expansion
- Diversity of aviation sectors and aircraft types (passenger service, cargo, corporate, charter, recreational/training, helicopter services)
- Full-service providers (FBO/SASO) for aircraft servicing and pilot/passenger amenities
- Aeronautical service provisions (air traffic control tower, customs)
- Community-based aeronautical services (medical, police, fire & rescue)
- Sustained and expected growing Boeing 737 production/delivery schedules
- Growth in alternative general aviation segments: sport and experimental aircraft
- Existing general aviation hangar wait list demand
- Reasonable rates and charges

BFI Downward Activity Influences (-):

- Limited expansion property/space for facilities and tenants
- Proximity and competition from surrounding public-use airports (SEA, RNT, PAE)
- Urban growth and environmental challenges
- Escalating operating costs and regulatory requirements
- Industry decline of the general aviation piston fleet and aircraft utilization

Forecast Methodologies

A wide variety of forecasting techniques have been developed to address aviation activity and overall demand. A technique's effectiveness depends on the availability and accuracy of the data. The three most common methodologies are briefly described below.

Regression Analysis. In a regression analysis forecast, the value being estimated or forecast (called the dependent variable) is related to other variables (called the independent or explanatory variables, which help "explain" the estimated value). A correlation coefficient is calculated for each pairing of dependent to independent variables to quantify this link. One major advantage of regression analysis is that if the independent variables are more readily projected than the forecasts or dependent available, then deriving a forecast is relatively easy.

Market Share Analysis. A market share analysis is a relatively easy method to use and can be applied to any measure for which a reliable higher-level (i.e. larger aggregate) forecast is available. Historical shares are calculated and used as a basis for projecting future shares. This approach is a "top-down" method of forecasting, since forecasts of larger aggregates (e.g., national aviation forecasts) are used to derive forecasts for smaller areas (e.g., individual airport aviation forecasts).

Trend Analysis. Trend analysis relies on projecting historic trends into the future. In trend analysis, a regression equation is used, with time as the independent variable. It is one of the fundamental techniques used to analyze and forecast aviation activity. While it is frequently used as a back-up or expedient technique, it is highly valuable because it is simple to apply. Sometimes trend analysis can be used as a reasonable method of projecting variables that would be complicated to project by other means.

Correlation Analysis

Correlation analysis, which is part of the regression analysis methodology, ignores units and orders of magnitude, and instead measure how closely different variables change in proportion to one another using percentages. Correlation can be negative, indicating that as one index grows, the other declines. Correlation is measured by the correlation coefficient, which ranges from -1 to +1. A score close to +/-1 suggest stronger positive/negative correlation, and a score closer to zero suggests that the two variables are not correlated.

While correlation shows potential interrelatedness between variables, it cannot be the sole factor to determine that growth of one variable is caused by the other. Often there are unrelated factors and additional variables that impact the growth in both variables. An example is a 10 percent growth in the sale of luxury goods correlating to the 10 percent growth in travel by private aircraft in a community. Purchasing luxury goods does not directly cause people to fly by private aircraft, nor vice versa – but a strong correlation suggests that a third factor may be causing both variables to grow (such as local growth in an industry with high paying jobs). Correlation analysis usually does not fully explain why variables behave the way they do, but does help suggest a connection, or lack thereof, between variables and may be subject to the same market forces. Correlation is augmented by professional judgement that helps explain the correlation. Factors evaluated in the correlation analysis and analysis results for BFI are shown in **Table B10**.

Table B10 **BFI CORRELATION ANALYSIS**

	BFI Activity					Seattle MSA								FAA Aerospace Forecasts										General Aviation Airplane Shipments by Type Manufactured Worldwide (GAMA)						
														Active General Aviation Fleet																
Year	Enplanements	Commercial Service Operations	General Aviation Operations	Based Aircraft	Air Cargo (in Pounds)	Popula-tion (in Thous-ands)	Personal Income (in Thous-ands $)	Earnings (in Thous-ands $)	Retail Sales (in Thous-ands $)	GRP (in Thous-ands $)	Employ-ment (in Thous-ands)	Price of Crude Oil ($/Bbl)	Price of Jet Fuel ($/gal)	SEP	MEP	Jet	Total	Air Carrier Operations (in Thousands)	Air Taxi Operations (in Thousands)	GA Local Operations (in Thousands)	GA Itinerant Operations (in Thousands)	Total GA Operations (in Thousands)	Air Carrier Domestic Enplane-ments (in Thous-ands)	Regional Domestic Enplane-ments (in Thous-ands)	Total Enplane-ments (in Thous-ands)	Active Pilots	SEP	MEP	Piston	TP	BJ	Turbine	Total
2006	31,418	10,427	225,395	491	222,380,000	3,248	154,851	126,547	58,505	213,454	2,108	66.05	1.92							18,707	17,034	39,878					2,513	242	2,755	412	887	1,299	4,054
2007	34,580	9,824	222,864	490	245,196,000	3,298	157,552	128,212	58,860	218,204	2,118	72.34	2.13	147,569	19,337	19,899	231,606	13,611	11,667,263	14,556	18,575	33,131	688,525	156,254	844,779	590,349	2,417	258	2,675	465	1,137	1,602	4,277
2008	34,597	10,568	218,937	438	237,994,000	3,348	160,254	129,877	59,214	222,953	2,128	99.67	2.96	145,497	17,515	19,949	228,664	13,780	11,032,059	14,081	17,492	31,573	680,727	159,085	839,813	613,746	1,943	176	2,119	538	1,317	1,855	3,974
2009	35,863	12,181	186,636	463	214,736,000	3,398	162,955	131,542	59,569	227,703	2,138	61.95	1.66	140,649	16,474	20,323	223,876	12,836	9,520,791	12,447	15,571	28,019	630,784	154,023	784,807	594,285	893	70	963	446	874	1,320	2,283
2010	33,656	10,754	179,703	470	234,960,000	3,448	165,657	133,207	59,924	232,453	2,148	79.48	2.15	139,519	15,900	20,853	223,370	12,657	9,410,381	11,716	14,863	26,580	634,811	161,711	796,522	627,588	781	108	889	368	767	1,135	2,024
2011	34,434	9,820	155,734	427	230,694,000	3,497	172,427	136,709	63,244	234,434	2,184	94.88	3.00	136,895	15,702	21,173	220,453	12,865	9,278,542	11,437	14,527	25,964	650,094	161,692	811,786	617,128	761	137	898	526	696	1,222	2,120
2012	23,078	5,666	143,518	427	339,860,424	3,552	182,850	143,253	65,827	245,797	2,229	94.05	3.06	128,847	14,313	22,097	209,034	12,872	8,994,371	11,608	14,521	26,129	653,787	159,019	812,807	610,576	817	91	908	584	672	1,256	2,164
2013	13,008	3,280	138,817	418	224,617,370	3,610	185,631	148,006	68,211	254,136	2,308	97.98	2.92	124,398	13,257	21,256	199,927	12,775	8,803,412	11,688	14,117	25,805	653,504	155,490	808,994	599,086	908	122	1,030	645	678	1,323	2,353
2014	20,418	5,874	135,250	396	241,744,133	3,652	189,939	151,550	70,251	260,387	2,348	93.17	2.69	126,036	13,146	22,139	204,408	13,014	8,439,713	11,675	13,978	25,654	668,953	154,121	823,074	593,499	986	143	1,129	603	722	1,325	2,454
2015	18,945	4,548	129,292	380	268,740,642	3,696	194,655	155,238	71,768	266,908	2,389	48.66	1.52	125,050	13,085	22,045	203,880	13,755	7,895,017	11,691	13,886	25,578	696,430	153,009	849,440	590,039	946	110	1,056	557	718	1,275	2,331

Correlation																													
Enplanements	(0.80)	(0.86)	(0.87)	(0.88)	(0.85)	(0.88)	(0.13)	(0.19)	0.92	0.85	(0.74)	0.96	0.08	0.69	0.37	0.65	0.45	(0.23)	0.49	(0.17)	0.38	0.38	0.29	0.37	(0.78)	0.58	0.27	0.38
Commercial Service Operations	(0.82)	(0.89)	(0.89)	(0.90)	(0.85)	(0.88)	(0.17)	(0.27)	0.89	0.80	(0.76)	0.92	(0.01)	0.64	0.43	0.62	0.50	(0.34)	0.41	(0.30)	0.36	0.37	0.26	0.37	(0.82)	0.55	0.22	0.36
General Aviation Operations	(0.97)	(0.96)	(0.93)	(0.91)	(0.94)	(0.88)	(0.14)	(0.22)	0.96	0.96	(0.94)	0.93	0.37	0.96	0.79	0.95	0.85	0.08	0.26	0.13	0.14	0.84	0.70	0.83	(0.67)	0.82	0.57	0.83
Based Aircraft	(0.92)	(0.92)	(0.92)	(0.92)	(0.92)	(0.91)	(0.17)	(0.26)	0.84	0.86	(0.80)	0.83	(0.13)	0.79	0.66	0.76	0.72	(0.33)	0.37	(0.29)	0.24	0.62	0.53	0.61	(0.79)	0.47	0.15	0.55
Air Cargo	0.35	0.43	0.37	0.36	0.35	0.29	0.12	0.28	(0.33)	(0.25)	0.54	(0.30)	0.08	(0.21)	(0.29)	(0.24)	(0.29)	0.21	0.09	0.23	0.06	(0.23)	(0.25)	(0.23)	0.35	(0.25)	(0.11)	(0.22)

Correlation Scale				
Strong Negative	Weak Negative	None	Weak Positive	Strong Positive
(1.0)	(0.5)	0.0	0.5	1.0

Given these variables, it is evident that most of the aviation activity measures show strongest positive correlation with variables that are declining, and strongest negative correlation with variables that are growing. Positive correlation means that when one increases, the other does the same; negative correlation means that when one increases, the other decreases. The correlation analysis shows the following observations:

- BFI's enplanements, commercial service operations, general aviation operations, and based aircraft have the strongest positive correlations with the active general aviation aircraft fleet as reported in the FAA's Aerospace Forecasts. The strongest negative correlations are with the Seattle MSA socioeconomic indicators.
- BFI's general aviation operations are also strongly correlated with air taxi and general aviation itinerant operations as reported in the FAA's Aerospace Forecasts.
- BFI's air cargo activity does not have a strong correlation to any variable, but the strongest correlation is with the jet segment of the active general aviation aircraft fleet as reported by the FAA's Aerospace Forecasts.

The local conditions prevalent at BFI are reflective of the nationwide decline in overall general aviation activity, especially in the piston-powered segment of general aviation industry. Declining usage and ownership of piston-powered general aviation aircraft has been occurring for more than a decade. However, usage and ownership of turbine-powered aircraft, both locally and nationally, has been increasing and is expected to continue in the future.

Commercial Passenger Enplanement & Operations Forecast

Commercial Passenger Enplanement Forecast

Forecasts of passenger enplanements serve as the foundation for other commercial service activity forecasts and provide a basis for determining future requirements for facilities integral to the accommodation of passengers. Typically, in an airport master plan, forecasts can be produced from historical trends, which have traditionally correlated with socioeconomic data. However, as previously stated, BFI's historical passenger enplanements do not have a strong link with the Seattle MSA econometric data. Therefore, regression analysis linked directly to any econometric data is not a viable methodology due to low predictive reliability for BFI.

Table B11 provides the historical (2000-2015) enplanements at BFI compared to those for the Puget Sound Region, the State of Washington, and the United States, and presents the respective market share of BFI compared to each region. The analysis indicates a fluctuation in BFI's market share, with no discernable trend that can be used for forecasting. Therefore, market share analysis is also not a viable methodology due to low predictive reliability.

Table B11 **BFI MARKET SHARE OF PASSENGER ENPLANEMENTS COMPARISON (2000 TO 2015)**

Year	BFI	Puget Sound Region	BFI Market Share	State of Washington	BFI Market Share	United States	BFI Market Share
2000	10,582	13,864,138	0.03%	15,996,284	0.027%	704,829,175	0.0006%
2001	10,555	13,988,927	0.06%	16,037,423	0.049%	693,147,977	0.0011%
2002	10,069	12,763,385	0.06%	14,600,550	0.050%	627,651,686	0.0012%
2003	16,220	12,991,451	0.11%	14,859,971	0.096%	643,224,641	0.0022%
2004	28,458	13,939,193	0.21%	15,898,945	0.185%	690,967,734	0.0043%
2005	23,016	14,277,318	0.15%	16,374,531	0.130%	733,403,888	0.0029%
2006	31,418	14,635,150	0.20%	16,778,067	0.176%	732,886,054	0.0040%
2007	34,580	15,152,852	0.18%	17,481,569	0.157%	756,525,464	0.0036%
2008	34,597	16,010,231	0.22%	18,497,508	0.188%	747,466,798	0.0047%
2009	35,863	15,273,875	0.21%	17,530,971	0.183%	695,488,533	0.0046%
2010	33,656	15,252,100	0.21%	17,658,548	0.179%	702,818,621	0.0045%
2011	34,434	15,902,517	0.21%	18,432,030	0.180%	722,926,202	0.0046%
2012	23,078	16,105,083	0.14%	18,664,260	0.120%	731,053,513	0.0031%
2013	13,008	16,555,367	0.09%	19,093,409	0.074%	734,336,521	0.0019%
2014	20,418	17,432,905	0.11%	19,953,576	0.095%	753,529,877	0.0025%
2015	18,945	19,657,736	0.13%	22,178,136	0.114%	786,389,033	0.0032%
Average Market Share			**0.14%**		**0.125%**		**0.0031%**

***SOURCE**: FAA TAF (2015 to 2035) and BFI Airport records.*

Although BFI's average daily scheduled flights have decreased since 2004, the average scheduled daily enplanements-per-departure have remained consistent. Per the BFI Airport Strategic Plan 2014-2020 study, "while modest growth in passenger demand and operations can be expected at BFI, the passenger market is not expected to exceed the capacity of the existing terminal complex and will remain in the nine-seat commuter aircraft category". The existing scheduled airline (Kenmore Air) is expected to provide the similar level of niche service activities into the future, including destinations, aircraft equipment, flight frequencies, and passenger processing levels. Below is a summary of the key 2015 activity indicators for the commercial service passenger operations at BFI.

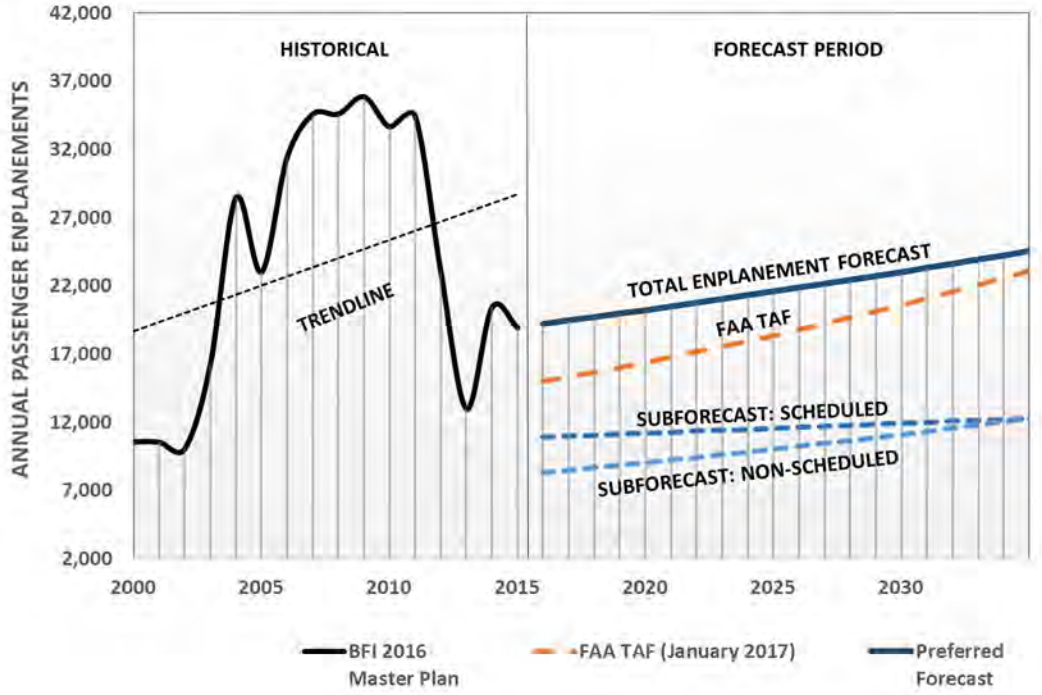
Preferred Passenger Enplanement Forecast. The preferred MP Update enplanement forecast was developed using percent trend analysis. This forecast technique extrapolates the total passengers, including those conducted by 'scheduled' and 'non-scheduled' operators, using the historical BFI annual enplaned passenger growth rate of 1.3 percent, as experienced from 2003 to 2015. During this trend period, total annual BFI enplanements increased nearly 2,725 passengers, from 16,220 to 18,945, averaging 227 additional passengers each year. The preferred MP Update forecast projects 24,541 enplanements by 2035, a total increase of 5,596, or an average of 280 additional passengers per year. The forecast of 'scheduled' (air carrier) and 'non-scheduled' (on-demand air taxi) passengers was projected using the 2015 proportion of 'scheduled' (53 percent) and 'non-scheduled' (47 percent) passengers. This ratio was graduated to a 50 percent and 50 percent proportion over the 20-year forecast period, indicative of the BFI shifting five-year trend towards 'non-scheduled' passengers, and more frequent 'non-scheduled' flights represented by a mix of air carrier charter operators, and occasional diverted flights from SEA.

The 'scheduled' air carrier service and activity levels are forecast to remain similar to past BFI trends experienced from 2005 to 2015, in terms of flight frequency and passenger load factor, which ranged between 40 percent and 65 percent, and averaged 55 percent.

Figure B9 graphs total enplanements from 2000 to 2035, including the preferred MP Update forecast in comparison with the FAA TAF enplanement forecast. The MP Update forecast includes the sub-forecasts for 'scheduled' and 'non-scheduled' passengers, and the FAA TAF forecast includes the total of the reported 'air carrier' and 'commuter' passengers combined. The BFI forecast passenger growth is projected to track at a level and rate comparable to the FAA TAF, in which the MP Update forecasts increases nearly 5,584 passengers at 1.3 percent annually, and the FAA TAF increases 7,844 passengers at 2.1 percent annually. As depicted, the sub-forecast levels of 'scheduled' and 'non-scheduled' passengers are expected to continue growth consistent with BFI historical levels and percent of total BFI passengers.

Table B12 summarizes the preferred MP Update and FAA TAF total enplanement forecasts, including 20-year forecast changes and compound annual growth rates (CAGR). The MP Update forecast results in enplaned passengers increasing from 18,945 in 2015 to 24,541 in 2035, while the FAA TAF forecasts increase from 15,236 in 2015 to 23,080 by 2035. In addition, both the 2035 MP Update forecast and the FAA TAF projections reach similar BFI passenger levels that are consistent with the historic average annual enplanement totals that have been recorded at the Airport between years 2000 and 2015.

Figure B9 **BFI PASSENGER ENPLANEMENT ACTIVITY TRENDS AND FORECAST SCENARIO**



SOURCE: *Historical: FAA T-100, USDOT BTS Website (March 2016).*
Forecast: FAA TAF (2015 to 2035) | Consultant Forecast (2015 to 2035) March 2016.

Table B12 **BFI PASSENGER ENPLANEMENTS (2000 TO 2035)**

Year [1]	FAA TAF	MP Update Forecast (Passenger Enplanements)		
		Scheduled	Non-Scheduled	Total
2000	4,343	--	--	10,582
2001	7,776	--	--	10,555
2002	7,273	2,003	8,066	10,069
2003	14,210	11,121	5,099	16,220
2004	29,447	19,321	9,137	28,458
2005	21,294	15,277	7,739	23,016
2006	29,439	26,271	5,147	31,418
2007	27,352	26,380	8,200	34,580
2008	34,838	26,638	7,959	34,597
2009	32,023	28,141	7,722	35,863
2010	31,571	26,238	7,418	33,656
2011	33,110	22,501	11,933	34,434
2012	22,357	13,679	9,399	23,078
2013	14,147	12,119	889	13,008
2014	18,851	12,410	8,008	20,418
2015	15,236 [1]	10,817	8,128	18,945 [2]
2020	16,373 [1]	11,181	9,030	**20,211** [2]
2025	18,340 [1]	11,546	10,016	**21,562** [2]
2030	20,565 [1]	11,910	11,094	**23,004** [2]
2035	23,080 [1]	12,270	12,271	**24,541** [2]
% CAGR	**2.1%**	**---**	**---**	**1.3%**

SOURCE: *Historical: FAA TAF (2000 to 2015) – Fiscal Year (FY) data, Calendar Year (CY) data from FAA T-100, USDOT BTS Website & FAA ACAIS (2000 to 2015).*

Forecast: [1] FAA TAF (2015 to 2035) – Fiscal Year (FY) data (April 2017).

[2] Consultant Forecast (2015 to 2035) April 2017 - CY data with ACAIS totals for 2015.

Commercial Passenger Aircraft Forecast

Table B13 summarizes the forecast of BFI commercial passenger transport aircraft operations, as conducted by 'scheduled' and 'non-scheduled' air carrier operators. During the 20-year forecast period, total commercial activity is projected to increase from 3,646 operations in 2015 to 5,178 operations by 2035, a 1.8 percent annual growth. Consistent with commercial passenger forecast, the proportion of commercial aircraft activity is projected to shift from 'scheduled' (49.9 percent in 2015) more towards 'non-scheduled' (50.1 percent in 2015). The 'scheduled' aircraft operations are forecast to increase at 1.3 percent annually, reflective of the BFI forecast passenger demand levels. Scheduled air service is expected to expand in a similar manner and capacity as existing scheduled air carrier enplanements, in terms of flight destinations, route schedule, aircraft equipment, and passenger load factors. The 'non-scheduled' aircraft operations are forecast to increase at 2.2 percent annually, which reflects the BFI 'non-scheduled' passenger enplanement growth (2.1 percent), is consistent with the BFI FAA TAF forecast of commercial aircraft operations (1.8 percent), as well as consistent with the *FAA Aerospace Forecast* industry-wide aircraft turbine (turboprop and jet) fleet and utilization growth forecasts of the air-taxi sector (2.2 percent).

This growth rate is reasonable provided the commercial on-demand fixed wing and helicopter air service operators established at BFI, and the specialized commercial on-demand tourism and seasonal travel charters conducted at BFI (sports teams, low-cost carrier charters, special civic events).

Table B13 **COMMERCIAL PASSENGER SERVICE OPERATIONS PROJECTIONS**

Year	Scheduled Air Carrier Passenger Operations	Percent Scheduled (Commuter)	Non-Scheduled Air Carrier Passenger Operations	Percent Non-Scheduled (Air Carrier)	Total Air Passenger Aircraft Operations
2015 (Actual)	1,821	49.9%	1,825	50.1%	**3,646**
2020	1,882	47.3%	2,095	52.7%	**3,977**
2025	1,982	45.7%	2,359	54.3%	**4,341**
2030	2,010	42.4%	2,730	57.6%	**4,740**
2035	2,100	40.6%	3,078	59.4%	**5,178**
CAGR 2015-2035	**0.7%**	--	**2.6%**	--	**1.8%**

SOURCE: *Base Year: Airport Records.*
Forecast: Consultant Forecast (2016 to 2035), Conducted March 2016.

Air Cargo Weight & Operations Forecast

Total air cargo volumes in the U.S. have declined over the last 10 years by a CAGR of 1.4 percent. This is a result of industry changes and consolidation related to increased jet fuel costs, declines coinciding with the global recession, increased security regulations, market saturation, and improved ground transport efficiency. The U.S. air cargo industry is not expected to return to the high growth rates experienced in previous decades and it is clear the market for air cargo has changed.

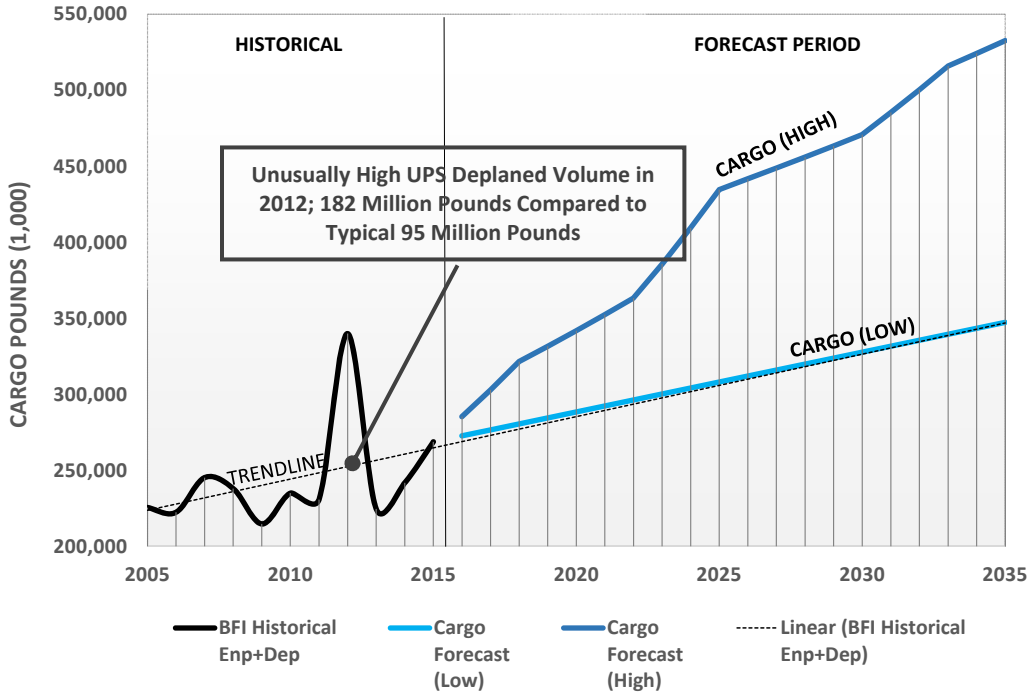
However, as noted previously, BFI's proximity to the Seattle Central Business District makes it a desirable location for the integrated express air cargo operations (e.g., provided by UPS) that dominate the air cargo activity at the Airport. This type of air cargo operation utilizes the hub-and-spoke transport model that is employed by passenger airlines, with regional carriers such as Ameriflight operating smaller turboprop aircraft that in turn feed the larger air carrier aircraft operated by UPS. Based upon this operational model, the BFI domestic air cargo activity has generally continued to increase since 2005, as quantified in terms of enplaned/deplaned pounds and aircraft landing weights, growing at CAGRs of 1.8 percent and -0.2 percent respectively.

Therefore, two potential growth rate scenarios for the volume of air freight/mail at BFI have been projected for this analysis. The first includes a "Low" growth scenario with a CAGR of 1.3 percent that is calculated using the past 10 year net increase versus decrease of total enplaned plus deplaned volumes (essentially a trend analysis), generating an average annual increase of 3.9 million pounds. This growth rate reflects the maturity of the air cargo market, the steady/consistent historic cargo growth that has occurred at BFI, and the anticipated slower growth by the FAA in terms of revenue ton miles (estimated between 0.5 percent and 1.0 percent CAGR).

The second scenario reflects a "High" growth scenario with a CAGR of 3.5 percent that projects a more aggressive rate of growth that could be supported by the continued growth of e-commerce, and result in the potential introduction of a new, or expanded air cargo operation at the Airport (e.g., the start-up of Amazon Prime Air Cargo operations). Each of these scenarios are presented in **Table B14** and **Figure B10** reflect total air cargo at the Airport for the Low and High scenarios, ranging from 173,671 tons to 266,299 tons by 2035.

Given the existing conditions driving air cargo activity at BFI (e.g., existing carriers, type of operation, and potential site development expansion limitations), the Low growth rate scenario has been selected as the preferred forecast. However, opportunities to accommodate future expansion of cargo development at the Airport will be investigated in the alternatives chapter of this Study. In addition, this selected Low rate of growth is conservative compared to Airbus' *Global Market Forecast for 2016-2035* and Boeing's *World Air Cargo Forecast 2016-2017*, which predict U.S. air cargo to grow at a CAGR of 1.6 percent and 2.2 percent respectively through their 20 year forecasts.

Figure B10 **BFI ENPLANED AND DEPLANED AIR CARGO TOTALS AND FORECAST SCENARIO(S)**



***SOURCE**: FAA T-100 Cargo Data; USDOT BTS Website (Obtained March 2016).*

Table B14 **BFI CARGO FORECAST SUMMARY (2000 TO 2035)**

Year	Historic Total Cargo Tons	Total Cargo Tons (Low)	Total Cargo Tons (High)
2000	N/A	---	---
2001	N/A	---	---
2002	N/A	---	---
2003	N/A	---	---
2004	N/A	---	---
2005	112,755	---	---
2006	111,190	---	---
2007	122,598	---	---
2008	118,997	---	---
2009	107,368	---	---
2010	117,480	---	---
2011	115,347	---	---
2012	169,930	---	---
2013	112,309	---	---
2014	120,872	---	---
2015	134,371	---	---
2020		144,196	170,888
2025		154,021	217,331
2030		163,846	235,366
2035		173,671	266,299
% CAGR	**1.8%**	**1.3%**	**3.5%**

***SOURCE**: Historical: FAA T-100 Cargo Data, USDOT BTS Website (March 2016).*
Forecast: Consultant Forecast (2016 to 2035), Conducted March 2016.

Table B15 displays that BFI aircraft cargo operations totaled 12,336 operations in 2015, as indicated by aircraft type. Traffic consists evenly of transport versus non-transport aircraft operations, in which nearly 75 percent of operations are conducted with widebody planes (B-767, MD-11, A-300), and 25 percent narrow body planes (e.g., B-737, B-757). The operations forecast is projected at an annual rate 1.0 percent that would support the other BFI air cargo activity components (enplaned/deplaned pounds, aircraft landing weights, revenue-ton-miles). Also, it is anticipated the BFI air cargo aircraft fleet and operations will remain fairly constant throughout the forecast period, including types of carriers, freight and mail delivery logistics, aircraft fleet composition, and domestic and international routes. During the 20-year forecast period, total air cargo aircraft operations are projected to increase from 12,336 to 15,052, reflecting a 1.0 percent annual growth.

Table B15 **AIR CARGO CARRIER OPERATIONS PROJECTIONS**

Year	Transport Aircraft	Narrowbody Transport Aircraft	Widebody Transport Aircraft	Non-Transport Aircraft	Total Air Cargo Aircraft Operations
2015 (Actual)	5,852	1,556	4,296	6,484	12,336
2015 (Actual %)	47.4%	26.6%	73.4%	52.6%	--
2020	6,150	1,635	4,515	6,815	12,965
2025	6,464	1,719	4,746	7,163	13,627
2030	6,794	1,807	4,988	7,528	14,322
2035	7,140	1,899	5,242	7,912	15,052
CAGR 2015-2035	**1.0%**	--	--	**1.0%**	**1.0%**

***SOURCE**: Base Year: Airport Records Forecast: Consultant Forecast (2016 to 2035), Conducted March 2016.*

General Aviation Operations Forecast

A comprehensive forecast requires an understanding of general aviation activity and involves an assessment of general aviation operations by major user component, which includes Air Taxi, Business/Corporate, and Recreational/Training. These general aviation components are individually characterized and influenced by differing user and industry operator factors. These operator factors are analyzed by segment in order to develop a more comprehensive projection of future general aviation activity levels for this diverse user segment at BFI. These factors are considered and incorporated into the development of the general aviation operation projections. The results of the forecasting effort for the general aviation categories are discussed below and are presented in **Table B16**.

- **General Aviation – Air Taxi.** Air taxi operations are classified as any company or individual providing air passenger transportation service on a nonscheduled basis and over unspecified routes utilizing general aviation-type aircraft, such as the Piper Navajo. In response to the increasing Seattle passenger market volume and available air transportation services, this segment of general aviation activity is forecast to increase by 1.4 percent throughout the forecast period. The proximity of BFI to the Seattle business and entertainment districts, technical corridor, and the San Juan Islands reinforces the growth potential for air taxi services.

- **General Aviation – Business/Corporate.** The business/corporate segment is commonly characterized by complex turbine-powered aircraft (i.e., larger turboprop and business jet aircraft), operated by individuals or corporations for executive purposes. On a national level, this segment is expected to grow as gauged by the aircraft production and hourly utilization. For example, the FAA Aerospace Forecasts indicates that active turbine-powered general aviation aircraft (both fixed wing and rotorcraft) is expected to increase 2.1 percent annually through 2036, and hours flown is expected to increase by 2.6 percent. The trends at BFI are expected to reflect national trends which is supported by higher facility and activity utilization, the increasing number of based business/corporate aircraft and facility assets, diversity of aircraft types, pilot operator services, and corporate flight departments located on the Airport.

Aircraft with the largest projected growth are turbine aircraft, including both fixed wing and helicopter operators. This growth is supported by the continued increase of corporate aircraft acquisition, higher aircraft utilization resulting from stronger national economic conditions, and the continued expansion of the fractional ownership program. The business/corporate segment of total operations should demonstrate an operations increase from 26,404 in 2015 to 46,418 in 2035, representing a 2.9 percent CAGR.

- **General Aviation – Recreational/Training.** The recreational/training segment is typified by small single and multi-engine piston-powered aircraft and continues to undergo transition at both the local and national levels. At the national level, the piston-powered aircraft fleet is experiencing continued attrition and retirement of older aircraft, coupled with the declining production of new aircraft. The FAA Aerospace Forecasts project continued declines in the piston-powered active aircraft fleet (i.e., -0.6 percent CAGR through 2036), and hourly utilization rates (i.e., -0.3 percent CAGR). The General Aviation Manufacturers Association (GAMA) indicates the production of new piston-powered aircraft declined by 61.7 percent from 2006 to 2015, a CAGR of -10.1 percent. At the local level, recreational/training aircraft operations have been on the decline at BFI for over a decade, with contributing factors including decreased pilot training, aging aircraft, increased operating/storage costs, and limited/decreased storage options. By 2025, it is expected the BFI activity declines experienced during the past ten years would "bottom out" and start to stabilize and rebound, as the result of a more established pilot population, infusion of economical aircraft technologies, and industry-wide adaption to operating costs and evolving aircraft/airmen regulatory requirements. However, the rebound by 2035 of 68,755 operations is still well below the 2015 operations of 96,876, reflecting a CAGR of -1.7 percent.

- **Total General Aviation.** As presented in **Table B18**, the total operations by general aviation aircraft is expected to decrease by 1,744 operations, representing a CAGR of -0.06 percent throughout the forecast period. This is reflective of the larger numerical decrease associated with recreational/training activity compared to the smaller increases numerically by air taxi and business/corporate activity.

Table B16 **GENERAL AVIATION AIRCRAFT OPERATIONS PROJECTIONS**

Year	Total General Aviation	General Aviation – Air Taxi	General Aviation – Business/Corporate	General Aviation – Recreational/Training
2015 (Actual)	**143,783**	20,503	26,404	96,876
2020	**135,430**	21,937	30,403	83,090
2025	**127,151**	23,470	35,009	68,672
2030	**134,394**	25,110	40,312	68,972
2035	**142,039**	26,866	46,418	68,755
CAGR	**-0.1%**	**1.4%**	**2.9%**	**-1.7%**

***SOURCE**: Forecast: Consultant Forecast (2015 to 2035), Conducted March 2016.*

Military Aircraft Operations Forecast

Military operations over the last 15 years have comprised an average of less than one percent of total aircraft operations at the Airport, with actual activity decreasing by approximately 23 percent. Typically, military operations levels are driven more by state and federal policy than by local decisions. It is likely that military operations will fluctuate in response to changing Department of Defense (DOD) funding, and operations related to Boeing's existing Military Flight Center and Test Facility at BFI, but no significant increase or decrease in flight operations are expected at the Airport throughout the forecast period. Current activity is related to testing and maintenance on the Boeing P-8 Poseidon, Boeing E-3 Sentry (AWACS), and the new Boeing KC-46 Pegasus (a widebody, multi-role tanker aircraft). **Table B17** presents the military aircraft operations forecast.

Table B17 **MILITARY AIRCRAFT OPERATIONS PROJECTIONS**

Year	Itinerant Military	Local Military	Total Military Operations
2015 (Actual)	965	643	1,608
2020	1,002	668	1,669
2025	1,040	693	1,733
2030	1,079	719	1,799
2035	1120	747	1,867
CAGR	**0.8%**	**0.8%**	**0.8%**

***SOURCE**: Forecast: Consultant Forecast (2015 to 2035), Conducted March 2016.*

Aircraft Operations Forecast

Aircraft operations, defined as either a takeoff or a landing, is a forecast component to determine the year-by-year total number of annual operations, as broken down by user category, aircraft type, and other operational parameters. In 2015, a total of 165,571 operations occurred at the Airport. **Table B18** lists a summary of the key 2015 operational mix parameters.

Table B18 **BFI OPERATIONAL MIX PARAMETERS – 2015**

Operational Mix	Total	Percent Share
Air Carrier	3,646	(2.2%)
Air Taxi	37,037	(22.4%)
General Aviation	123,280	(74.5%)
Military	1,608	(0.9%)
Itinerant Traffic	129,648	(78.3%)
Local Traffic	35,923	(21.7%)
VFR Traffic	107,483	(65.0%)
IFR Traffic	58,088	(35.0%)
Business	85,302	(51.5%)
Recreational/Training	80,269	(48.5%)
Total Operations:	**165,571**	

Forecast of Aircraft Operating Mix – Aircraft Types

The following lists the aircraft operational mix, by major user group, as estimated for in 2007 and 2015. For comparative purposes, 2007 was the last available year with a full assessment of the BFI operational fleet mix, as conducted for the 2008 *BFI Aviation Forecast Update Report*. Similarly, as done in 2007, the 2015 fleet mix was generated from the bottom-up, compiled from Airport/ATCT operational records and FAA published information. The 2015 aircraft mix is also reflective of recent-past BFI trends, including key user/tenant activities, based aircraft types, and fuel sale records. **Table B19** shows a breakdown of BFI aircraft types.

Table B19 **BFI AIRCRAFT TYPES – 2007 VS. 2015**

Aircraft Type	2007	2015
Piston	64%	62%
Turboprop	10%	14%
Business Jet	14%	10%
Transport Jet	4%	8%
Helicopter	8%	6%

Table B20 is the forecast of total annual operations broken-down by major user category, including the percent annual growth rate over the 20-year forecast period.

Table B20 **FORECAST OPERATIONS MIX – USER CATEGORY**

Year	Airline	Air Cargo	Boeing	General Aviation (Air Taxi)	General Aviation (Bus/Rec)	Military	TOTAL
2015	3,646	12,336	4,198	20,503	123,280	1,608	**165,571**
2020	3,977	12,965	5,197	21,937	113,493	1,669	**159,239**
2025	4,341	13,627	6,297	23,470	103,681	1,733	**153,148**
2030	4,740	14,322	6,553	25,110	109,284	1,799	**161,807**
2035	5,178	15,052	6,819	26,866	115,173	1,867	**170,956**
% CAGR	**1.8%**	**1.0%**	**2.5%**	**1.4%**	**-0.3%**	**0.8%**	**0.2%**

SOURCE: *Forecast: Consultant Forecast (2016 to 2035), Conducted March 2016.*
Note: TAF projections of commercial operations include air cargo operations and some general aviation air taxi operations. The airport forecasts include only operations on commercial service airlines. For this MP Update, air cargo operations have been developed separately and air taxi operation have been included in general aviation operations projections.

Table B21 is the forecast of total annual operations broken-down by major aircraft type, including the percent annual growth rate over the 20-year forecast period. In the future, a further increase of BFI transport aircraft utilization is expected, attributed mainly to air cargo operators, more frequent on-demand passenger service, and Boeing aircraft production/delivery schedules. Also, there is expected to be a further concentration of based corporate and specialized high-end general aviation service tenants.

Historical BFI piston and turboprop general aviation fleet mix trends are expected to continue, largely coincident with the nationwide piston/turboprop aircraft manufacturing and utilization rates. Otherwise, economic, and regulatory factors are assumed to induce a cyclical pattern to this overall BFI activity pattern.

Table B21 **FORECAST OPERATIONS MIX – AIRCRAFT TYPE**

Year	Piston	Turboprop	Business Jet	Transport Jet	Helicopter	Total
2015	102,480	22,459	16,425	13,483	10,725	**165,571**
2020	88,177	24,412	19,570	14,668	12,412	**159,239**
2025	72,974	26,534	23,318	15,958	14,364	**153,148**
2030	71,198	28,842	27,783	17,361	16,623	**161,807**
2035	68,377	31,350	33,104	18,888	19,237	**170,956**
% CAGR	**-2.0%**	**1.7%**	**3.6%**	**1.7%**	**3.0%**	**0.2%**

***SOURCE**: Forecast: Consultant Forecast (2016 to 2035), Conducted March 2016.*

Table B22 is the forecast of forecast of total operations conducted as itinerant and local, and actual instrument (IFR) and visual (VFR) conditions. Itinerant and VFR operations will continue to be the dominant aircraft activity at BFI. It is expected the Airport will maintain a similar operational profile throughout the planning period.

Table B22 **FORECAST OPERATIONS MIX – OPERATION TYPE**

Year	Total Itinerant Operations	Total Local Operations	Total IFR	Total VFR
2015	125,648 (78%)	35,923 (22%)	58,088 (35%)	107,483 (65%)
2020	124,206 (78%)	35,033 (22%)	55,866 (35%)	103,372 (65%)
2025	119,455 (78%)	33,693 (22%)	53,730 (35%)	99,419 (65%)
2030	126,209 (78%)	35,598 (22%)	56,768 (35%)	105,040 (65%)
2035	133,346 (78%)	37,610 (22%)	59,977 (35%)	110,978 (65%)
% CAGR	**0.3%**	**0.2%**	**0.2%**	**0.2%**

***SOURCE**: Forecast: Consultant Forecast (2016 to 2035), Conducted March 2016.*

Operational Peaking

Table B23 is the operational peaking forecast of total annual operations broken-down by month, day, and hour. Operational peaking is used to assess airfield user patterns, quantify capacity levels, and to analyze various facilities for level of service. The design-day and design-hour activity levels are reflective of the Airport's busy periods. This absolute peak period analysis is typically used in order to avoid constructing for capacity requirements that rarely occur. Peaking activity is derived from the aggregate annual Airport operations, calculated using FAA guidance, and substantiated by monthly Air Traffic Control activity records. Per FAA OPSNET data, the peak-month activity typically occurs from May to August, with the highest average peak-month of 11.4 percent experienced in July and/or August. The percent of peak-hour operations is estimated using FAA guidance contained in AC 150/5060-5 - *AIRPORT CAPACITY AND DELAY* to range between 12 to 18 percent.

Table B23 **OPERATIONAL PEAKING (ANNUAL, MONTH, DAY, AND HOUR)**

Operational Peaking	Peaking Calculation	Activity Demand (Civilian Operations)				
		2015	2020	2025	2030	2035
Total Annual Operations	--	**165,571**	**159,239**	**153,148**	**161,807**	**170,956**
Peak Month Operations	11.4%	18,957	18,232	17,534	18,526	19,573
Average Day Peak Month	30.5 Days	622	598	575	607	642
Peak Hour	15.0%	93.2	89.7	86.2	91.1	96.3
Peak Hour - Itinerant	75.5%	35.2	33.9	32.6	34.4	36.3
Peak Hour - Local	24.5%	11.4	11.0	10.6	11.2	11.8
Peak Hour - IFR	35.1%	16.4	15.7	15.1	16.0	16.9
Peak Hour - VFR	64.9%	30.3	29.1	28.0	29.6	31.2

***SOURCE**: 2015 baseline data obtained from FAA OPSNET.*
Note: Forecast: Consultant Forecast (2020 to 2035), conducted March 2016 using FAA guidance from AC 150/5060-5.

General Aviation Based Aircraft Forecast

The number and type of based aircraft influences airfield operational system needs and influences the type and location of facilities, along with appropriate space allocation. Given the constrained terminal and landside property at BFI, based aircraft forecasts have a direct relationship to the function, utilization, and value of future Airport property assets. **Table B24** shows the BFI based aircraft count for 2015.

Table B24 **BFI BASED AIRCRAFT – 2015**

Category	Total	Percent Share
Single-engine piston	188	(49%)
Multi-engine piston	42	(11%)
Single-engine turboprop	15	(4%)
Multi-engine turboprop	18	(5%)
Small cabin business Jet	39	(10%)
Large cabin business Jet	47	(12%)
Helicopter	31	(5%)
Total Based Aircraft:	**390**	

The number and type of aircraft expected to base at an airport is dependent on many factors such as communications, available facilities, airport services, airport proximity and access, aircraft basing capacity available at nearby airports, airspace congestion, and other similar considerations. General aviation aircraft operators are particularly sensitive to the quality and location of their basing facility, with proximity of home and work often identified as the primary considerations in the selection of an aircraft basing location.

Table B25 provides the historical based aircraft data for BFI compared to the based aircraft within the Puget Sound Region, the State of Washington, and the nation, as well as BFI's market share for each region. As with the enplanement analysis, this analysis indicates a fluctuation in BFI's market shares with no discernable trends that can be used for forecasting. Therefore, market share analysis is not a viable methodology for projecting based aircraft due to low predictive reliability.

Table B25 **BFI MARKET SHARE OF BASED AIRCRAFT COMPARISON (2000-2015)**

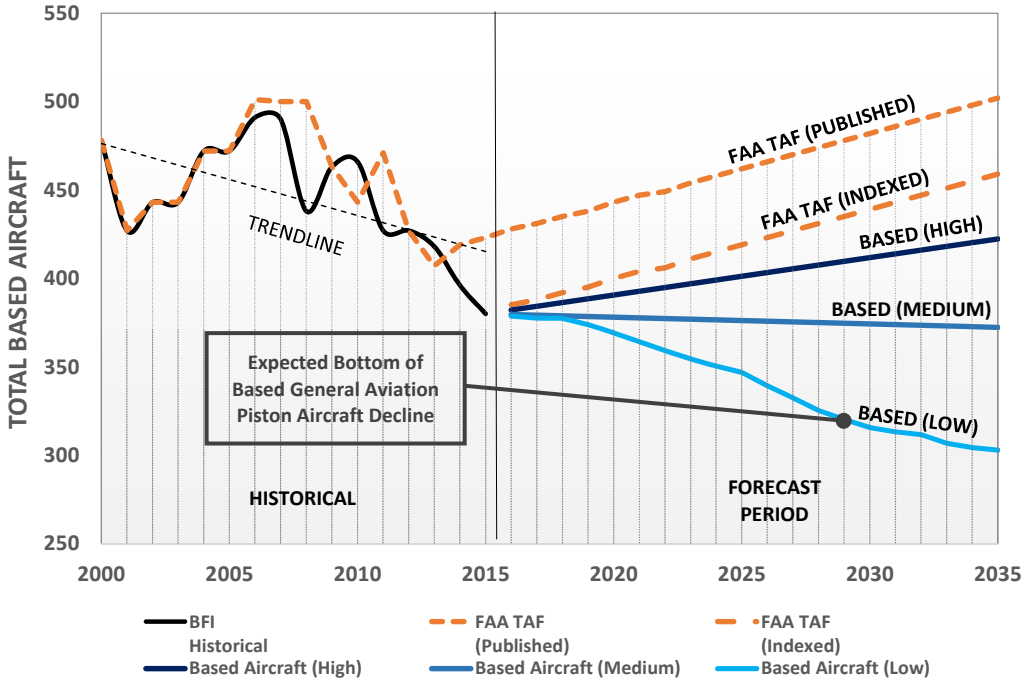
Year	BFI	Puget Sound Region	Market Share	State of Washington	Market Share	United States	Market Share
2000	478	2,360	20.25%	5,872	8.14%	179,719	0.27%
2001	427	2,375	17.98%	6,273	6.81%	186,731	0.23%
2002	443	2,455	18.05%	6,418	6.90%	188,757	0.23%
2003	443	2,485	17.83%	6,475	6.84%	190,101	0.23%
2004	472	2,485	18.99%	6,467	7.30%	193,041	0.24%
2005	472	2,549	18.52%	6,631	7.12%	197,214	0.24%
2006	491	2,623	18.72%	6,845	7.17%	197,301	0.25%
2007	490	2,661	18.41%	7,121	6.88%	199,608	0.25%
2008	438	2,335	18.76%	6,048	7.24%	175,579	0.25%
2009	463	2,426	19.09%	6,148	7.53%	177,432	0.26%
2010	470	2,387	19.69%	5,963	7.88%	165,472	0.28%
2011	418	2,234	18.71%	5,651	7.40%	166,953	0.25%
2012	396	2,149	18.43%	5,587	7.09%	170,375	0.23%
2013	380	2,275	16.70%	5,554	6.84%	163,994	0.23%
2014	478	2,360	20.25%	5,872	8.14%	179,719	0.27%
2015	491	2,623	18.72%	6,845	7.17%	197,301	0.25%
Average Market Share			**18.74%**		**7.28%**		**0.25%**

***SOURCE**: FAA TAF (2015 to 2035) and BFI Airport Records.*

Figure B11 graphs the based aircraft between 2000 and 2015. In addition, the graph provides the FAA TAF forecast (actual and indexed to 2015 based aircraft levels) along with the preliminary range of low, medium, and high MP Update forecasts. The FAA TAF based aircraft projection, which is projected using a top-down forecasts method, results in a high forecast level as a consequence of using a high based aircraft count starting in 2015 (423 versus the actual 380 based aircraft). For this reason, the FAA TAF has been indexed downward to reflect the actual 380 based aircraft. Based aircraft were projected using several BFI historic trend methods combined with FAA industry forecast growth rates by major aircraft type (see **Table B26**). The low forecast reflects a continued loss of piston based aircraft. The growth forecast scenarios reflect a slowing decline of piston based aircraft, coupled with a greater proportion of business-corporate general aviation utilization increases, including the potential influx of new high-end service operator tenants at BFI.

Preferred Based Aircraft Forecast. The preferred based aircraft forecast was derived from a bottom-up approach, by applying FAA Aerospace Forecasts general aviation forecast rates to each of the major aircraft types (single piston, twin piston, turboprop, business jet, helicopter) based at BFI in 2014 and 2015. In addition, general aviation aircraft production publications were referenced to provide a more detailed understanding of delivery trends for particular aircraft models, such as the small, medium, and large cabin business jets, and piston versus turbine helicopter production. The preferred forecast method generates a slight net decline in based aircraft, as evident of the past 10 years of piston aircraft trends, which is a reasonable expectation for BFI, at least in the near-term five to 10-year forecast horizon. The preferred forecast results in a total of 372 based aircraft by 2035, representing a net decline of eight aircraft. The piston fleet is projected to decline by 1.2 percent, the turboprop fleet increases 0.5 percent, and the business jet increases 2.0 percent annually.

Figure B11 **BASED AIRCRAFT TRENDS AND FORECAST PROJECTION SCENARIOS**



***SOURCE**: Trend – BFI Airport Records | Forecast – Consultant Forecast (April 2016).*

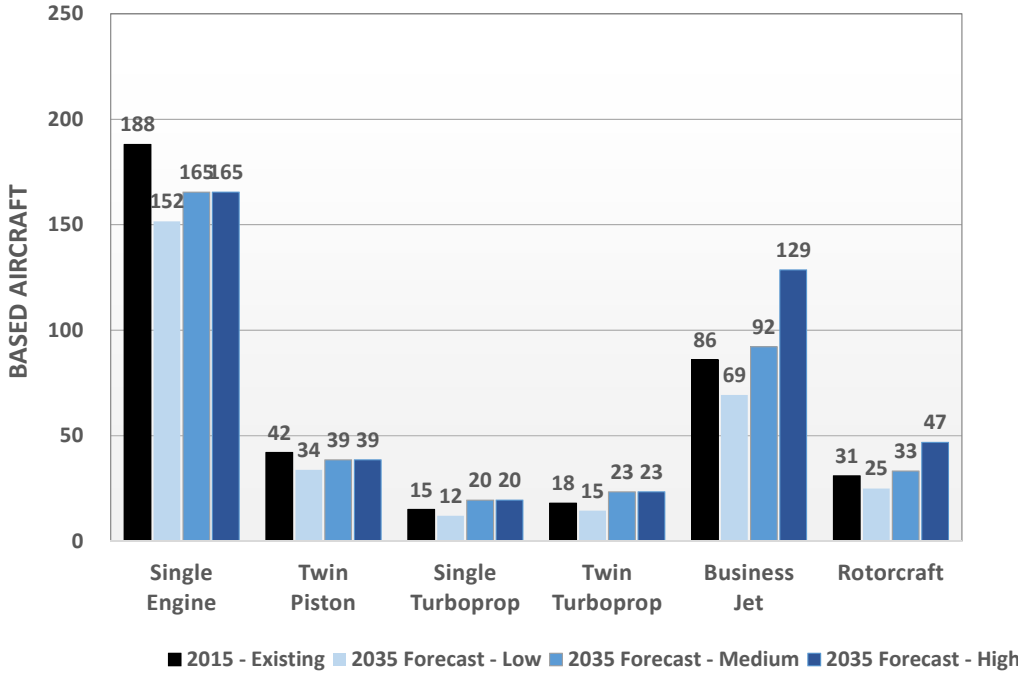
Table B26 **BFI BASED AIRCRAFT HISTORICAL AND FORECAST SCENARIOS (2000 TO 2035)**

Year	FAA TAF (Published)	FAA TAF (Indexed)	Based Aircraft MP Update Forecasts		
			High	Medium	Low
2000	478	478	478	478	478
2001	427	427	427	427	427
2002	443	443	443	443	443
2003	443	443	443	443	443
2004	472	472	472	472	472
2005	472	472	472	472	472
2006	501	501	491	491	491
2007	500	500	490	490	490
2008	500	500	438	438	438
2009	463	463	463	463	463
2010	443	443	466	466	466
2011	471	471	427	427	427
2012	427	427	427	427	427
2013	407	407	418	418	418
2014	419	419	396	396	396
2015	423	423	380	380	380
2020	**443**	**400**	**391**	**378**	**369**
2025	**462**	**419**	**401**	**376**	**347**
2030	**482**	**439**	**412**	**374**	**316**
2035	**502**	**459**	**422**	**372**	**303**
% CAGR	**0.9%**	**0.4%**	**0.5%**	**-0.1%**	**-1.1%**

SOURCE: *Historical: FAA and BFI Based Aircraft Records.*
Forecast: Consultant Forecast (2015 to 2035), Conducted April 2016.
Note: Dark box indicates recommended forecast scenario.

Figure B12 depicts the forecast of based aircraft by aircraft user group. The forecasts continue to show a decline in piston aircraft, a marginal increase in turboprop, and a moderate increase in business jet and helicopter. It is anticipated the based piston fleet will stabilize between 150 and 165 based aircraft. The based turbine aircraft segment is expected to increase due to a continued expanding demand and concentration of business-class aircraft at BFI.

Figure B12 **BASED AIRCRAFT TYPES BY FORECAST PROJECTION SCENARIOS**



***SOURCE**: Consultant Based Aircraft Forecast Scenarios (2016 to 2035), Conducted April 2016.*

Summary

It is anticipated that BFI will see some growth in most activity areas during the 20-year planning period. By 2035, approximately 37,000 enplanements and nearly 171,000 operations are projected to occur. Continued declines are anticipated in in both operations and based aircraft related to the recreational/training sector of general aviation, which are projected to be offset by steady and continued growth of the business/corporate general aviation sector (see **Table B27**).

Table B27 **SUMMARY OF AVIATION ACTIVITY FORECASTS 2015-2035**

Airport Activity	2015	2020	2025	2030	2035	CAGR 2015-2035
Passenger Enplanements	**18,945**	**20,211**	**21,562**	**23,004**	**24,541**	**1.30%**
Scheduled (Kenmore Air)	10,817	11,181	11,546	11,910	12,270	0.63%
Non-Scheduled	8,128	9,030	10,016	11,094	12,271	2.08%
Operations						
Commercial Service	***7,844***	***9,174***	***10,638***	***11,293***	***11,297***	***2.15%***
Scheduled (Kenmore Air)	1,821	1,882	1,982	2,010	2,100	0.7%
Non-Scheduled	1,825	2,095	2,359	2,730	3,078	2.6%
Boeing	4,198	5,197	6,297	6,553	6,819	2.46%
Air Cargo	***12,336***	***12,965***	***13,627***	***14,322***	***15,052***	***1.0%***
General Aviation	***143,783***	***135,430***	***127,151***	***134,394***	***142,039***	***-0.06%***
Air Taxi	20,503	21,937	23,470	25,110	26,866	1.36%
Corporate	26,404	30,403	35,099	40,312	46,418	2.86%
Recreational/Training	96,876	83,090	68,672	68,672	68,755	-1.7%
Military	***1,608***	***1,669***	***1,733***	***1,799***	***1,867***	***0.75%***
Total Operations	**165,571**	**159,239**	**153,148**	**161,807**	**170,956**	**0.2%**
Based Aircraft	**380**	**378**	**376**	**374**	**372**	**-0.1%**
Air Cargo (Enplaned & Deplaned in tons)	134,371	144,196	154,021	163,846	173,671	**1.29%**

***SOURCE**: Forecast: Consultant Forecast (2015 to 2035), Conducted April 2016.*

Runway Design Code (RDC)/Critical Aircraft Analysis

The forecast of aircraft types using, and those that are expected to use BFI offers insight on the designation of the appropriate Runway Design Code (RDC) for each runway. FAA Advisory Circular 150/5300-13A, Change 1, *Airport Design*, provides guidance for this determination. The RDC is based on the "Design Aircraft" that is determined to be the most critical aircraft, or group of aircraft, using or projected to use a runway on a regular basis. Several FAA guidance documents define regular basis as 500 or more annual operations (landing and takeoffs are considered as separate operations). It is important to note that the 500 annual operations "substantial use" threshold is not a cap or limit on aircraft operations, but rather a planning metric for consideration of the potential need to upgrade airport facilities to a particular design standard. The identified design aircraft can either be one aircraft, or a composite of more than one aircraft, representing the highest Aircraft Approach Category (AAC) and Airplane Design Group (ADG).

The selected AAC and ADG are then combined to represent the Runway Design Code (RDC) of a particular runway, and the RDC determines the dimensional criteria standards that are applicable to that runway. The first component (i.e., the AAC) is depicted by a letter and relates to the aircraft approach speed. The second component (i.e., the ADG), is depicted by a roman numeral and relates to the aircraft wingspan and tail height. The third component relates to the visibility minimums for the runway, defined as RVR values in measurements of feet at 1,200, 1,600, 2,400, 4,000, and 5,000 (corresponding to lower than ¼ mile, lower than ½ mile but not lower than ¼ mile, lower than ¾ mile but not lower than ½ mile, lower than one mile but not lower than ¾ mile, and not lower than 1 mile respectively).

The FAA's specified criteria for AAC, ADG, and Visibility Minimums, as referenced in AC 150/5300-13A, *Airport Design, Change 1,* are presented in **Tables B28**, **B29**, and **B30**.

Table B28 **AIRCRAFT APPROACH CATEGORY (AAC)**

AAC	V_{Ref}/Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

SOURCE: *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014.*

Table B29 **AIRPLANE DESIGN GROUP (ADG)**

ADG	Tail Height	Wingspan
I	Less than 20 Feet	Less than 49 Feet
II	Greater than 20, but less than 30 Feet	Greater than 49, but less than 79 Feet
III	Greater than 30, but less than 45 Feet	Greater than 79, but less than 118 Feet
IV	Greater than 45, but less than 60 Feet	Greater than 118, but less than 171 Feet
V	Greater than 60, but less than 66 Feet	Greater than 171, but less than 214 Feet
VI	Greater than 66, but less than 80 Feet	Greater than 214, but less than 262 Feet

SOURCE: *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014.*

Table B30 **VISIBILITY MINIMUMS**

RVR (ft)	Instrument Flight Visibility Category (statute miles)
VIS	Visual Approach
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than ¾ mile
2400	Lower than ¾ mile but not lower than ½ mile
1600	Lower than ½ mile but not lower than ¼ mile
1200	Lower than ¼ mile

SOURCE: *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014.*

Runways

Runway 14R/32L (Primary). According to operational data collected in part from BFI using the Passur Aerospace data tool and information provided by BFI Operations Staff, the Airport's primary runway (Runway 14R/32L), has a RDC of D-IV, with the most critical aircraft being a combination of commercial service jets. The design aircraft for Runway 14R/32L is various models of the Boeing 767 (200 and 300 series). Each of the aircraft has an ADG of IV and an AAC of C & D. The operations per each aircraft are depicted in **Table B31**.

Table B31 **RUNWAY 14R/32L CRITICAL AIRCRAFT OPERATIONS, 2015**

Aircraft	Operations
Boeing 767 (All Models)	4,200
Boeing 767-300 ER & ERW	2,666
Total	**4,200**

SOURCE: *BFI Passur Data estimates & Airport Staff.*

Runway 14R/32L (Secondary). The Airport's secondary parallel runway (Runway 14L/32R) has a RDC of B-I (Small Aircraft Only), with the most critical aircraft being a combination of various small general aviation aircraft (e.g., the Piper Navajo PA, Cessna's 172 Skyhawk and 182 Skylane, and the Cirrus SR 22). These aircraft have an ADG of I and an AAC of A & B. The estimated operations for each aircraft are depicted in the **Table B32**.

Table B32 **RUNWAY 14L/32R CRITICAL AIRCRAFT OPERATIONS, 2015**

Aircraft	Operations
Piper Navajo PA	5,502
Cessna 172 Skyhawk	10,599
Cessna 182 Skylane	9,652
Cirrus SR 22	1,561
Total	27,314

SOURCE: *BFI Passur Data estimates.*

Aircraft depicting the various RDCs at BFI are presented in **Figure B13**.

Runway 13R/31L

ARC C/D-IV: **LARGE COMMERCIAL JET**

> ***Boeing 767-200 & 300***
> **Boeing 757-200**
> **Airbus A-300**
> **Boeing MD-11**

Runway 13L/31R

RDC A/B-I: **Small General Aviation: ≥ 12,500 lbs.**

> ***Piper Navajo PA***
> **Cessna 172 Skyhawk**
> **Cessna 182 Skylane**
> **Cirrus SR 22**

Representative Aircraft not to scale.

FIGURE B13 **Representative Aircraft by Runway Design Code (RDC)**

Mead &Hunt

Forecast Approval

The Aviation Forecast Guidance APP-400 specifies that local aviation forecasts are approved by regional airports division offices or airports district offices (ADOs). Local forecasts that are consistent with the FAA's Terminal Area Forecast (i.e., the local forecast differs by less than 10 percent in the first five years, differs by less than 15 percent in the remaining forecast periods, and does not affect the timing or scale of an airport project) do not need to be coordinated with APP-400 and APO-110. Local forecasts that are not consistent with the TAF, but which do not affect the timing or scale of an airport project and do not impact the analysis of a National Environmental Policy Act (NEPA) document or Benefit Cost Analysis (BCA), may be accepted (not approved) for information purposes by the regional office/ADO without APP/APO coordination.

Tables B33 & **B34** present BFI's FAA TAF forecast comparison summary and the planning forecast summary. As can be noted in **Table B33**, BFI's projected aircraft operations are within the specified TAF thresholds of 10 & 15 percent for FAA acceptance. However, the forecasted passenger enplanements do not comply with these specified thresholds due to a filing error on a T-100 Market All Carrier Report by Sierra Pacific Airlines, who is a large certificated air carrier that serves BFI. It was determined by FAA Headquarters that this filing error likely resulted in an underreporting of approximately 2,562 enplanements to the Bureau of Transportation Statistics (BTS) database, which is the source for FAA's existing TAF enplanement data.

FAA Headquarters believes Airport Staff correctly reported those enplanements when they responded to the FAA's preliminary enplanement data request to determine AIP funding, and therefore the enplanements were accounted for in the 2015 ACAIS total (see **Appendix One** for a copy of the 2015 BFI ACAIS report) but were not included in the corresponding TAF total for the same year. In addition, the TAF does not include enplanements from Nonscheduled/On-Demand Air Carriers, filing FAA Form 1800-31, which would account for an additional 402 enplanement differential between the 2015 base year ACAIS and TAF totals. After accounting for any additional discrepancy between the calendar year and fiscal year data sets, this should explain the difference between the 2015 base year ACAIS and TAF enplanement totals that result in BFI's master plan enplanement forecast exceeding the 10 percent allowance for the five-year planning horizon and the 15 percent allowance for the 10-year planning horizon.

The FAA ADO has concurred with the stated reasons for the discrepancy in the 2015 base year enplanement counts and has approved the BFI Master Plan Update forecasts, as presented (see **Appendix Two** for a copy of the FAA Forecast Approval Letter).

Table B33 **FAA TAF FORECAST COMPARISON, 2015-2030**

Forecast Component	Year	Airport Forecast [1]	FAA TAF [2]	AF/TAF (% Difference)
Passenger Enplanements				
Base yr.	2015	18,945 [3]	15,236 [4]	24.3%
Base yr. + 5yrs.	2020	20,211	16,373	23.4%
Base yr. + 10yrs.	2025	21,562	18,340	17.6%
Base yr. + 15yrs.	2030	23,004	20,565	11.9%
Commercial Operations [5]				
Base yr.	2015	40,683	40,072	1.5%
Base yr. + 5yrs.	2020	44,076	43,418	1.5%
Base yr. + 10yrs.	2025	47,735	47,106	1.3%
Base yr. + 15yrs.	2030	50,725	51,110	-0.8%
Total Operations				
Base yr.	2015	165,571	170,950	-3.1%
Base yr. + 5yrs.	2020	159,239	173,347	-8.1%
Base yr. + 10yrs.	2025	153,148	178,563	-14.2%
Base yr. + 15yrs.	2030	161,807	184,115	-12.1%

SOURCE: *Forecast: Consultant Forecast (2015 to 2035), Conducted April 2017.*

Notes:
[1] The Airport Forecast is based on Calendar Year (CY) data.
[2] TAF data is based on the U.S. Government Fiscal Year (FY) basis (October through September).
[3] Actual CY ACAIS data for 2015.
[4] Total does not include accounting of 2,974 base year enplanements due to a T-100 Market All Carrier Report filing error and non-reporting of enplanements by Nonscheduled/On-Demand Air Carriers.
[5] TAF projections of commercial operations include air cargo operations and some general aviation air taxi operations. The airport forecasts include operations of commercial service airline aircraft, air cargo aircraft, air taxi aircraft, and Boeing production/delivery aircraft projections.

Table B34 **FAA TAF - AIRPORT PLANNING FORECAST SUMMARY**

Forecast Component	Base Yr. Level 2015	Base Yr. + 1yr. 2016	Base Yr. + 5yrs. 2020	Base Yr. + 10yrs. 2025	Base Yr. + 15yrs. 2030	2030 % Change
Passenger Enplanements [1]	**18,945**	**19,628**	**20,211**	**21,562**	**23,004**	**1.3%**
Air Carrier (Non-Scheduled)	8,128	8,302	9,030	10,016	11,094	2.1%
Commuter (Scheduled)	10,817	10,890	11,181	11,546	11,910	0.6%
Annual Aircraft Operations[1]	**165,571**	**160,623**	**159,239**	**153,148**	**161,807**	**-0.2%**
Itinerant	**129,648**	**126,007**	**125,341**	**121,256**	**128,112**	**-0.1%**
Air Carrier	3,646	3,710	3,977	4,341	4,740	1.8%
Commuter/Air Taxi	37,037	37,639	40,099	43,394	45,985	1.5%
Total Commercial	**40,683**	**41,349**	**44,076**	**47,735**	**50,725**	**1.5%**
General Aviation	88,000	83,686	80,263	72,482	76,307	-0.9%
Military	965	972	1,002	1,040	1,079	0.8%
Local	**35,923**	**34,616**	**33,898**	**31,892**	**33,696**	**-0.4%**
General Aviation	35,280	33,968	33,230	31,199	32,976	-0.4%
Military	643	648	668	693	719	0.8%
Instrument Operations [1]	58,088	56,352	55,866	53,730	56,768	-0.2%
Peak Hour Operations [1]	93	90	86	91	96	0.2%
Cargo/Mail (Enp+Dep Tons) [1]	134,371	136,336	144,196	154,021	163,846	1.3%
Based Aircraft (Rounded) [1]	**380**	**379**	**379**	**377**	**375**	**-0.1%**
Single Engine (Non-Jet)	203	202	198	194	189	-0.5%
Multi Engine (Non-Jet)	60	60	61	62	62	0.2%
Jet	86	86	88	89	91	0.4%
Helicopter	31	31	32	32	33	0.4%
Other	N/A	N/A	N/A	N/A	N/A	N/A
Average Aircraft Size (seats)						
Air Carrier	125.0	127.0	130.0	132.0	135.0	--
Commuter	9.0	9.0	9.0	9.0	9.0	--
Avg. Enplaning Load Factor						
Air Carrier	60%	60%	60%	60%	60%	--
Commuter	45%	48%	50%	50%	50%	--
GA Ops Per Based Aircraft	436	424	420	406	431	--

***SOURCE**: Forecast: Consultant Forecast (2015 to 2035), Conducted April 2017.*

Notes: [1] The Airport Forecast is based on Calendar Year (CY) data.

C Capacity & Facility Requirements

INTRODUCTION. In efforts to quantify an airport's future facility needs, it is necessary to translate the forecasted aviation activity into specific physical requirements for King County International Airport/Boeing Field (BFI or Airport). Therefore, this chapter analyzes the actual types and quantities of facilities and/or the required improvements to existing facilities needed to accommodate the projected demand safely and efficiently. For those components determined to be deficient, the type, size, or amount of facilities required to meet the demand is identified. Two separate analyses are included: those requirements related to airside facilities, and those requirements related to landside facilities.

This analysis uses the forecasts presented in the preceding chapter for establishing future development at the Airport. This is not intended to dismiss the possibility that either accelerated growth or consistently higher or lower levels of activity may occur. Aviation activity levels should be monitored for consistency with the forecasts. In addition, an airport's runway(s) and taxiways should be designed in accordance with the specified Runway Design Code (RDC) based on the "Design Aircraft". The FAA defines "Design Aircraft" as an aircraft or group of aircraft within an RDC that have a minimum of 500 annual operations at an airport. The existing Airport Layout Plan (ALP) indicates Runway 14R/32L is designated as RDC D-IV, while Runway 14L/32R is designated as RDC B-I (Small Aircraft). Based on the critical aircraft analysis conducted for this MP Update, these existing RDCs have been confirmed. Therefore, the following RDCs at BFI will be evaluated for this planning effort:

- **Runway 14R/32L: RDC D-IV-4000**
- **Runway 14L/32R: RDC B-I (Small Aircraft)-Visual**

Airfield Capacity Methodology

The capacity of an airfield is primarily a function of the major aircraft operating surfaces that compose the facility and the configuration of those surfaces (runways and taxiways). However, it is also related to and considered in conjunction with environmental conditions, wind coverage, airspace utilization, and the availability and type of navigational aids. Capacity refers to the number of aircraft operations that a facility can accommodate either on an hourly or yearly basis. It does not refer to the size or weight of aircraft.

The evaluation method used to determine the capacity of the airside facilities to accommodate aviation operational demand is described in the following narrative. Evaluation of this capability is expressed in terms of potential excesses and deficiencies in capacity. The methodology used for the measurement of airfield capacity is described in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

From this methodology, airfield capacity is defined in the following terms:

- **Hourly Capacity of Runways:** The maximum number of aircraft that can be accommodated under conditions of continuous demand during a one-hour period.
- **Annual Service Volume (ASV):** A reasonable estimate of an airport's annual capacity (i.e., level of annual aircraft operations that will result in an average annual aircraft delay of approximately one to four minutes).

The capacity of an airport's airside facilities is a function of several factors. These factors include the layout of the airfield, local environmental conditions, specific characteristics of local aviation demand, and air traffic control requirements. The relationship of these factors and their cumulative impact on airfield capacity are examined in the following paragraphs.

Airfield Layout

The arrangement and interaction of airfield components (runways, taxiways, and ramp entrances) refers to the layout or "design" of the airfield. As previously described, BFI is operated with a parallel runway configuration (Runway 14R/32L & Runway 14L/32R) that are oriented in a general northwest-southeast direction and supported by a system of parallel and connecting taxiways.

Environmental Conditions

Climatological conditions specific to the location of an airport not only influence the layout of the airfield, but also affect the use of the runway system. Surface wind conditions have a direct effect on the operations of an airport; runways not oriented to take the fullest advantage of prevailing winds will restrict the capacity of the airport to varying degrees. When landing and taking off, aircraft can operate properly on a runway if the wind component perpendicular to the direction of travel (defined as a crosswind) is not excessive. The wind coverage analysis translates the crosswind velocity and direction into a "crosswind component". Smaller aircraft are more easily affected by crosswinds than larger aircraft, so therefore, they have a smaller crosswind component.

Ceiling and Visibility. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, describes three categories of ceiling and visibility minimums for use in both capacity and delay calculations. Visual Flight Rules (VFR) conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level and the visibility is at least three statute miles. Instrument Flight Rules (IFR) conditions occur when the reported cloud ceiling is at least 500 feet, but less than 1,000 feet and/or visibility is at least one statute mile, but less than three statute miles. Poor Visibility and Ceiling (PVC) conditions exist whenever the cloud ceiling is less than 500 feet, and/or the visibility is less than one statute mile. However, meteorological data obtained for BFI from the National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center (NCDC) (2006 to 2015) for use in this planning effort, have been categorized in more specific terms.

A summary of this data is presented in the following text and **Table C1**.

- **VFR Conditions:** A cloud ceiling equal to or greater than 1,000 feet above ground level (AGL) and the horizontal visibility is equal to or greater than 3 statute miles (SM). These conditions occur at the Airport approximately 91.7 percent of the time annually.
- **VFR minimums to RNAV GPS Approach minimums (Runway 14R):** A cloud ceiling less than 1,000 feet AGL and/or visibility less than 3 SM, but ceiling is equal to or greater than 680[1] feet AGL and visibility is equal to or greater than ¾ SM. These conditions occur at the Airport approximately 4.2 percent of the time annually.
- **VFR minimums to RNAV RNP Approach minimums (Runway 14R):** A cloud ceiling less than 1,000 feet AGL and/or visibility less than 3 SM, but ceiling is equal to or greater than 542[2] feet AGL and visibility is equal to or greater than 1½ SM. These conditions occur at the Airport approximately 4.5 percent of the time annually.
- **VFR minimums to ILS Approach minimums (Runway 32L):** A cloud ceiling less than 1,000 feet AGL and/or visibility less than 3 SM, but ceiling is equal to or greater than 428 feet AGL and visibility is equal to or greater than 1½ SM. These conditions occur at the Airport approximately 5.1 percent of the time annually.
- **VFR minimums to ILS Approach minimums (Runway 14R):** A cloud ceiling less than 1,000 feet AGL and/or visibility less than 3 SM, but ceiling is equal to or greater than 308[3] feet AGL and visibility is equal to or greater than ¾[4] SM. These conditions occur at the Airport approximately 6.3 percent of the time annually.
- **Below Runway 14R Instrument Approach Minimums:** A cloud ceiling less than 308 feet AGL and/or visibility less than ¾ SM. These conditions occur at the Airport approximately 2.0 percent of the time annually.
- **VFR minimums to Cat I ILS Approach minimums (Potential):** A cloud ceiling less than 1,000 feet AGL and/or visibility less than 3 SM, but ceiling is equal to or greater than 200 feet AGL and visibility is equal to or greater than ½ SM. These conditions occur at the Airport approximately 6.8 percent of the time annually.
- **VFR minimums to Cat II ILS Approach minimums (Potential):** A cloud ceiling less than 1,000 feet AGL and/or visibility less than 3 SM, but ceiling is equal to or greater than 100 feet AGL and visibility is equal to or greater than ¼ SM. These conditions occur at the Airport approximately 7.1 percent of the time annually.

1 Ceiling minimum for procedure was lowered from 703' to 662' in August 2017 and raised to 680' in 2019.
2 Ceiling minimum for procedure was increased from 505' to 524' in August 2017 and raised to 542' in 2019.
3 Ceiling minimum for procedure was increased from 273' to 290' in August 2017 and raised to 308' in 2019.
4 Visibility minimum for procedure was lowered from 1 mile to ¾ mile in August 2017.

Table C1 **EXISTING METEOROLOGICAL CONDITIONS**

Weather Condition	Percent	Approximate Days Per Year
Existing		
VFR (Greater Than: 1,000 FT; 3 SM)	91.7%	334.7
MVFR (1,000 - 3,000 FT; 3 - 5 SM)[1]	*21.7%*	*79.2*
IFR (680-1,000 FT; ¾-3 SM) to VFR Mins. (Runway 14R)	4.2%	15.3
IFR (542-1,000 FT; 1.5-3 SM) to VFR Mins. (Runway 14R)	4.5%	16.4
IFR (428-1,000 FT; 1.5-3 SM) to VFR Mins. (Runway 32L)	5.1%	18.6
IFR (308-1,000 FT; ¾-3 SM) to VFR Mins. (Runway 14R)	6.3%	22.9
Below Minimums (0-308 FT; 0- ¾ SM)	2.0%	7.3
Potential/Comparative IFR		
IFR (200-1,000 FT; ½-3 SM) to VFR Mins. (Cat I ILS)	6.8%	24.8
IFR (100-1,000 FT; ¼-3 SM) to VFR Mins. (Cat II ILS)	7.1%	25.9

SOURCE: *Weather analysis tabulation provided by Mead & Hunt utilizing data obtained from NOAA, NCDC Station 727935/BFI. Period of Record: 2006-2015.*

[1] Marginal VFR (MVFR) is a subset of the VFR total.

Therefore, in consideration of the existing weather data available for analysis from the existing BFI Automated Surface Observing System (ASOS), it can be noted that approximately 75 percent of the available IFR accessibility is provided by the Runway 14R ILS offering a 290-foot ceiling and ¾-statute mile visibility minimums. Thus, the Airport can be expected to experience VFR conditions approximately 91.7 percent of the time, IFR conditions approximately 6.3 percent of the time, and below minimums approximately 2.0 percent of the time. Additional IFR data, demonstrating potential lower instrument approach minimums (e.g., Cat I and Cat II ILS) has also been provided for comparative analysis. These findings will be evaluated in a later section of this document to identify potential future instrument procedure enhancements or revisions for the Airport.

Wind Coverage. Surface wind conditions (i.e., direction and speed) generally determine the desired alignment and configurations of the runway system. Runways that are not oriented to take advantage of prevailing winds will restrict the capacity of an airport. Wind conditions affect all aircraft in varying degrees; however, the ability to land and takeoff in crosswind conditions varies according to pilot proficiency and aircraft type. Generally, the smaller the aircraft, the more it is affected by crosswinds.

To determine wind velocity and direction at BFI, wind data to construct the all-weather wind rose was obtained for the years 2006-2015 from observations taken at the Airport. There were approximately 97,068 observations available for analysis during this ten-year period. The allowable crosswind component is dependent upon the RDC for the type of aircraft that utilize the Airport on a regular basis. As identified previously, the RDC for Runway 14R/32L is D-IV and Runway 14L/32R is B-I (Small Aircraft).

In consideration of the RDC D-IV classification for Runway 14R/32L, these standards specify that the 20-knot crosswind component be utilized for the analysis. In consideration of the RDC B-I (Small Aircraft) classification for Runway 14L/32R, these standards specify that the 10.5-knot crosswind component be utilized for the analysis, which is considered the maximum crosswind component to serve small single and multi-engine aircraft. Therefore, depending on runway designation, the 20-knot and 10.5-knot crosswind components, were analyzed. **Figure C1** illustrates the all-weather wind coverage provided at BFI.

The desirable wind coverage for an airport's runway system is 95 percent. This means that the runway orientation and configuration should be developed, so that the maximum crosswind component is not exceeded more than five percent of the time annually. **Table C2** the wind coverage offered by the Airport's existing runway system, including the coverage for each runway end. Based on the all-weather wind analysis for BFI, utilizing data from the NCDC and the FAA Wind Analysis tool, the existing runway configuration provides excellent wind coverage (i.e., more than 99 percent for the 10.5-knot crosswind component. Therefore, no additional runways are required from a *wind* coverage standpoint. In consideration of a single runway end, Runways 14R & 14L offer superior wind coverage for the all-weather condition.

Table C2 **ALL-WEATHER WIND COVERAGE SUMMARY**

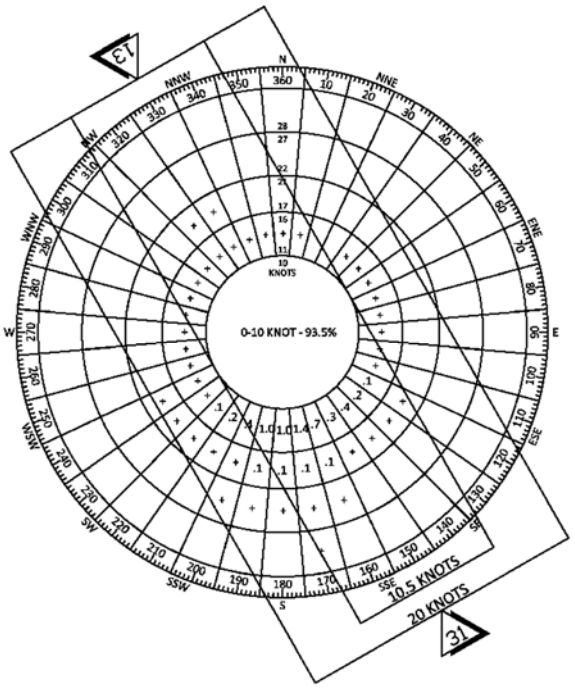
Runway	10.5-Knot	13-Knot	16-Knot	20-Knot
Runways 14R/32L & 14L/32R	99.2%	---	---	100%
Runways 14R & 14L	93.6%	---	---	94.4%
Runways 32L & 32R	72.5%	---	---	72.7%
Combined Runways	99.2%	---	---	100%

SOURCE: *Wind analysis tabulation provided by Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from NOAA, NCDC Station 727935/BFI. Period of Record: 2006-2015.*

Note: A 5-knot tailwind component was used for the individual runway end analysis.

Figure C1 **ALL-WEATHER WIND ROSE**

SOURCE: *Wind rose provided by Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from NOAA, NCDC Station 727935/BFI. Period of Record: 2006-2015.*



The Airport is served by five instrument approach procedures (four to Runway 14R and one to Runway 32L). To analyze the effectiveness of the current approaches an IFR wind analysis has been conducted. Using the wind data obtained from the NCDC, **Table C3** quantifies the wind coverage provided during IFR meteorological weather conditions (i.e., ceiling less than 1,000 feet AGL and/or visibility less than three SM) to each runway and the individual runway ends. From the analysis, it can be determined that Runway 14R offers the best overall wind coverage under IFR meteorological conditions, which is consistent with the findings of the all-weather wind analysis. **Figure C2** graphically portrays the IFR wind coverage.

Table C3 **IFR WEATHER WIND COVERAGE SUMMARY**

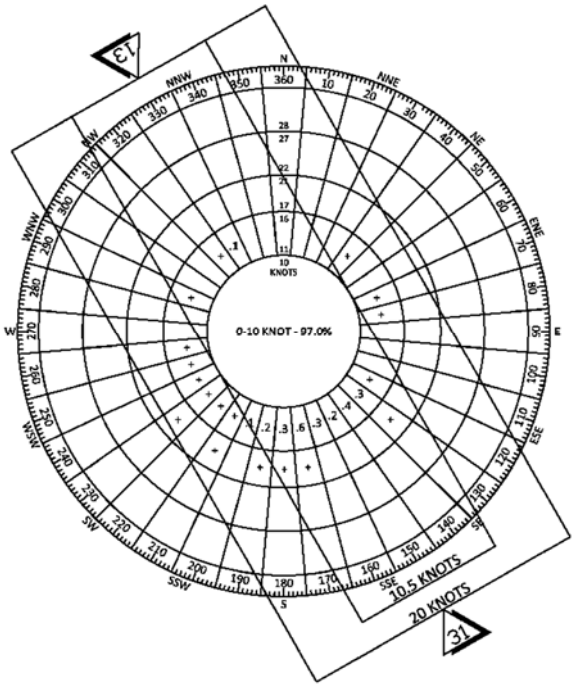
Runway	10.5-Knot	13-Knot	16-Knot	20-Knot
Runways 14R & 32L	**99.7%**	---	---	**100%**
Runway 14R	96.9%	---	---	97.2%
Runway 32L	78.8%	---	---	79.0%

SOURCE: *Wind analysis tabulation provided by Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from NOAA, NCDC Station 727935/BFI. Period of Record: 2006-2015.*

Note: A 5-knot tailwind component was used for the individual runway end analysis.

Figure C2 **IFR WEATHER WIND ROSE**

SOURCE: *Wind rose provided by Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from NOAA, NCDC Station 727935/BFI. Period of Record: 2006-2015.*



Characteristics of Demand

Certain site-specific characteristics related to aviation use and aircraft fleet impact the capacity of the airfield. These characteristics include runway use, aircraft mix, percent arrivals, touch-and-go operations, and exit taxiways.

Aircraft Mix. The capacity of a runway is dependent on the type and size of the aircraft that utilize the facility. Aircraft are categorized into four classes: Classes A and B consist of small single engine and twin-engine aircraft (both prop and jet), weighing 12,500 pounds or less, which are representative of the smaller general aviation fleet. Class C and D aircraft (aircraft weighing between 12,500 - 300,000 pounds and greater than 300,000 pounds respectively) are large jet and propeller aircraft typical of those utilized by the larger general aviation fleet, airline industry, and the military. Aircraft mix is defined as the relative percentage of operations conducted by each of these four classes of aircraft. In consideration of the forecasts presented in the previous chapter, an aircraft mix table has been generated.

Table C4 presents the projected operational mix for the selected forecasts.

Table C4 **AIRCRAFT CLASS MIX FORECAST, 2015-2035**

Year	VFR Conditions			IFR Conditions		
	Class A & B	Class C	Class D	Class A & B	Class C	Class D
2015[1]	72.3%	25.6%	2.1%	37.6%	58.5%	4.8%
2020	69.0%	28.0%	2.1%	36.0%	60.0%	4.7%
2025	66.0%	32.0%	2.2%	34.5%	61.5%	4.5%
2030	62.5%	36.0%	2.3%	33.0%	63.0%	4.3%
2035	59.2%	38.3%	2.4%	31.4%	64.5%	4.1%

Notes: Future percentage breakdowns were estimated by Mead & Hunt.
[1] Existing percentage breakdowns were tabulated/estimated by Mead & Hunt from review of 2015 BFI Passur data.
Class A - Small Single Engine, < 12,500 pounds. **Class B** - Small Twin-Engine, < 12,500 pounds.
Class C - 12,500 - 300,000 pounds. **Class D** - > 300,000 pounds.

Percent Arrivals. Runway capacity is also significantly influenced by the percentage of all operations that are arrivals. Because aircraft on final approach are typically given absolute priority over departures, higher percentages of arrivals during peak periods of operations will reduce the ASV. The operations mix occurring on the runway system at the Airport reflects a general balance of arrivals to departures; therefore, it will be noted in the capacity calculations that arrivals equal departures during the peak period.

Touch-and-Go Operations. A touch-and-go operation refers to an aircraft maneuver in which the aircraft performs a normal landing touchdown followed by an immediate takeoff, without stopping or taxiing clear of the runway. These operations are normally associated with training activity and are included in local operations figures when reported by an air traffic control tower. According to discussions with BFI Airport Traffic Control Tower (ATCT) staff, touch-and-go operations are estimated to represent between 10 percent and 15 percent of the total annual operations being conducted at the Airport. It is anticipated that this existing level of flight training will likely continue through the planning period; thus, the overall percentage of touch-and-go activity is projected to remain relatively constant through the planning period.

Runway Use. The use configuration of the runway system is defined by the number, location, and orientation of the active runway(s) and relates to the distribution and frequency of aircraft operations to those facilities. Both the prevailing winds in the region, the instrument approach procedure capabilities the runways, and the existing runway configuration at BFI combine to dictate the utilization of the existing runway system. In addition, the BFI ATCT has in place an existing waiver (Waiver 02-T-08) that authorizes simultaneous same direction operations, during VFR conditions, on the parallel runways by Category I[5] and Category II[6] aircraft. This operational waiver, which is authorized at the existing non-standard runway centerline separation of 377 feet, serves to increase the utilization of Runway 14L/32R by the smaller aircraft fleet and enhance the operational throughput of the Airport.

[5] Small single engine, propeller driven aircraft weighing 12,500 lbs. or less and all helicopters.
[6] Small twin engine, propeller driven aircraft weighing 12,500 lbs. or less.

According to the analysis of 2015 Passur data and estimates by BFI ATCT staff, the existing runway utilization breakdown for the Airport is presented as follows:

Runway 14R/32L @ 50.0 percent
- Runway 14R @ 34.0 percent
- Runway 32L @ 16.0 percent

Runway 14L/32R @ 50.0 percent
- Runway 14L @ 34.0 percent
- Runway 32R @ 16.0 percent

Exit Taxiways. The capacity of a runway system is greatly influenced by the ability of an aircraft to exit the runway as quickly and safely as possible. Therefore, the quantity and design of the exit taxiways can directly influence aircraft runway occupancy time and the capacity of the runway system.

Based on the location of the existing exit taxiways serving the runway system at BFI, the number of available exit taxiways for use in the capacity calculation is generally adequate. For Runway 14R/32L, in consideration of the mix index of aircraft, the capacity analysis described in the FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, gives credit to only those exit taxiways located between 3,000 and 5,500 feet from the landing threshold for aircraft operating under both VFR and IFR conditions.

Therefore, landings to each end of Runway 14R/32L received an exit factor rating of two. Due to the shorter length of Runway 14L/32R, landings to each runway end only received an exit factor of one. A taxiway exit factor rating of four is the maximum rating that can be received, and no credit given for an exit within 750 feet of another exit. Thus, the number and location of a runway's exit taxiways is one of the variables that can influence the hourly throughput capacity of the facility. Given the Airport's existing and projected operational levels, the future addition and/or repositioning of existing exit taxiways (if any) will be evaluated in conjunction with the formulation of airside development alternatives.

Air Traffic Control Rules

The FAA specifies separation criteria and operational procedures for aircraft in the vicinity of an airport contingent upon aircraft size, availability of radar, sequencing of operations, and noise abatement procedures (both advisory and/or regulatory, which may be in effect at the Airport). Typically, the impact of air traffic control on runway capacity is most influenced by aircraft separation requirements dictated by the mix of aircraft utilizing the Airport. However, as noted in the **Inventory of Existing Conditions** chapter (see page A.34), there are several existing airspace and instrument approach procedure constraints for BFI that were documented in the *2015 NextGen Airspace Optimization Study*. At present, any arrival or departure capacity constraints at SEA will also impact the operational throughput capacity of operations at BFI. The identified Air Traffic Control (ATC) enhancement opportunities for BFI are focused on a de-confliction of the airspace with SEA that would ultimately permit independent operations for both arrivals and departures between the two airports. The combination of these airspace improvements and the potential for improved instrument approach procedure minimums could positively impact the operational capacity at BFI.

Airfield Capacity Analysis

As previously described, the determination of capacity for BFI uses the methodology described in the FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*. Several assumptions are incorporated in these capacity calculations: arrivals equal departures, the percent of touch-and-go operations is between zero and 50 percent of total operations, there is a full-length parallel taxiway with ample exits and no taxiway crossing problems, there are no airspace limitations (as noted in the section above, this is not the case at BFI), the Airport has at least one runway equipped with an ILS and the necessary air traffic control facilities to carry out operations in a radar environment, IFR weather conditions occur roughly 10 percent of the time, and approximately 80 percent of the time the Airport is operated with the runway use configuration that produces the greatest hourly capacity.

Applying information generated from the preceding analyses, capacity and demand are formulated in terms of the following results:

- **Hourly Capacity of Runways** (VFR and IFR)
- **Annual Service Volume** (ASV)

Hourly Runway Capacity

Calculations of hourly capacity begin with an evaluation of each possible runway-use configuration at the Airport. With consideration of the Airport's aircraft mix index, annual percentage of touch-and-go operations, and taxiway exit rating, an hourly capacity was calculated. In its normal operating configurations, the VFR hourly capacity is potentially as high as 90 operations and the IFR hourly capacity is potentially as high as 45 operations per hour.

Annual Service Volume

After determining the hourly capacity for each potential runway use configuration, a weighted hourly capacity of the entire Airport can be calculated. The weighted hourly capacity takes into consideration not only the aircraft mix index, but the percent utilization of each possible runway use configuration as well. The weighted hourly capacity for BFI for 2015 was determined to be approximately 89.6 operations per hour. This weighted hourly capacity can then be used in calculating the ASV for the Airport.

The ASV is calculated using the following formula:

ASV = C_W x D x H

CW weighted hourly capacity
D ratio of annual demand to average daily demand
H ratio of average daily demand to average peak hour demand

With the existing runway configuration, and in consideration of existing utilization patterns, the Airport has been determined to have a daily ratio (D) of 270.5 and an hourly ratio (H) of 10.0 and, thus, an ASV of approximately 243,247. Conditions that involve the determination of the weighted hourly capacity and the daily demand are not forecast to change significantly at the Airport in the future, and those numbers will generally remain constant throughout the planning period.

The hourly ratio, as specified in the formula, is the inverse of the daily operations that occur during the peak period. In other words, as operations increase, the peak periods tend to spread out, increasing the hourly ratio (H). As the hourly ratio increases, the ASV will increase. Thus, as presented in **Table C5** even without runway improvements, the ASV at BFI could increase to over 250,000 operations by 2035.

This analysis indicates that the forecast operational demand for BFI can be adequately accommodated by the existing parallel runway configuration, operating with the current ATC waiver (Waiver 02-T-08) that permits simultaneous same direction operations for Category II aircraft during VFR conditions. It should also be noted that the Airport has historically accommodated annual operation totals in excess of 350,000, and thus it can be concluded that overall annual capacity will not be an issue within the 20-year planning period covered in this MP Update. However, the potential for future instrument approach procedure enhancements and taxiway improvements will be examined and potentially recommended for development to maintain an efficient and safe aviation operational environment.

Table C5 **AIRFIELD CAPACITY FORECAST SUMMARY, 2015-2035**

Year	Annual Operations	Design Hour Operations	Annual Service Volume (ASV)
2015	165,571	61	243,247
2020	159,239	60	237,843
2025	153,148	59	232,622
2035	170,956	61	251,158

SOURCE: *Mead & Hunt using FAA AC 150/5060-5, Airport Capacity and Delay, September 2005.*

Ground Access Capacity

The capacity of airport ground access roadway systems is a function of the maximum number of vehicles accommodated by a roadway section in a given time period. Thus, the capacity analyses for the roadways providing access to the Airport, as well as the airport roadway system, are based upon generalized planning guidelines from the *2010 Highway Capacity Manual (HCM)*, published by the Transportation Research Board. According to this manual, it is normally preferred that roadways operate below capacity to provide reasonable flow and minimize delay to the vehicles using it. The manual defines different operating conditions, known as Levels-Of-Service (LOS). The LOS is a function of the volume and composition of the traffic and the speeds attained. Six LOS have been established, designated by the letters A-F, providing for best to worst service in terms of driver satisfaction. LOS A roadways are completely unimpeded in their ability to maneuver within the traffic system. A LOS C (stable traffic flow and minimal delays) is generally the preferred level-of-service on an urban road system. Average hourly volumes of airport service roadways of typical facilities at level-of-service C and D are summarized in **Table C6**. The various ranges given in the table make their use in defining roadway capacity analysis beneficial for initial problem testing.

Table C6 **GROUND ACCESS FACILITY VOLUME**

Facility Type	Average Hourly Volume[1] (Vehicle/Hour/Lane)[2]
Freeways (Uninterrupted Flow Facilities)	1,510-1,830
Signalized Arterials – 40 mph or higher posted speed limit (Interrupted Flow Facilities) [3]	996-1,056
Signalized Arterials – 35 mph or slower posted speed limit (Interrupted Flow Facilities) [3]	444-900

SOURCE: *Mead & Hunt review of 2010 Highway Capacity Manual & Florida Department of Transportation's Generalized Peak Hour Directional Volumes.*

[1] Level-of-Service C and D.

[2] Passenger-Car Equivalents.

[3] Includes One-Way Facility Adjustment (increase) of 1.2.

Airport Area Roadway System. The breadth of ranges given in **Table C6** is most useful for initial testing of problems with roadway capacity. At BFI, this relates primarily to the existing east side and west side Principal Arterial roadways (i.e., Airport Way South and East Marginal Way South) and includes the east-west connector roadways at the north end of the Airport (i.e., Ellis Avenue South, South Albro Place, and South Hardy Street) and both Norfolk Road and South Boeing Access Road serving the south end of the Airport. According to 2014 vehicle volume/capacity data from the Seattle Comprehensive Plan / Transportation Appendix, both Airport Way South and East Marginal Way South are operating well below capacity (i.e., 38 percent and 34 percent respectively), and each roadway is designated as *Major Truck Streets* by the Seattle Department of Transportation.

Based on the 2035 projections from the *2014 Seattle Comprehensive Plan/Transportation Appendix*, the vehicle volume/capacity is forecast to increase only slightly to 49 percent for East Marginal Way South. However, the 2035 projections for Airport Way South are forecast to exceed 100 percent of the roadway capacity, due in part to expected increases in vehicle volumes, but also based on current plans for potential bicycle improvements to the roadway that would reduce the throughput capacity for automobiles. The east side of the Airport also benefits from an internal access roadway (i.e., Perimeter Road South) that facilitates the movement of vehicles to all east side aviation development areas, with a limited number of access points to Airport Way South and connects to South Hardy Street at the north end of the Airport.

Airport Area Highway and Rail System. BFI is also well positioned within a network of state and federal highways, with Interstate Highway 5 (I-5) located to the east of the Airport, and State Highway 99/West Marginal Way located to the West. The Airport's arterial roadway system that was described above is provided with two connections to I-5 from Airport Way South (at both the north and south ends of the facility, and three connections to State Highway 99/West Marginal Way from East Marginal Way South (at both the north and south ends of the Airport and via 16th Avenue South that crosses the Duwamish River at the South Park Bridge). Given BFI's location within the Duwamish Industrial Corridor and the corridor's land use designation as a Manufacturing Industrial Center (MIC), the Corridor's role as a major employment center continues to grow. According to 2013 data presented in the Airport's most recent Economic Impact Study, this MIC supports an estimated 21,000 direct and indirect aerospace and manufacturing jobs, and over 18,400 of these jobs could be attributed to the presence of BFI. It has also been determined that these employment centers generally operate during non-peak hour traffic periods.

The non-peak hour traffic LOS ranges from C to A on the arterial roadways in the vicinity of the Airport. However, the throughput of these roadways can degrade to a LOS ranging from F to D during the peak period. In addition, the peak period of use for I-5 can begin as early as 5:00 a.m.

In efforts to improve access to the Duwamish Industrial Corridor for these commuting workers, the Sound Transit Board has approved a draft 2040 System Plan that includes the development of a Boeing Access Road (BAR), Link, and Sounder Infill Transfer Station. The Transfer Station would be located along the south side of South Boeing Access Road, between I-5 and the Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) Rail lines that are utilized by Sound Transit's Sounder Commuter Rail. With an estimated daily ridership of 4-6,000 commuters, is has also been determined that the Transfer Station would need to be served with shuttle bus service to link the various employment centers within the Industrial Corridor along East Marginal Way South, the Gateway area, and the BFI passenger terminal building. The estimated cost of the BAR, Link, and Sounder Infill Transfer Station ranges from $218 million to $229 million.

Passenger Terminal Area Roadway, Curb, & Parking. The focus of the access roadway capacity assessment for the passenger terminal area is on the service provided between the terminal curb or parking areas and the highway interchange linking the Airport with the regional transportation system. Since previous sections addressed the capacity of the surrounding arterials and highways, this analysis for the BFI terminal area will focus on the King County Airport Access Road, which connects the terminal area with Perimeter Road South and Airport Way South. King County Airport Access Road is a one-way, looped roadway (consisting of two drive thru lanes) and a designated drop-off/pick-up lane at the terminal curb, which is approximately 250 feet in length. Most passengers, their baggage, and sometimes accompanying visitors are dropped off and picked up at the terminal building curb frontage. In this area, passengers leave ground transportation (automobile, taxi, limousine, or courtesy van) and become pedestrians on their way to or from the terminal building. Therefore, the terminal curb is the interface between the terminal building and the ground transportation system. In addition, the terminal parking facilities (serving both passengers and employees) are located directly northeast of the terminal building and provide ground level parking for 207 vehicles.

Based on existing/forecast passenger enplanement counts and terminal building employees, as well as Airport Staff observations, it appears that the BFI terminal loop roadway system, terminal curb, and terminal parking facility has adequate capacity to serve the functions of the passenger terminal area, at an acceptable LOS, for the duration of the planning period. However, this analysis does not consider background traffic (traffic using Airport Way South that is unrelated to passenger generated traffic), which could impact travel times to the BFI passenger terminal area during peak period travel times.

Capacity Summary

This section has analyzed the capacity of existing facilities at BFI. Both adequate airfield and ground access facilities are critical components in the ability of the Airport to efficiently serve the public. Capacity deficiencies that cause delays associated with one area will often be reflected in the ability or inability of the entire facility to function properly. The following facility requirements section will delineate the various facilities required to properly accommodate future demand. This information, in addition to the capacity analysis, will provide the basis for formulating the alternative development scenarios for the Airport, ensuring that the new Recommended Development Plan can adequately accommodate the long-term aviation development requirements of the region.

Airfield Facility and Airspace Requirements

To identify facility needs, it is necessary to translate the forecast aviation activity into specific types and quantities. This section addresses the actual physical facilities and/or improvements to existing facilities needed to accommodate the projected demand that will be placed on the Airport safely and efficiently. This section consists of two separate analyses: those requirements dealing with *airfield* facilities, and those dealing with *landside* facilities. The analysis of airfield requirements focuses on the determination of needed facilities and spatial considerations related to the actual operation of aircraft on the Airport. This evaluation includes the analysis of airfield dimensional criteria according to the updated FAA Advisory Circular 150/5300-13A, Change 1, *Airport Design,* the establishment of design parameters for the runway and taxiway system, and an identification of airfield instrumentation and lighting needs.

Airfield Design Standards

The types of aircraft that currently operate at BFI, and those projected to utilize the facility in the future have an impact on the planning and design of airport facilities. This knowledge assists in the selection of FAA specified design standards for the Airport, which include runway and taxiway dimensional requirements, runway length, and pavement strength. These standards are based on the "Design Aircraft" that currently utilize the Airport, or that are projected to utilize the Airport in the future. According to AC 150/5300-13A, Change 1, *Airport Design*; the first step in defining a runway's design geometry is to determine the RDC. The *Design Aircraft* can take the form of one aircraft, or a composite aircraft representing a collection of aircraft classified by three parameters: Aircraft Approach Category[7] (AAC), Airplane Design Group[8] (ADG), and Taxiway Design Group[9] (TDG).

The critical aircraft for each runway at BFI was identified and is documented as follows:

- **Runway 14R/32L:** Combination of the various models of the Boeing 767 (200 and 300 series) at Aircraft Approach Category D, based on approach speed and Airplane Design Group IV, based on wingspan, along with approach visibility minimums of ≥ ¾-mile.
- **Runway 14L/32R:** Combination of various small general aviation aircraft (e.g., the Piper Navajo PA, Cessna's 172 Skyhawk and 182 Skylane, and the Cirrus SR 22) at Aircraft Approach Category A & B, based on approach speed, and Airplane Design Group I (Small Aircraft), based on wingspan, along with visual approach minimums.

The third component of the *Design Aircraft* is the Taxiway Design Group (TDG). The TDG is based on both the wheelbase, the distance between the aircraft's main gear, or the overall Main Gear Width (MGW), and the distance from the aircraft cockpit to the main gear, or the Cockpit to Main Gear (CMG) distance. For example, the Boeing 767-300 has a MGW of 35.8 feet, and a CMG of 82.2 feet, placing the aircraft in the TDG 5 classification. Not all the taxiways at BFI are designed to accommodate the same TDG's, and these taxiway design standards will be covered in greater detail in later sections.

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7 Aircraft Approach Category relates to aircraft approach speed in "knots" (operational characteristics).
8 Airplane Design Group relates to either aircraft wingspan or tail height in "feet" (i.e., physical characteristics).
9 Taxiway Design Group relates to undercarriage dimensions of the aircraft in "feet" (i.e., physical characteristics).

Runway 14R/32L Design Standards. Existing dimensions and the corresponding existing FAA design standards applicable to Runway 14R/32L are presented in **Table C7**. The runway has existing non-standard dimensions for several of the specified FAA dimensional standards for the RDC D-IV-4000 (see list below), and these are presented on **Figures C3** through **C7**. It should also be noted that this master plan will evaluate these existing non-standard conditions in the preparation of the **Alternatives Analysis and Development Concepts** chapter of this MP Update:

- Parallel Runway Centerline Separation (Existing ATC Waiver[10])
- Runway Object Free Area (ROFA) Length (Existing Non-Standard Condition)
- Runway Centerline to Parallel Taxiway Centerline Separation - Taxiways A & B (Existing Non-Standard Condition)
- Runway Centerline to Aircraft Parking Area Separation
- Runway Approach & Departure RPZ Land Uses

Table C7 **RUNWAY 14R/32L DESIGN STANDARDS MATRIX – RDC D-IV-4000 (≥ ¾-MILE VISIBILITY MINIMUMS)**

Item	Existing Dimension	FAA Criteria	Standard Met
Runway Design			
Runway Width	200 ft	150 ft	Yes (+50')
Shoulder Width	25 ft [1]	25 ft	Partial length
Blast Pad Width	200 ft	200 ft	Yes [2]
Blast Pad Length	200 ft	200 ft	No [2]
Crosswind Component	20 knots	20 knots	Yes
Runway Protection			
Runway Safety Area (RSA) - Both Runway Ends			
Length beyond departure end	1,000 ft	1,000 ft	Yes
Length prior to threshold	600 ft	600 ft	Yes
Width	500 ft	500 ft	Yes

[10] Existing ATC waiver document is included for reference in **Appendix Three**.

Table C7 **RUNWAY 14R/32L DESIGN STANDARDS MATRIX – RDC D-IV-4000 (≥ ¾-MILE VISIBILITY MINIMUMS) – CONTINUED**

Item	Existing Dimension (ft)	FAA Criteria (ft)	Standard Met
Runway Object Free Area (ROFA)			
Length beyond departure end (Runway 14R)	**120**	1,000	**No** [3]
Length beyond departure end (Runway 32L)	1,000	1,000	Yes
Length prior to threshold (Runway 14R)	600	600	Yes
Length prior to threshold (Runway 32L)	**120**	600	**No** [3]
Width	800	800	Yes
Runway Obstacle Free Zone (ROFZ) - Both Runway Ends			
Length	200	200	Yes
Width	400	400	Yes
Precision Obstacle Free Zone (POFZ)			
Length	Not Applicable	200	Not Applicable
Width	Not Applicable	800	Not Applicable
Approach Runway Protection Zone (RPZ)			
Length (Runway 14R/Runway 32L)	1,700/1,700	1,700/1,700	**No** [4, 5]
Inner Width (Runway 14R/Runway 32L)	1,000/500	1,000/500	**No** [4, 5]
Outer Width (Runway 14R/Runway 32L)	1,510/1,010	1,510/1,010	**No** [4, 5]
Departure Runway Protection Zone (RPZ) - Both Runway Ends			
Length	1,700	1,700	**No** [6, 7]
Inner Width	500	500	**No** [6, 7]
Outer Width	1,010	1,010	**No** [6, 7]
Runway Separation			
Runway centerline to:			
Parallel runway centerline	**375**	700 [8]	**No** [9]
Holding position	250	250	Yes
Parallel taxiway/taxilane centerline (TW B)	**325 & 350**	400 [10]	**No** [11]
Parallel taxiway/taxilane centerline (TW A)	**350**	400 [10]	**No/Partial** [11]
Aircraft parking area (east)	**≤500** [12]	500	**No/Partial** [11]
Aircraft parking area (west)	**≤500** [12]	500	**No/Partial** [11]

SOURCE: *FAA Advisory Circular 150/5300-13A, Change 1, Airport Design (February 2014).*

Notes:
[1] Existing shoulder is in place between exit Taxiways A4 and B3 at the north end and Taxiways A9 and B5 at the south end.
[2] Existing Prior Permission Required Pavement (PPRP) satisfies existing Runway 14R blast pad dimensions.
[3] ROFA intersects existing east side perimeter fence (Existing Non-Standard Condition).
[4] Dimension correct, but incompatible land uses are located within the Runway 14R approach RPZ (i.e., BFI fuel farm and Georgetown Steam Plant). FAA compliance of existing aircraft tiedown apron within Runway 14R approach RPZ to be confirmed.
[5] Dimension correct, but incompatible land uses are located within the Runway 32L approach RPZ (i.e., Airport Way and BNSF/UP R.R. tracks).
[6] Dimension correct, but incompatible land uses are located within the Runway 32L departure RPZ (i.e., BFI fuel farm).
[7] Dimension correct, but incompatible land uses are located within the Runway 14R departure RPZ (i.e., Airport Way, Norfolk St., BNSF/UP R.R. tracks, and industrial warehouse facilities).
[8] Specified separation requirements for simultaneous takeoff and landings using VFR per FAA Airport Design Advisory Circular.
[9] The existing FAA ATC operational waiver restricts same direction simultaneous operations to Category II aircraft (i.e., twin-engine propeller driven aircraft weighing less than 12,500 lbs.) during VFR/daytime only conditions (the minimum parallel runway centerline separation distance specified by ATC for Category II aircraft is 500 feet).
[10] Separation standards are increased based on TDG to accommodate high speed exits (e.g., 450' for TDG 5).
[11] Existing Non-Standard Condition.
[12] Some marked aircraft parking positions are located within the required 500-foot setback.

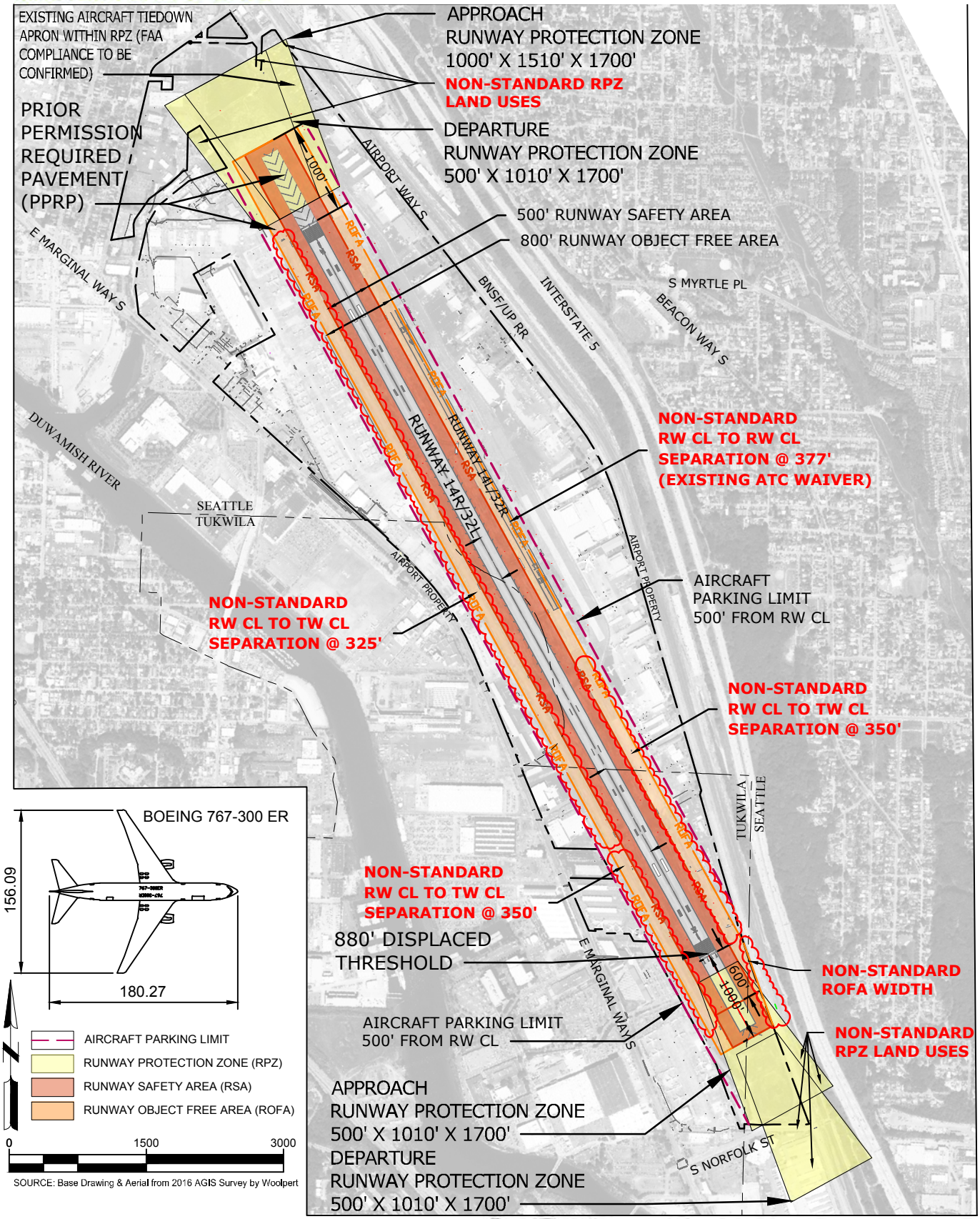


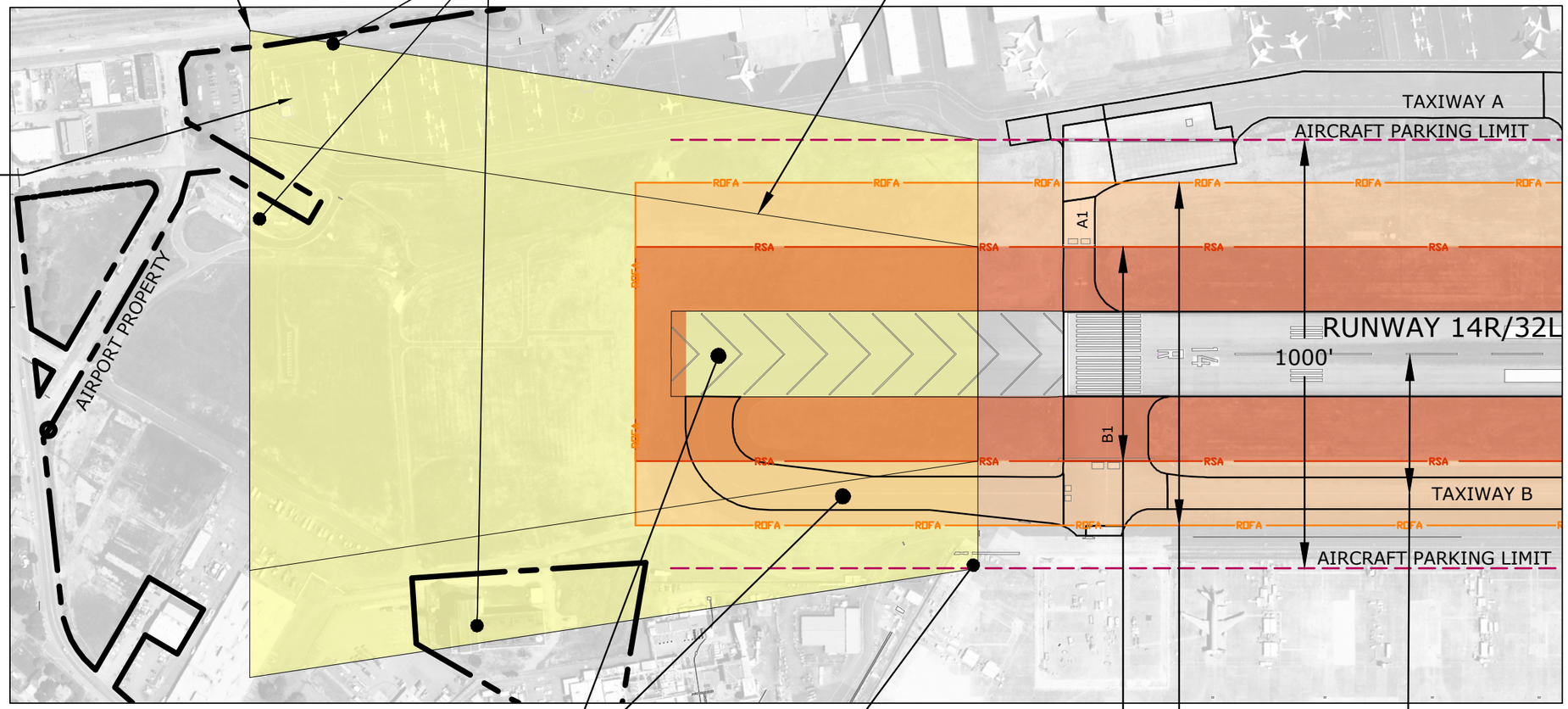
FIGURE C3 **Runway 14R/32L RDC D-IV-4000 Design Standards**

APPROACH
RUNWAY PROTECTION ZONE
1000' X 1510' X 1700'

NON-STANDARD RPZ LAND USES (ROADWAY, FUEL FARM & GEORGETOWN STEAM PLANT)

DEPARTURE
RUNWAY PROTECTION ZONE
500' X 1010' X 1700'

EXISTING AIRCRAFT TIEDOWN APRON WITHIN RPZ (FAA COMPLIANCE TO BE CONFIRMED)



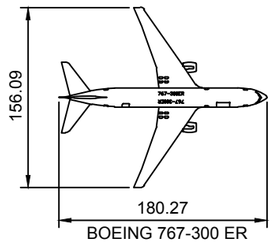
PRIOR PERMISSION REQUIRED PAVEMENT (PPRP)

NON-STANDARD AIRCRAFT PARKING POSITION

500' RUNWAY SAFETY AREA

800' RUNWAY OBJECT FREE AREA

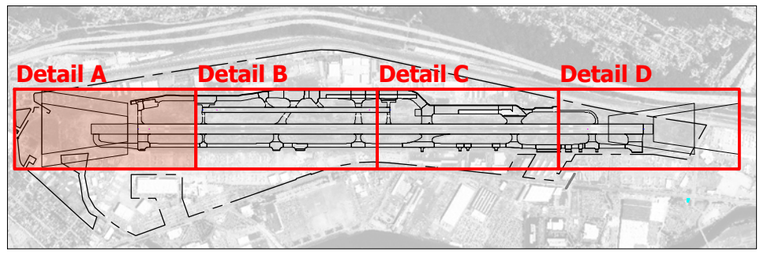
NON-STANDARD RUNWAY CL TO TAXIWAY CL SEPARATION @ 325'



AIRCRAFT PARKING LIMIT
RUNWAY PROTECTION ZONE (RPZ)
RUNWAY SAFETY AREA (RSA)
RUNWAY OBJECT FREE AREA (ROFA)

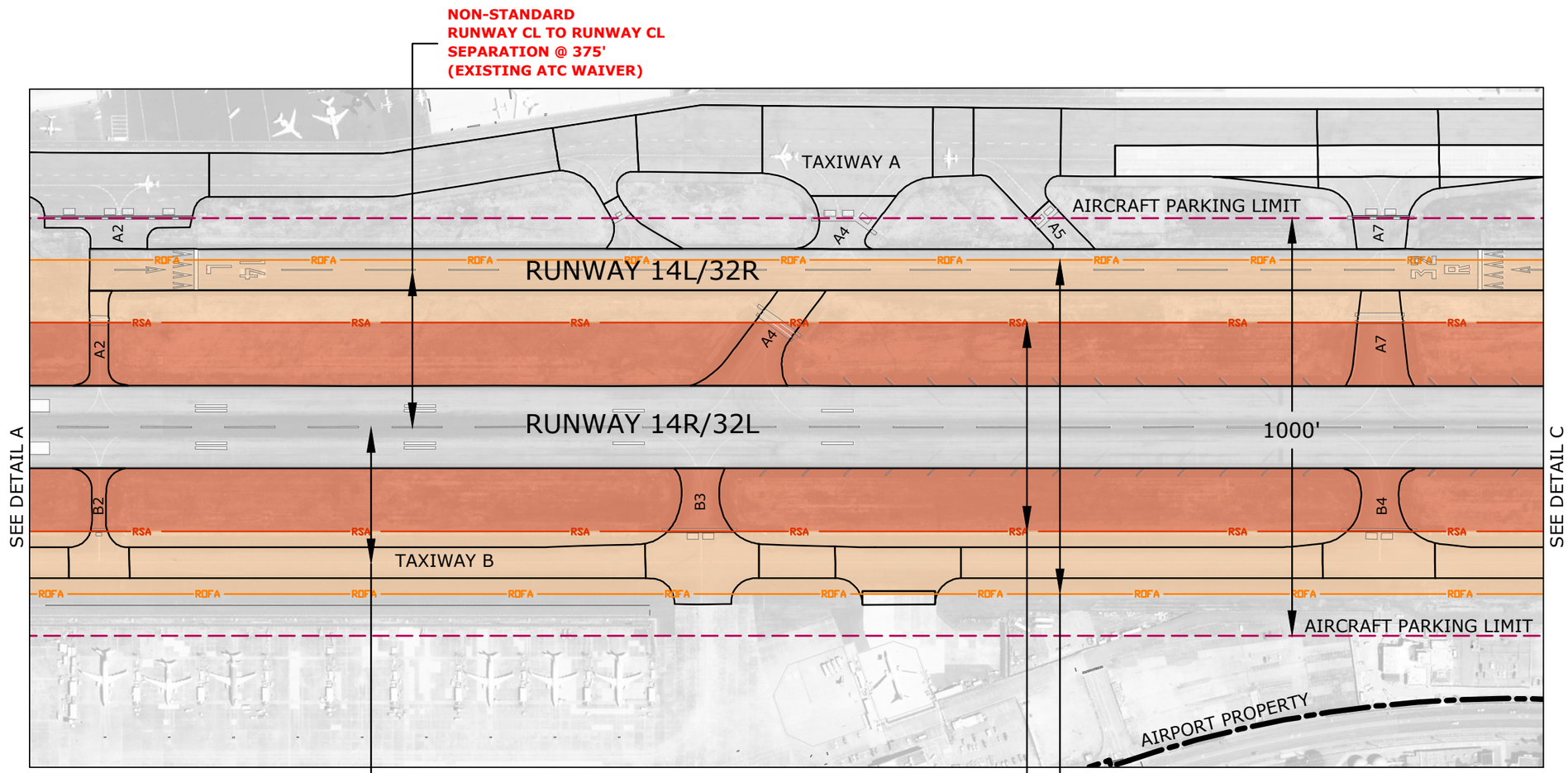
0 300 600

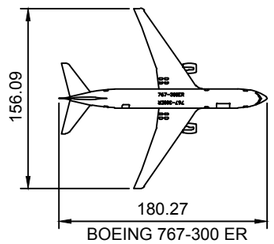
SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert



Keymap

FIGURE C4 **Runway 14R/32L RDC D-IV-4000 Design Standards - Detail A**





AIRCRAFT PARKING LIMIT
RUNWAY PROTECTION ZONE (RPZ)
RUNWAY SAFETY AREA (RSA)
RUNWAY OBJECT FREE AREA (ROFA)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

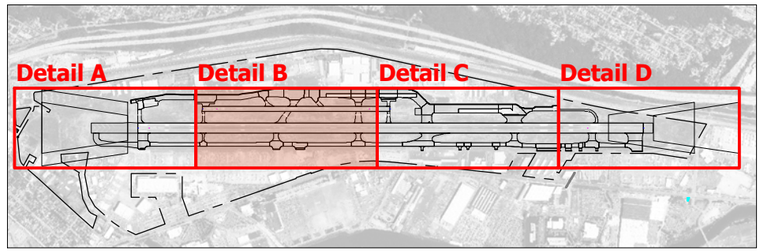


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FIGURE C5 **Runway 14R/32L RDC D-IV-4000 Design Standards - Detail B**

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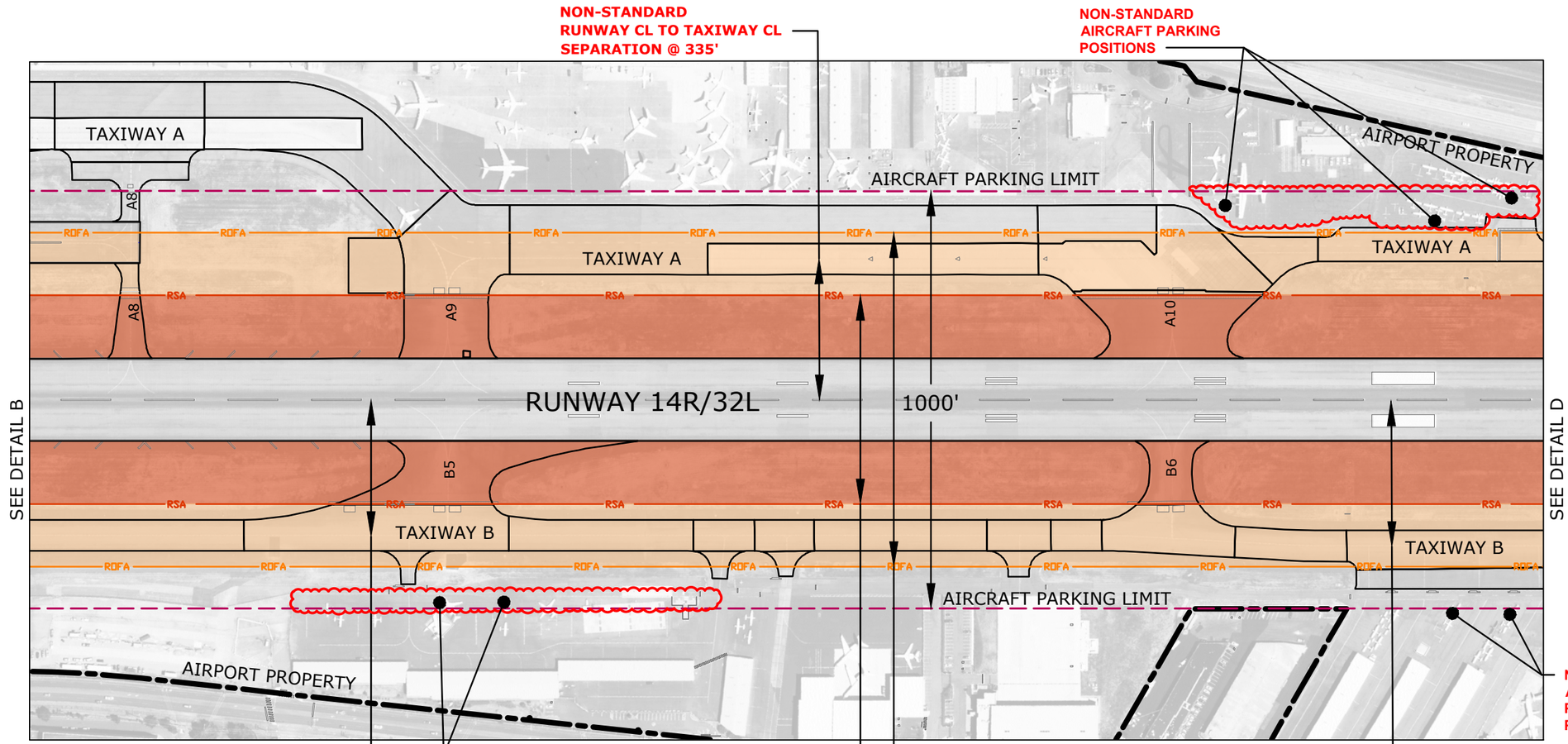

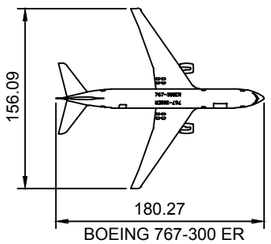

AIRCRAFT PARKING LIMIT
RUNWAY PROTECTION ZONE (RPZ)
RUNWAY SAFETY AREA (RSA)
RUNWAY OBJECT FREE AREA (ROFA)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

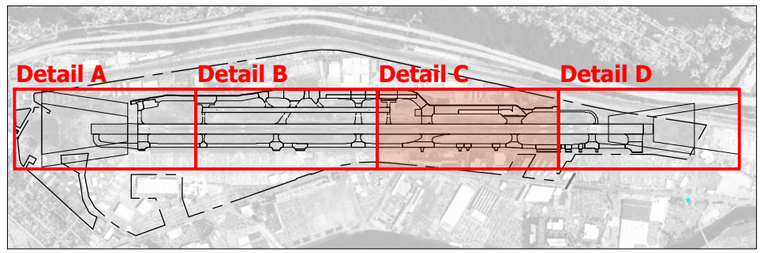

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FIGURE C6 **Runway 14R/32L RDC D-IV-4000 Design Standards - Detail C**

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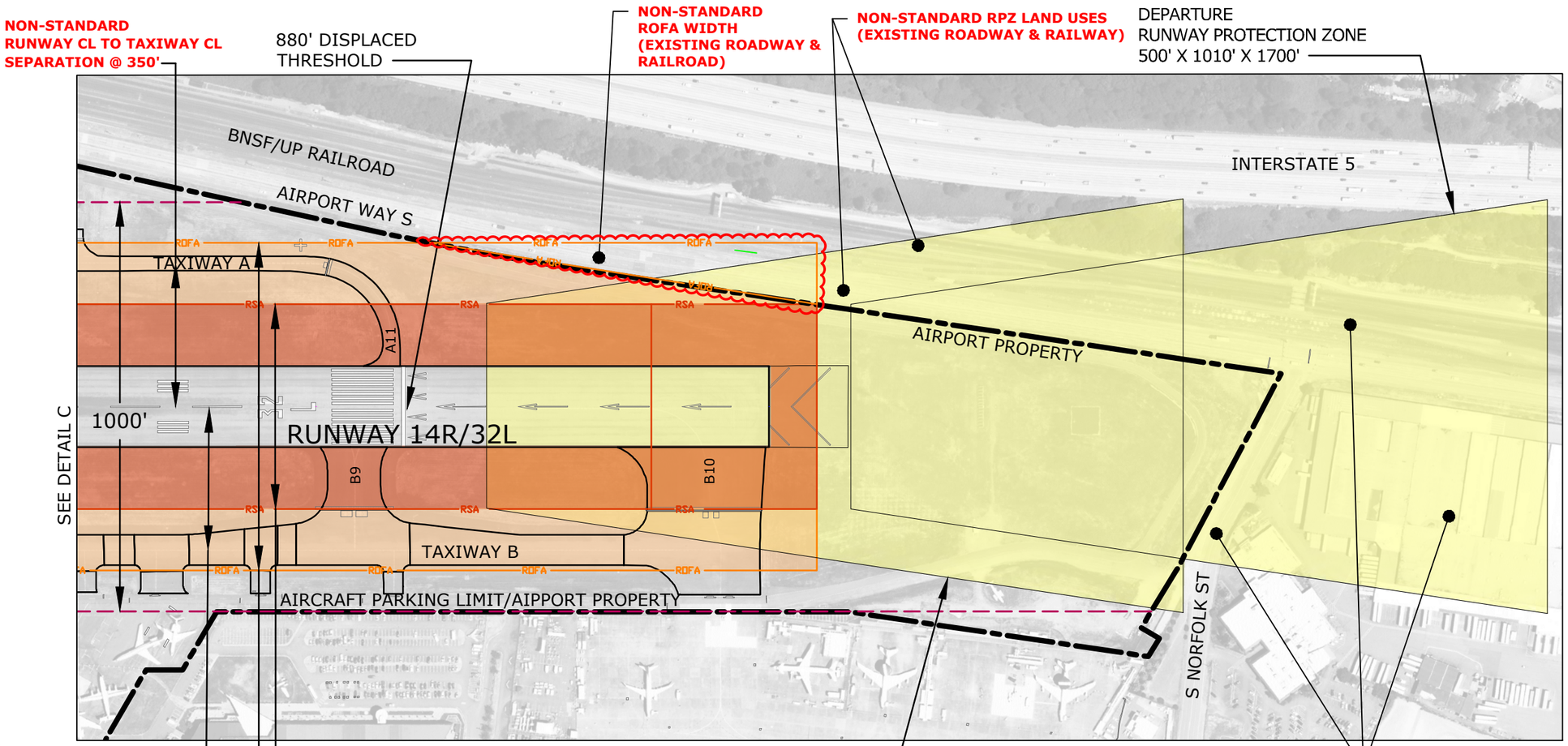

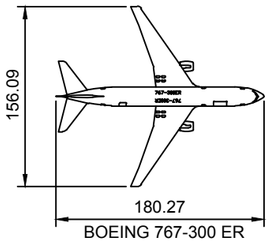

AIRCRAFT PARKING LIMIT
RUNWAY PROTECTION ZONE (RPZ)
RUNWAY SAFETY AREA (RSA)
RUNWAY OBJECT FREE AREA (ROFA)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

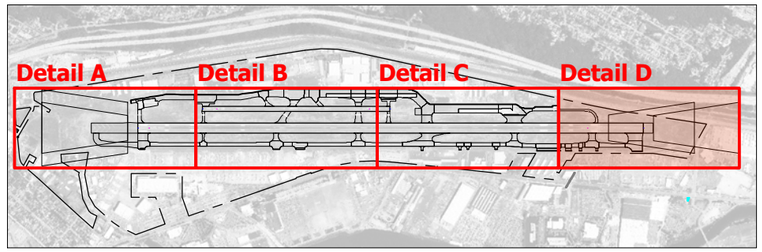

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FIGURE C7 **Runway 14R/32L RDC D-IV-4000 Design Standards - Detail D**

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Runway 14L/32R Design Standards. Existing dimensions and the corresponding existing FAA design standards applicable to Runway 14R/32L are presented in **Table C8** and **Figure C8**. As can be noted, the runway meets all but one of the specified FAA dimensional standards for the RDC B-I (SMALL AIRCRAFT)-VISUAL. The one existing non-standard conditions is the parallel runway centerline separation. As noted previously for Runway 14R/32L, the existing non-standard parallel runway centerline separation is currently being mitigated with an approved FAA ATC wavier that will be reevaluated in conjunction with the review of the updated ALP for this MP Update.

Table C8 **RUNWAY 14R/32L DESIGN STANDARDS MATRIX – RDC B-I (SMALL AIRCRAFT)-VISUAL**

Item	Existing Dimension	FAA Criteria	Standard Met
Runway Design			
Runway Width	100 ft	60 ft	Yes (Exceeds Criteria)
Shoulder Width	10-14 ft	10 ft	Yes/Partial [1]
Blast Pad Width	0 ft	80 ft	Yes [2]
Blast Pad Length	0 ft	60 ft	Yes [2]
Crosswind Component	10.5 knots	10.5 knots	Yes
Runway Protection			
Runway Safety Area (RSA) - Both Runway Ends			
Length beyond departure end	240 ft	240 ft	Yes
Length prior to threshold	240 ft	240 ft	Yes
Width	120 ft	120 ft	Yes
Runway Object Free Area (ROFA) - Both Runway Ends			
Length beyond departure end	240 ft	240 ft	Yes
Length prior to threshold	240 ft	240 ft	Yes
Width	250 ft	250 ft	Yes
Runway Obstacle Free Zone (ROFZ) - Both Runway Ends			
Length	200 ft	200 ft	Yes
Width	250 ft	250 ft	Yes
Approach Runway Protection Zone (RPZ) - Both Runway Ends			
Length	1,000 ft	1,000 ft	Yes [3]
Inner Width	250 ft	250 ft	Yes [3]
Outer Width	450 ft	450 ft	Yes [3]
Departure Runway Protection Zone (RPZ)			
Length	1,000 ft	1,000 ft	Yes [3]
Inner Width	250 ft	250 ft	Yes [3]
Outer Width	450 ft	450 ft	Yes [3]

SOURCE: *FAA Advisory Circular 150/5300-13A, Change 1, Airport Design (February 2014).*

Note: [1] Existing shoulder in place for full length of runway west side and partial length on east side between Taxiways A2 & A4.
[2] Blast pads are optional for installation on RDC B-I (Small Aircraft) runways.
[3] FAA compliance of existing aircraft tiedown apron within Runway 14L departure RPZ to be confirmed.

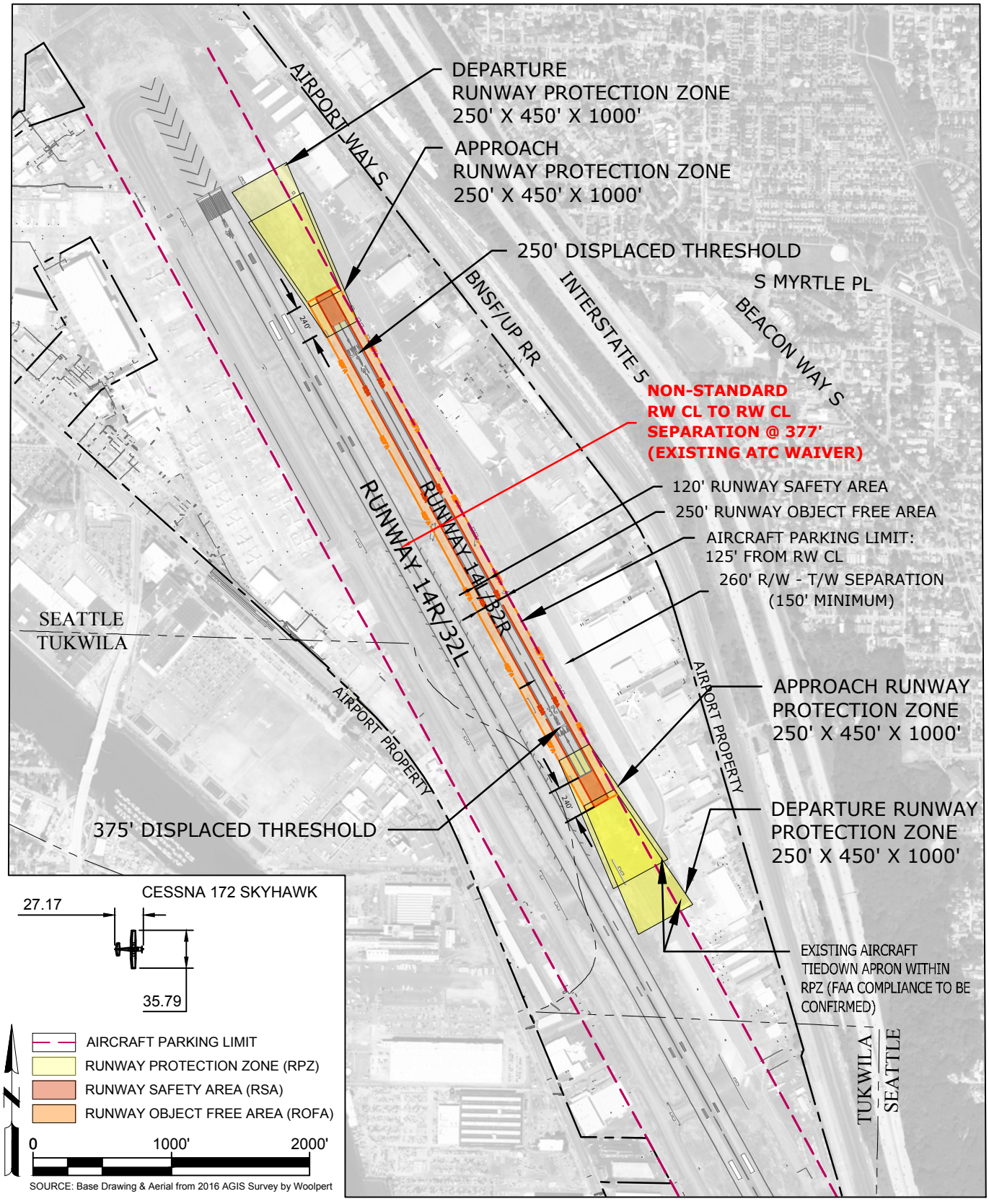

FIGURE C8 **Runway 14L/32R RDC B-I (Small Aircraft)-Visual Design Standards**

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King County International Airport/ Boeing Field

Table C8 **RUNWAY 14R/32L DESIGN STANDARDS MATRIX – RDC B-I (SMALL AIRCRAFT)-VISUAL– CONTINUED**

Item	Existing Dimension (ft)	FAA Criteria (ft)	Standard Met
Runway Separation			
Runway centerline to:			
Parallel runway centerline	**377**	700 [3]	**No** [4]
Holding position	125	125	Yes
Parallel taxiway/taxilane centerline (TW A)	200-260	150	Yes
Aircraft parking area (east)	≥300	125	Yes
Aircraft parking area (west)	Not Applicable	125	Not Applicable

SOURCE: *FAA Advisory Circular 150/5300-13A, Change 1, Airport Design (February 2014).*
Note: [3] Specified separation requirements for simultaneous takeoff and landings using VFR.
[4] Existing non-standard condition is mitigated by FAA ATC operational waiver.

Runway Design

In consideration of the forecasts of future aviation activity, the adequacy of the runway system must be analyzed from several perspectives. These include runway orientation and airfield capacity, which were analyzed in previous sections, as well as runway length, pavement strength and runway visibility, which will be evaluated in the following text. The analysis of these various aspects pertaining to the runway system will provide a basis for recommendations of future improvements.

Runway Length. The determination of runway length recommendations for airport planning purposes is based on several factors. These factors include:

- Airport elevation Above Mean Sea Level (AMSL)
- Mean Normal Maximum daily Temperature (MNMT) of the hottest month
- Runway gradient
- Family grouping of critical aircraft for runway length purposes
- Stage length of the longest nonstop trip destination

The calculation for runway length requirements at BFI is based on an elevation of 21.3 feet (AMSL), 75.3° Fahrenheit mean normal maximum temperature (MNMT), and a maximum differential in runway centerline elevation for each runway as follows:

- Runway 14R/32L @ 4.0 feet
- Runway 14L/32R @ 0.5 feet

In addition, the existing pavement available for takeoffs and landings at BFI is impacted by the location of designated landing and departure thresholds that are specified by the declared distances published for each runway. As noted in the **Inventory of Existing Conditions** chapter, each of the Airport's runways have existing displaced landing thresholds that reduce the existing length available for landings. Also, the runway length available for takeoffs to the south on Runway 14R/32L is reduced due to the published Accelerate Stop Distance Available (ASDA) for this runway. However, additional pavement for south departures on Runway 14R is available for use (i.e., the PPRP at the north end of the runway) to those aircraft operators that require additional takeoff length. Use of the pavement, by advance request, is coordinated with BFI Operations Staff to ensure that the runway is clear of any debris. The primary users of the PPRP are Boeing, in conjunction with their aircraft flight test operations, and the occasional cargo or business jet operator that are flying a long-haul stage length. Between 2007 and 2015, the Runway 14R/32L PPRP at BFI has been utilized an average of 33 times per year. The following figures, **Figures C9** and **C10**, provide a graphic presentation of the existing published declared distances for each of the runway facilities at BFI.

In 2005, the FAA published an update to the Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design. The revised AC included a process for determining recommended runway length. The first step is to determine a critical aircraft for runway length. If this critical aircraft is a regional jet or a commercial aircraft with a Maximum Take-Off Weight (MTOW) over 60,000 pounds, the AC directs the reader to the design guidelines in Chapter 4, which includes instructions for utilizing aircraft manufacturer published Airport Planning Manuals (APMs) for determining recommended runway lengths and then applying an adjustment for non-zero effective runway gradients. This adjustment equates to a 10-foot increase in runway length for each one foot of difference in the runway centerline elevation. After following the Chapter 4 instructions for each individual aircraft using the Airport on a regular basis, the final recommended runway length is determined by selecting the longest runway length recommendation. For the purposes of this runway length analysis, the critical aircraft(s) were the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the Airport. The primary users of the Airport, in consideration of all civil aircraft activity, were grouped into the various operational categories that are represented at BFI (i.e., "commercial" that includes cargo and passenger aircraft and a separate grouping for large "business jets").

The critical aircraft that currently operate at the Airport were considered in **Table C9**, and the runway length requirements for these aircraft apply to the primary runway at BFI (i.e., Runway 14R/32L). Also, the aircraft represented in bold text identifies the critical aircraft for runway length within each operational category that recorded a minimum of 500 annual operations at BFI in 2015. In addition, for this grouping of aircraft, the landing length requirements are typically less demanding than the takeoff length requirements and this is the case for BFI. **Table C10** provides a comparative landing length for each aircraft.

It is important to consider that the fleet mix of the commercial air carriers at BFI will continue to evolve with the introduction of new aircraft models by Boeing. However, the aircraft types operated by the cargo and passenger carriers are projected to remain consistent through the planning period of this MP Update.

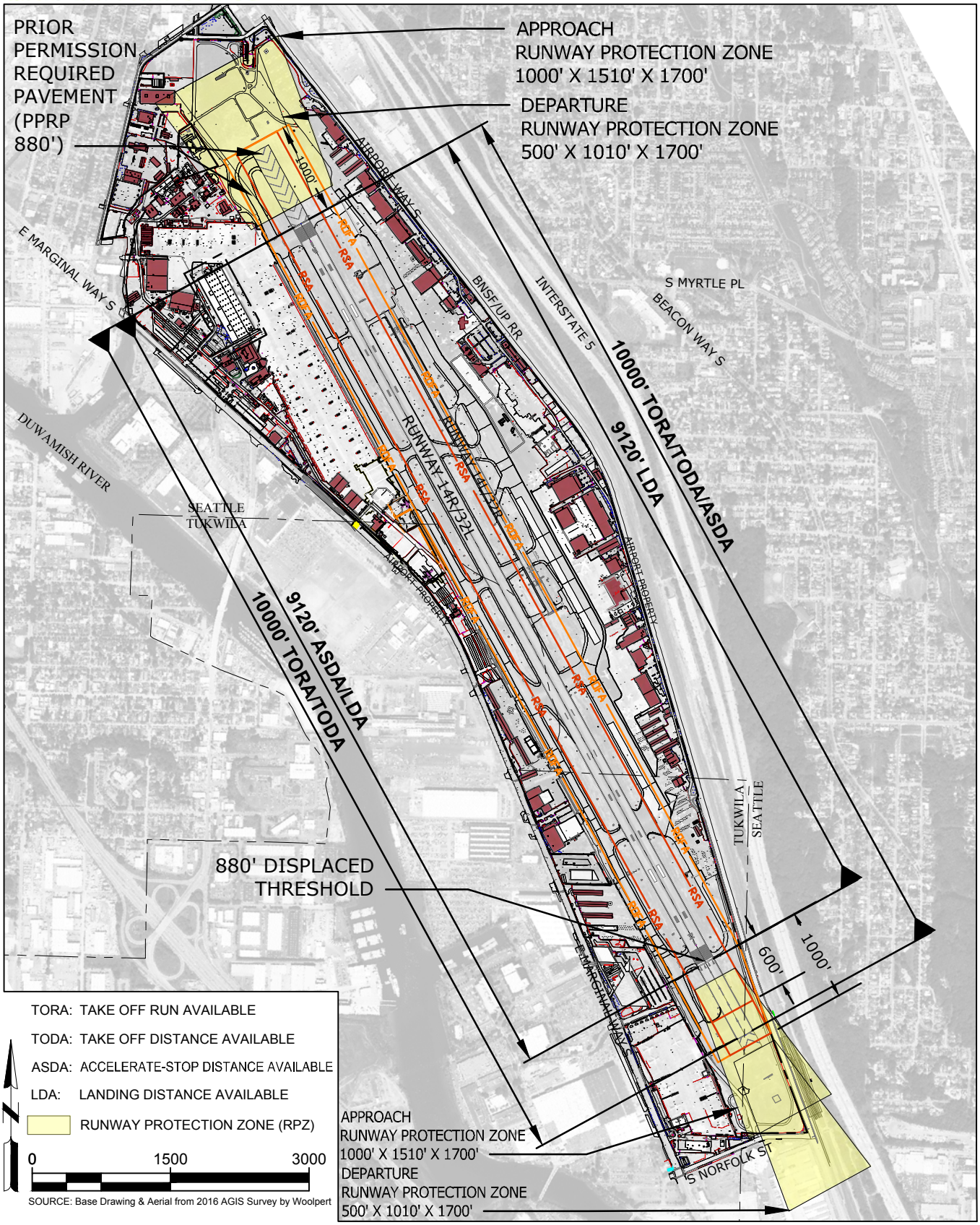

FIGURE C9 **Runway 14R/32L Declared Distances Detail**

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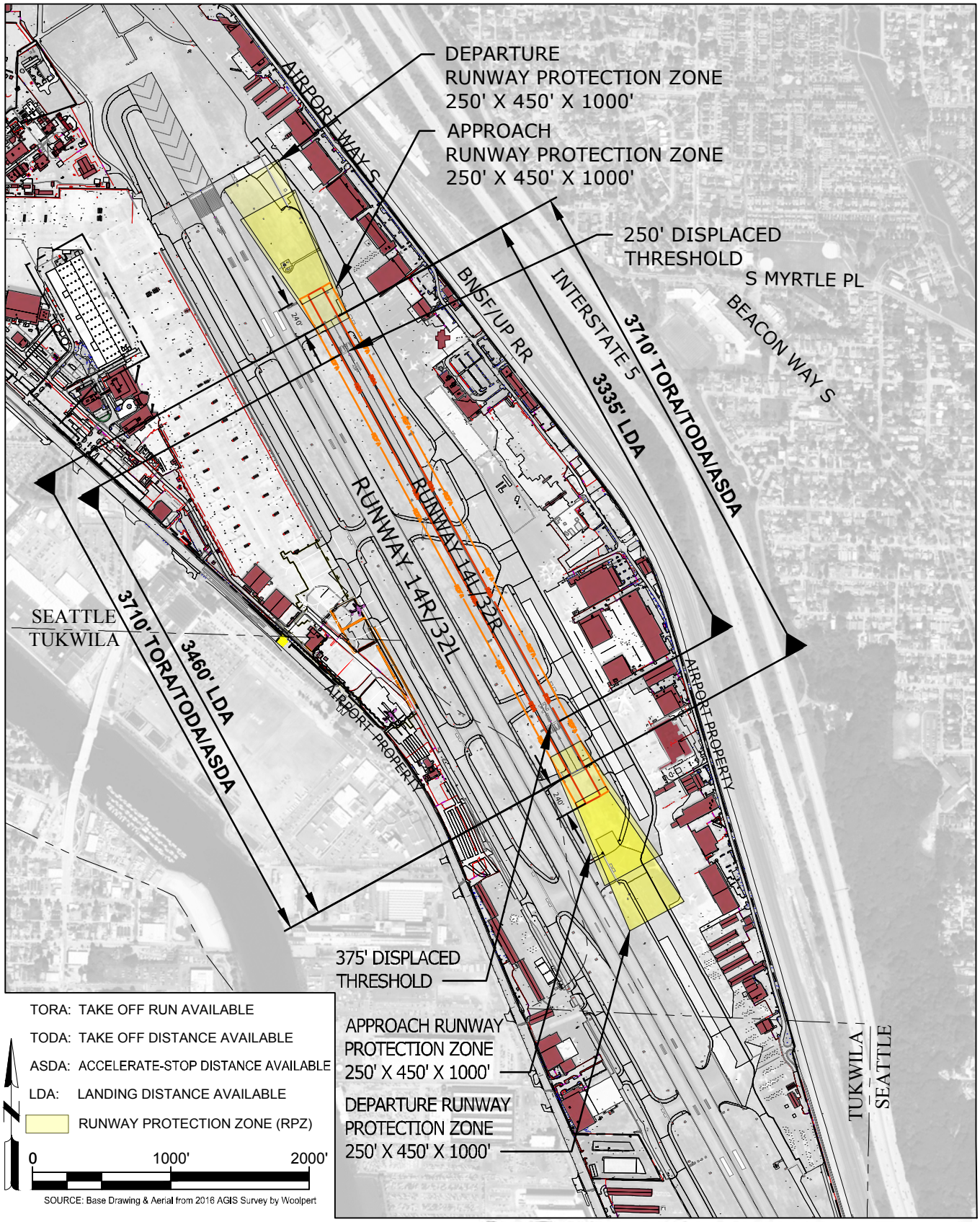

FIGURE C10 **Runway 14L/32R Declared Distances Detail**

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King County International Airport/ Boeing Field

Table C9 **EXISTING AIRCRAFT RUNWAY TAKEOFF LENGTH RECOMMENDATIONS, IN FEET**

Aircraft Type	Engine Type/Model	Aircraft Operator	Max Takeoff Weight (MTOW) (lbs.)	Runway Length Standard Day[1, 2] (ft)	Runway Length Warm Day[1, 2] (ft)
Existing Runways:					
Runway 14R/32L ASDA @ 9,120/10,000' (Primary)					
Runway 14L/32R ASDA @ 3,710' (Secondary)					
Cargo Aircraft					
Boeing (Douglas) MD 11	PW4460	UPS	602,500	10,135	11,235
Boeing 767-300*	**CF6-80 series**	**UPS**	**412,000**	**9,150**	**9,650**
Airbus A-300	PWJT9D-7R4H1	UPS	363,760	7,535	8,135
Boeing 757-200*	PW 2040	UPS	255,000	6,835	8,035
Beech C-99*	PT6A36	Ameriflight	11,300	3,240	---
Piper PA-31-350*	Lycoming TIO-540-J2BD	AIRPAC Airlines	7,000	2,550	---
Passenger Aircraft					
Boeing 777-300	PW98K	Boeing	660,000	10,540	11,140
Boeing 787-800	Typical Engines	Boeing	502,500	10,140	10,840
Boeing 737-900*	**CFM56-7B26**	**Boeing**	**174,200**	**9,240**	**9,790**
Boeing (Douglas) MD 83	JT8D-219	Charter	160,000	8,235	9,035
Boeing (Douglas) MD 88	JT8D-217A	Charter	149,500	7,835	8,235
Boeing 737-800*	CFM56-7B27	Boeing	172,500	7,285	7,835
Bombardier CRJ-900	CF34-8C5	Charter	84,500	6,785	7,835
Airbus A-320	CFM56	Charter	169,756	6,785	7,435
Boeing 737-700*	CFM56-7B24B1	Boeing	154,500	6,235	6,535
Airbus A-319	CFM56	Charter	154,323	5,935	6,035
Boeing 717-200	BR715	Charter	119,000	5,535	5,785
Bombardier CRJ-700	CF34-8C1	Charter	72,750	5,335	6,385
Cessna 208 Caravan*	PT6A-114A	Kenmore Air	8,000	2,095	---
Business Jet Aircraft (>60,000 lbs. MTOW)					
Gulfstream V/G500*	**---**	**Private**	**90,500**	**6,030**	**---**
Bombardier Global Express	---	Private	92,500	5,580	---
Gulfstream IV/G400*	---	Private	73,200	5,320	---

SOURCE: *Mead & Hunt review of Airplane Characteristics from various manufacturer's Airport Planning documents.*

[1] All Airport Planning Manuals considered for this analysis included runway length charts with a design temperature of standard day (59° F. @ sea level) and standard day plus 25° - 30° F. The Normal Mean Maximum Temperature of the hottest month at BFI is 75.3°F, and well below the specified "Hot Day" temperature.

[2] All runway length requirements include a 40-foot adjustment (increase) based on the existing Runway 14R/32L centerline elevation differential.

[*] Asterisk identifies aircraft that recorded a minimum of 500 annual operations at BFI in 2015.
*Aircraft in **bold** text identifies the critical aircraft for runway length within each operational category that recorded a minimum of 500 annual operations at BFI in 2015.*

Table C10 **EXISTING AIRCRAFT RUNWAY LANDING LENGTH RECOMMENDATIONS, IN FEET**

Aircraft Type	Maximum Landing Weight (lbs.)	Flap Setting	Dry Runway Length[1] (ft)	Wet Runway Length[1, 2] (ft)
Existing Runways:				
Runway 14R/32L LDA @ 9,120 (Primary)				
Runway 14L/32R LDA @ 3,460'/3,335' (Secondary)				
Cargo Aircraft				
Boeing (Douglas) MD 11	471,000	50°	7,600	8,700
Boeing 767-300*	**326,000**	**30°**	**5,700**	**6,600**
Airbus A-300	304,230	40°	5,100	5,865
Boeing 757-200*	198,000	30°	4,900	5,500
Boeing 767-200*	272,000	30°	4,800	5,400
Boeing 737-200	107,000	30°	4,750	5,500
Beech C-99*	10,100	---	2,470	2,841
Piper PA-31-350*	7,000	---	1,880	2,162
Passenger Aircraft				
Boeing 777-300	524,000	---	6,000	6,950
Boeing 737-900*	**146,300**	**30°**	**5,900**	**6,750**
Bombardier CRJ-900	73,500	45°	5,600	6,440
Boeing 737-800*	144,000	40°	5,400	6,300
Boeing 787-800	380,000	30°	5,400	6,200
Boeing (Douglas) MD 83	139,500	40°	5,100	5,900
Airbus A-320	145,505	ND	5,100	5,865
Bombardier CRJ-700	67,000	45°	5,100	5,865
Boeing (Douglas) MD 88	130,000	40°	4,800	5,600
Boeing 737-700*	129,200	40°	4,700	5,500
Airbus A-319	137,788	35°	4,700	5,405
Boeing 717-200	102,000	40°	4,700	5,500
Cessna 208 Caravan*	7,800	---	1,625	1,869
Business Jet Aircraft (>60,000 lbs. MTOW)				
Gulfstream IV/G400*	**58,500**	**---**	**3,377**	**3,884**
Gulfstream V/G500*	75,300	---	3,170	3,646
Bombardier Global Express	73,500	---	2,670	3,071

SOURCE: *Mead & Hunt review of Airplane Characteristics from various manufacturer's Airport Planning documents.*

[1] All Airport Planning Manuals considered for this analysis included runway length charts with a design temperature of standard day (59° F. @ sea level), zero wind, zero gradient, and maximum flap setting.

[2] Wet runway length requirements include a 115% adjustment (increase).

[*] Asterisk identifies aircraft that recorded a minimum of 500 annual operations at BFI in 2015.

*Aircraft in **bold** text identifies the critical aircraft for runway length within each operational category that recorded a minimum of 500 annual operations at BFI in 2015.*

Runway 14R/32L (Primary Runway) Length Analysis. Following a review of the runway length data presented in the previous four tables, which specifies a "worst case" scenario for aircraft operational weights, it can be confirmed that the Boeing 767-300 is identified as the "critical aircraft" for runway length on Runway 14R/32L. As identified in **Table C9**, the Boeing 767-300 requires a specified takeoff length ranging from 9,150 feet to 9,650 feet and a specified landing length requirement of 6,600 feet (a copy of the F.A.R. takeoff and landing length charts from the Aircraft Planning Manual is included in **Appendix Four** for reference). Based upon the availability of the PPRP for Runway 14R departures that increases the ASDA from 9,120' to 10,000 feet to those aircraft operators that need it, Runway 14R/32L at BFI is adequate to accommodate takeoff and landing length requirements of the existing and future commercial aircraft fleet, as well as large business jet aircraft.

Runway 14L/32R (Secondary Runway) Length Analysis. Serving as the Airport's secondary parallel runway, Runway 14L/32R primarily accommodates the general aviation users at BFI, with aircraft having a MTOW of less than 12,500 pounds. The recommended runway lengths for this weight category of airplanes is derived from the FAA AC 150/5325-4B, which provides standards and guidelines recommended strictly for use in the design of civil airports and include airplane performance data curves and tables for use in airport planning and runway length analysis. The runway length recommendations are dependent on meeting the operational requirements of a certain percentage of the fleet (i.e., 95 percent vs. 100 percent).

Runway lengths for airplanes with a maximum certified takeoff weight of 12,500 pounds or less in the AC are based on the aircraft approach speed in knots, number of passenger seats, airport elevation above mean sea level, and mean daily maximum temperature of the airport's hottest month. There are no adjustments recommended for effective runway gradient or wet and slippery runway conditions. **Table C11** represents various recommended lengths for Runway 14L/32R based on the small aircraft fleet that operate at BFI.

Table C11 **GENERALIZED RUNWAY 14L/32R LENGTH RECOMMENDATIONS, IN FEET**

Aircraft Type	Runway Length Curve (ft)	Runway Length with Adjustments
Runway 14L[1]/32R[2] (Secondary) @ 3,710'		
Small Aircraft with less than ten seats		
95% of Fleet	2,900	None
100% of Fleet	3,450	None
Small Aircraft with more than ten seats	3,900	None

SOURCE: *Mead & Hunt analysis using FAA AC 150/5325-4B, Runway Length Requirements for Airport Design. Lengths based on an elevation of 17.7 feet (AMSL), 75.3° Fahrenheit MNMT, and a maximum differential in runway centerline elevation of 0.5'.*

Notes: [1] Runway 14L landing threshold is displaced by 250 feet.
[2] Runway 32R landing threshold is displaced by 375 feet.

Based on an examination of the 2014 Passur aircraft operations data for BFI it is determined that the "100 percent of Fleet" of small aircraft with less than ten seats is the appropriate group to establish the recommended runway length for Runway 14L/32R, specifying a recommended runway length of 3,450 feet. As presented in the previous table, the existing runway length of 3,710 feet generally accommodates this grouping of aircraft for takeoffs and for landings in consideration of the reduced landing length available that is dictated by the existing displaced thresholds at each runway end (i.e., a Runway 14L LDA of 3,460 feet and a Runway 32R LDA of 3,335 feet). In addition, a copy of the runway length curves for *Small Airplanes with Fewer than 10 Passenger Seats* and *Small Airplanes having 10 or More Passenger Seats* from AC 150/5325-4B, *Runway Length Requirements for Airport Design* is included in **Appendix Five** for reference.

Runway Pavement Strength. As identified in the **Inventory of Existing Conditions** chapter of this document, the gross weight bearing capacity for each of the runways at BFI does vary as follows:

- Runway 14R/32L (Primary) @ 100,000 pounds single wheel, 200,000 pounds dual wheel, 500,000 pounds dual tandem wheel, and 800,000 pounds dual double tandem wheel main landing gear configuration.
- Runway 14L/32R (Secondary) @ 120,000 pounds single wheel, 250,000 pounds dual wheel, 550,000 pounds dual tandem wheel, and 1,109,000 pounds dual double tandem wheel main landing gear configuration, but is limited to use by aircraft weighing up to 12.500 pounds.

King County has also completed a separate pavement condition/analysis study of the existing airfield that will inform the planning recommendations and phasing of future pavement reconstructions projects identified in this MP Update.

Runway Line-of-Sight. According to existing runway line-of-sight standards, any two points located five feet above the runway centerline must be mutually visible for the entire length of the runway. If the runway has a full-length parallel taxiway, the visibility requirement is reduced to one-half the runway length. BFI meets all of the criteria to comply with the runway line-of-sight standards for the entire length of each runway.

Runway Protection Zones. The function of a Runway Protection Zone (RPZ) is to enhance the protection of people and property on the ground beyond the runway ends. This is achieved through airport control of the RPZ areas, and control is preferably exercised through the acquisition of sufficient property interest within the RPZ. It is desirable to clear all above ground objects from with RPZs; where this is impractical, airport owners, at minimum, should maintain the RPZ clear of all facilities supporting incompatible activities.

As defined in AC 150/5300-13A, RPZs are trapezoidal in shape, are centered about the runway centerline, and are specified as either "Approach" or "Departure" RPZs. The RPZs extend from a point 200 feet beyond the end of the area usable for takeoff or landing. The RPZ dimensions are functions of the type of aircraft using the runway and the approach visibility minimums associated with each runway end.

In FAA Memorandum *Interim Guidance on Land Uses within a Runway Protection Zone*, the FAA Office of Airports (ARP), outlined interim policy on land uses within RPZs, providing comprehensive guidance documents for existing and proposed land uses within RPZs. The interim guidance requires ARP Regional Office (RO), and Airport District Office (ADO), staff to consult with National Airport Planning and Environmental Division (APP-400), when defined land uses would enter the limits of the RPZ as a result of actions such as airfield improvements (e.g., runway extensions or shifts), change in *Design Aircraft* increasing the RPZ dimensions, new or revised instrument approach procedures increasing the RPZ dimensions, or local development proposals in the RPZ. As specified in this FAA Memorandum, it should be noted that "this interim policy only addresses the introduction of new or modified land uses to an RPZ and proposed changes to the RPZ size or location". However, the master planning process is the appropriate time to look at the practicability of removing incompatible land uses in the RPZ.

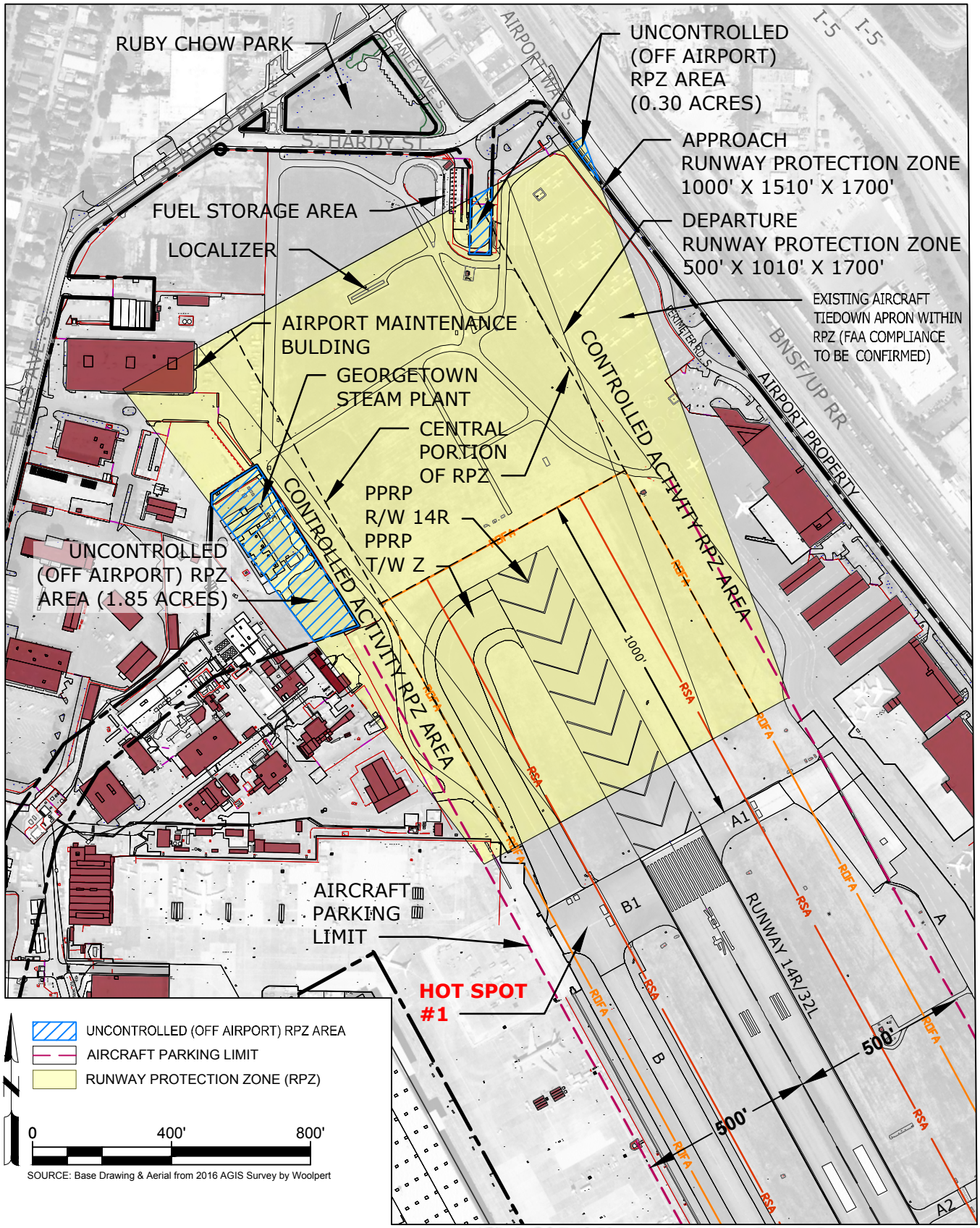
Land uses defined in the memorandum that require consultation include buildings and structures (e.g., residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings), recreational land uses (e.g., golf courses, sports fields, amusement parks, other places of public assembly), transportation facilities (such as, rail facilities, public roads and highways, vehicular parking facilities), above or below ground fuel storage or hazardous materials storage facilities, wastewater treatment facilities, and above ground utility infrastructure (e.g., electrical substations, including any type of solar panel installations). RO and ADO staff are further required to work with airport sponsors to identify, analyze, and document a full range of alternatives that avoid introducing a land use issues within the RPZ, minimize the impact of the land use in the RPZ (e.g., routing a new roadway through the controlled activity area, move farther away from the runway end, etc.), and mitigate risk to people and property on the ground (e.g. tunneling, depressing, and/or protecting roadways through the RPZ, implement operational measures to mitigate any risks). The following uses are permissible within a RPZ without further evaluation from the FAA; farming that meets airport design standards; irrigation channels that meet the requirements of AC 150/5200-33 and FAA/USDA manual, Wildlife Hazard Management at Airports; airport service roads, if the road is not a public road, and is directly controlled by the airport; underground facilities, as long as they meet other design criteria, such as RSA requirements: and unstaffed NAVAIDs and facilities, such as equipment for airport facilities that are considered fixed-by-function.

In consideration of the existing instrument approach minimums and the type of aircraft the runway is designed to accommodate, **Table C12** provides a comparison of the existing RPZ dimensions with the FAA's specified RPZ dimensional requirements. A graphic representation of how these RPZs are positioned at each runway end, for both approach and departures, is also presented in the following four illustrations (see **Figures C11** through **C14**).

Table C12 **RUNWAY PROTECTION ZONE DIMENSIONS, IN FEET**

Item	Width at Runway End (ft)	Length (ft)	Width at Outer End (ft)	Airport Controls Entire RPZ
Existing RPZ Dimensional Requirements				
Runway 14R/32L				
Runway 14R (Approach)	1,000	1,700	1,510	No
Runway 14R (Departure)	500	1,700	1,010	Yes
Runway 32L (Approach)	500	1,700	1,010	Yes
Runway 32L (Departure)	500	1,700	1,010	No
Runway 14L/32R				
Runway 14L (Approach & Departure)	250	1,000	450	Yes
Runway 32R (Approach & Departure)	250	1,000	450	Yes
Standard Approach RPZ Dimensions for Various Visibility Minimums				
Visual and not lower than 1-mile, Small Aircraft Only	250	1,000	450	---
Visual and not lower than 1-mile, Approach Categories A & B	500	1,000	700	---
Visual and not lower than 1-mile, Approach Categories C & D	500	1,700	1,010	---
Not lower than 3/4-mile, all aircraft	1,000	1,700	1,510	---
Lower than 3/4-mile, all aircraft	1,000	2,500	1,750	---
Standard Departure RPZ Dimensions				
Small Aircraft Only, AACs A and B	250	1,000	450	---
Large Aircraft, AACs A and B	500	1,000	700	---
Large Aircraft, AACs C, D, and E	500	1,700	1,010	---

SOURCE: *FAA AC 150/5300-13A, Change 1, Airport Design.*



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE C11 **Runway 14R**
Runway Protection Zone Detail

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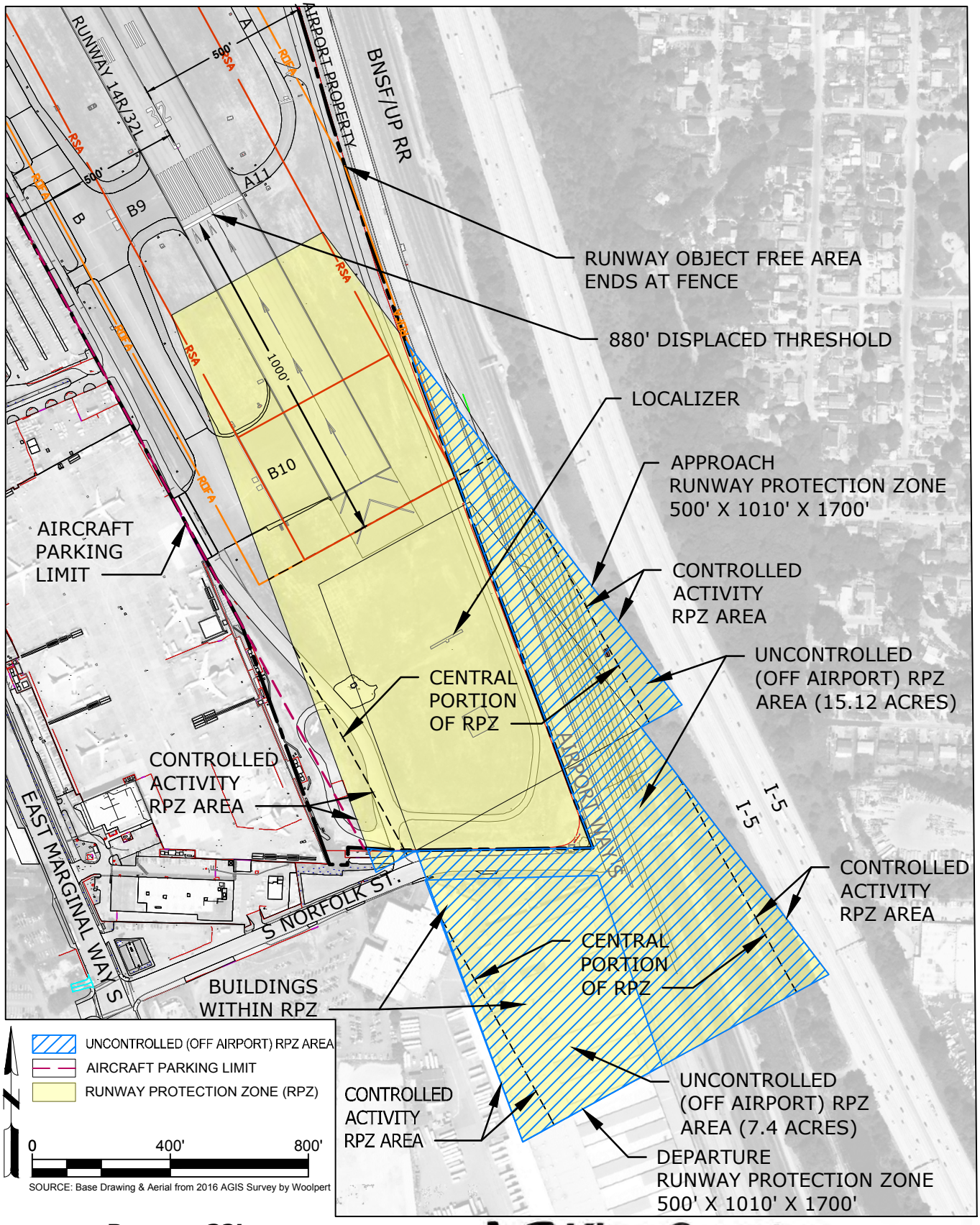

FIGURE C12 **Runway 32L**
Runway Protection Zone Detail

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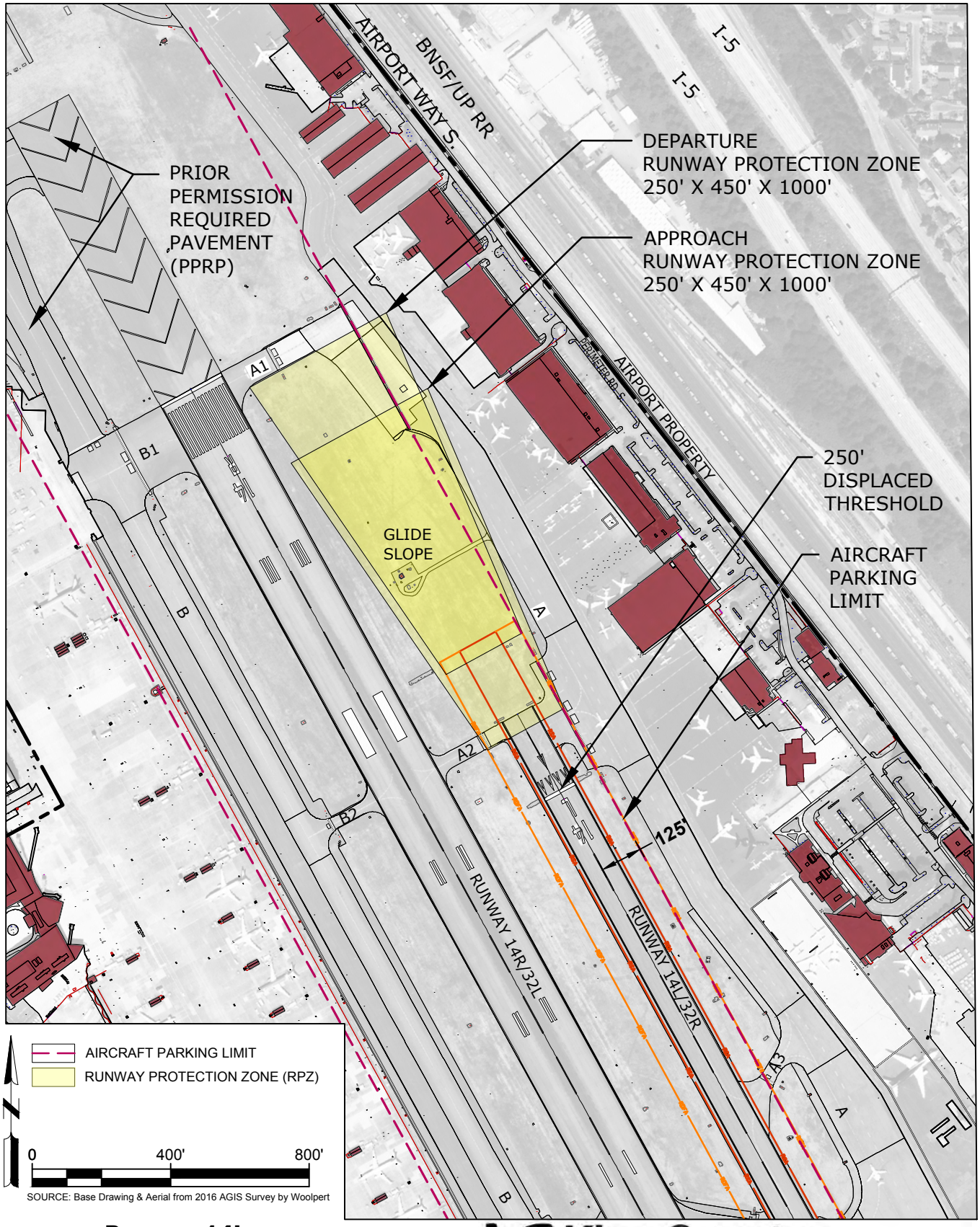
King County International Airport/ Boeing Field



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE C13 **Runway 14L**
Runway Protection Zone Detail

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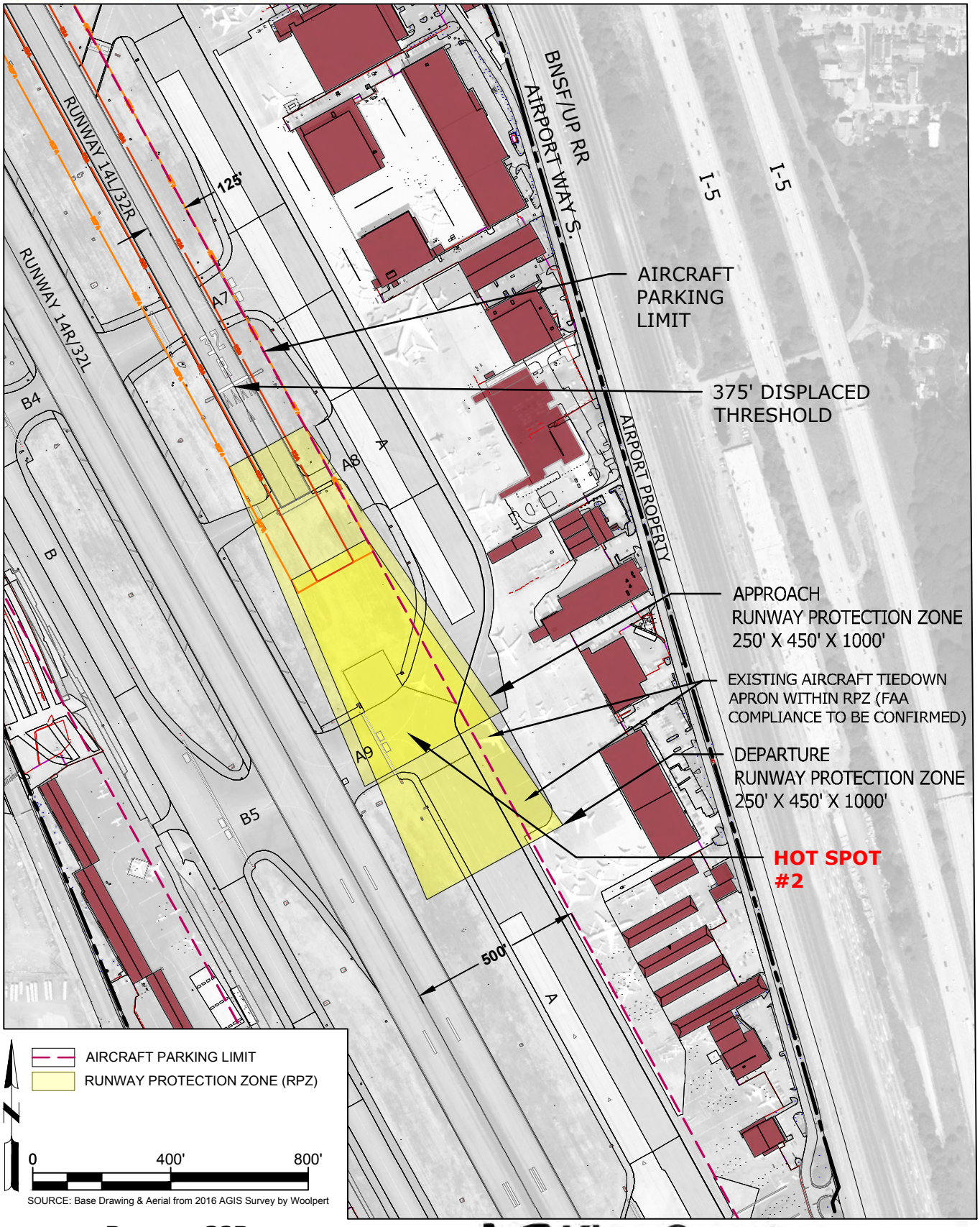
King County International Airport/ Boeing Field



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE C14 **Runway 32R**
Runway Protection Zone Detail

Mead & Hunt

King County International Airport/ Boeing Field

Currently, the existing RPZs at BFI meet the dimensional standards based on the existing visibility minimums and the appropriate AAC. However, the existing RPZs for Runways 14R and 32L extend beyond the Airport boundary and are not fully controlled by King County. These existing uncontrolled RPZ areas are defined as follows:

Runway 14R

- Airport Way S. and 15 Avenue S. right-of-way (ROW) @ 0.3 acres
- Georgetown Steam Plant property @ 1.85 acres
- Existing fuel storage area (located on Airport property, but categorized as an existing non-conforming land use for portion that is located within RPZ boundary)

Runways 32L

- Airport Way S., BNSF/UP Railroad, I-5, and S. Norfolk St. ROW @ 15.1 acres
- Prologis (former Sabey) property @ 7.4 acres

As noted above, the Runway 14R/32L RPZs contain existing non-conforming land uses (e.g., existing roadway and railroad right-of-way, buildings, and fuel storage area). Any alternatives that analyze future improvements to the runway and/or instrument approach procedures (presented in the next chapter) will include a re-evaluation of the RPZ requirements presented here, including an analysis of the compatible nature of land uses that might be located within RPZs because of activities listed in the FAA memorandum on land use guidance. Even though the FAA prefers the control of the RPZ to come from fee simple land acquisition of the property, further consideration will be given to the various options the Airport has regarding achieving full control of all RPZs, which also include RPZ easement acquisition, and negotiated RPZ land use agreements.

Runway End Siting Surfaces

Criteria contained in FAA AC 150/5300-13A, Change 1 *Airport Design* provides guidance for the proper siting of runway ends and thresholds. The criteria are in the form of evaluation surfaces that are typically trapezoidal shaped and extend away from the runway ends along the centerline at a specific slope, expressed in horizontal feet by vertical feet. The specific size, slope, and starting point of the trapezoid depends upon the visibility minimums and the type of procedure associated with the runway end. The existing criteria for BFI are presented in **Table C13**.

Threshold Siting Surface (TSS) Analysis. Thresholds are located to provide proper clearance over obstacles for landing aircraft on approach to a runway end. When an object is beyond an airport owner's ability to remove, relocate, or lower obstructs the airspace required for aircraft to land at the beginning of the runway for takeoff, the landing threshold may require a location other than the end of the pavement (i.e., a displaced threshold). Like the RPZ criteria, the threshold siting criteria are based on the type of aircraft and approach visibility minimums associated with each runway end. As can be noted, both Runway 14R/32L and Runway 14L/32R are clear of any TSS obstructions.

Vertical Guidance Surface (VGS) Analysis. The VGS is an imaginary surface used to evaluate precision approaches and approaches providing vertical guidance. When objects exceed the height of the VGS that cannot be mitigated, then an approach with vertical guidance cannot be authorized. The VGS begins at the threshold, has a width at the threshold of the runway width plus 200 feet, an outer width of 1,520 feet, extends to 10,000 feet (or the visual descent point or the decision altitude), and has a slope of 30:1. As can be noted, the existing VGS is only applicable to Runway 14R/32L, and only one VGS obstruction (i.e., a tree/#405950) was identified for Runway 14R.

Departure Surface Analysis. Departure ends of runways normally mark the end of the full-strength runway pavement available and suitable for departures. Departure surfaces, when clear of obstacles, allow pilots to follow standard departure procedures. If obstacles penetrate the departure surface, then the obstacles must be evaluated through the Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) process. After the OE/AAA process, departure procedure amendments such as non-standard climb rates, non-standard (higher) departure minimums, or a reduction in the length of Takeoff Distance Available (TODA) may be required. Departure surfaces begin at the end of the Takeoff Distance Available (TODA), are trapezoidal in shape, extend along the extended runway centerline, and have a slope of 40:1. As can be noted, the departure surface criteria are only applicable to Runways 14R & 32L at BFI. There were 690 obstructions identified for the Runway 14R departure surface and 318 obstructions identified for Runway 32L.

Table C13 **RUNWAY END SITING CRITERIA, IN FEET**

Runway Type	Distance from Runway End (ft)	Width at Inner Edge (ft)	Length (ft)	Width at Outer Edge (ft)	Slope
Existing Threshold Siting Surfaces					
Runway 14R/32L					
Runway 14R (Type 4 with Type 6 overlay)[1]	200	400	10,000	3,400	20:1
Runway 32L (Type 4 with Type 6 overlay)[2]	200	400	10,000	3,400	20:1
Runway 14L/32R					
Runway 14L (Type 2)[3]	0	250	5,000	700	20:1
Runway 32R (Type 2)[3]	0	250	5,000	700	20:1
Standard Threshold Siting Surface Dimensions:					
1. Approach end of runways expected to serve small airplanes with approach speeds less than 50 knots. (Visual runways only, day/night)	0	120	3,000	300	15:1
2. Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more. (Visual runways only, day/night)	0	250	5,000	700	20:1
3. Approach end of runway expected to serve large airplanes. (Visual runways only, day/night)	0	400	10,000	1,000	20:1
4. Approach end of runways expected to accommodate instrument approaches having visibility greater than or equal to 3/4 statute mile	200	400	10,000	3,400	20:1
5. Approach end of runways expected to accommodate instrument approaches having visibility minimums less than 3/4 statute mile	200	800	10,000	3,400	34:1

Table C13 **RUNWAY END SITING CRITERIA, IN FEET – CONTINUED**

Runway Type	Distance from Runway End (ft)	Width at Inner Edge (ft)	Length (ft)	Width at Outer Edge (ft)	Slope
Existing Departure Surfaces (RWs 14R & 32L only)					
6. Approach end of runways expected to accommodate instrument approaches with vertical guidance	0	Runway width + 200	10,000	1,520	30:1
7. Departure runway ends for any instrument ops. [4]	0	1,000	10,200	6,466	40:1
Standard Departure Surface Dimensions:	0	1,000	10,200	6,466	40:1

SOURCE: *FAA Engineering Brief #99/Changes to Tables 3-2 and 3-4 of AC 150/5300-13A, Airport Design.*

[1] Runway Type 4 surface and Type 6 VGS surface is clear.

[2] Runway Type 4 surface has one obstruction, but Type 6 VGS surface is clear.

[3] Runway Type 2 surface is clear.

[4] Runway 14R Type 7 surface has 690 obstructions and Runway 32L Type 7 surface has 318 obstructions.

Updated Airport Geographic Information System (AGIS) survey data has been collected and was analyzed/documented for this evaluation effort. Following the consideration of this information in the alternatives analysis and selection of the recommended Conceptual Development Plan, specific sheets of the Airport Layout Plan Drawing Set will be prepared and presented in the **Executive Summary** chapter that illustrate the applicable threshold siting surface (TSS) and departure surface in both plan and profile views for each runway end. In addition, the specific boundary and clearance criteria for this surface has changed since the preparation of the previous Master Plan, and the continued clearance of these surfaces need to be confirmed periodically in response new construction and growth of vegetation.

Federal Aviation Regulations (FAR) Part 77

Safe and efficient landing and takeoff operations at an airport require that certain areas on and near the airport are clear of objects or restricted to objects with certain function, composition, and/or height. Obstruction clearing standards and criteria are established to create a safer environment for aircraft operations on or near the airport. Any existing or proposed object, whether man-made or of natural growth that penetrates obstruction clearance surfaces is classified as an "obstruction" and is presumed to be a hazard to air navigation. These obstructions are subject to FAA aeronautical study, after which the FAA issues a determination stating if the obstruction is in fact considered a hazard.

The criteria contained in Federal Aviation Regulations (FAR), Part 77 *Safe, Efficient Use, and Preservation of Navigable Airspace*, apply to existing and proposed manmade objects and/or objects of natural growth and terrain (i.e., obstructions). These guidelines define the critical areas in the vicinity of airport that should be kept free of obstructions. Secondary areas may contain obstructions if they are determined to be non-hazardous by aeronautical study and/or if they are marked and lighted as specified in the aeronautical study determination. Airfield navigational aids, as well as lighting and visual aids, by nature of their location, may constitute obstructions. However, these objects do not violate FAR Part 77 requirements, as they are essential to the operation of the Airport.

The *Primary Surface* is a surface that is longitudinally centered on the runway. This surface extends 200 feet beyond each end of the runway for a hard surface runway. The *Primary Surface* width also varies based upon the current instrument approach visibility minimums of the runway. For Runway 14R/32L, which has existing instrument approach visibility minimums as low as ¾-statute miles, the resulting Primary Surface width is 1,000 feet wide, (500 feet from centerline on each side of the runway). For Runway 14R/32L, which is designated as a Utility runway per FAR Part 77, the Primary Surface is 250 feet in width.

The Approach Surface is longitudinally centered on the extended runway centerline and extends outward and upward from each end to the *Primary Surface* at a specific slope, expressed in horizontal feet by vertical feet. For example, a 20:1 slope rises one unit vertically for every 20 units horizontally. An *Approach Surface* is applied to each end of the runway based upon the type of approach available or planned for that runway end. The inner width of the *Approach Surface* is the same as the *Primary Surface* (1,000 Feet) and expands uniformly to a width of 16,000 feet for each end of Runway 14R/32L. The outer width of the approach surface for each end of Runway 14L/32R expands uniformly to a width of 1,250 feet. The *Approach Surface* for Runway 14R/32L extends for a horizontal distance of 10,000 feet at a slope of 50:1 and an additional 40,000 feet at a slope of 40:1. The *Approach Surface* for Runway 14L/32R extends for a horizontal distance of 5,000 feet at a slope of 20:1.

As noted previously, new aerial photography and obstruction data has been acquired that permits an updated analysis of the FAR Part 77 surfaces and documentation of potential obstructions. Based upon the initial evaluation of this data, the following approach surface obstruction data is provided below for each runway:

Runway 14R/32L (Primary Runway)

- Runway 14R Approach Surface with 130 Obstructions
- Runway 32L Approach Surface with 443 Obstructions

Runway 14L/32R (Secondary Runway)

- Runway 14L Approach Surface with 1 Obstruction
- Runway 32R Approach Surface with 4 Obstructions

The specific mapping of the various FAR Part 77 imaginary surfaces for each runway at BFI and the known associated obstacle and terrain penetrations of these surfaces will be prepared as sheets of the Airport Layout Plan Drawing Set and presented in the **Executive Summary** chapter.

Instrumentation and Lighting

Instrument Approach Procedures. Instrument Approach Procedure (IAP) capabilities and associated equipment, airport lighting, and weather/airspace services, were detailed in the **Inventory of Existing Conditions** chapter. As noted, the Airport has five published instrument approach procedures (IAPs). Runway 14R offers the best IAP minimums, with ceiling and visibility minimums of 308 feet and ¾ statute mile (ILS), including minimums of 680 feet and ¾ statute mile (RNAV GPS). Based upon an analysis of the Airport's existing climatological conditions (presented earlier in this chapter), the existing IAPs provide adequate IFR accessibility, with below minimum conditions occurring 2.0 percent of the time annually, or approximately 7.3 days of the year.

In addition, based on the IFR wind analysis, Runway 14R provides the best wind coverage during IFR weather conditions. However, any future IAP improvements should also include consideration of future enhancements for Runway 32L to maximize the potential NextGen implementation options/strategies that are currently under investigation within the Puget Sound Region [i.e., implement RNAV Standard Instrument Departures (SIDs) for both north Flow and South Flow conditions to permit independent operations and de-conflict airspace between BFI and SEA with development of new NextGen RNAV (GPS) approach for poor weather/north flow conditions (during Plan C) to permit simultaneous/independent operations]. These implementation strategies may also require the mitigation of existing obstructions (if feasible), based upon the findings of the new AGIS obstruction survey, to accommodate potential new NextGen instrument approach procedures at BFI.

Visual Landings Aids. Presently, the runways at BFI are equipped with a variety of visual landing aids. These facilities are listed as follows:

Runway 14R/32L

- High Intensity Runway Lights (HIRLs)
- Four-box Precision Approach Path Indicator (PAPI) – Each runway end
- Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF)– Runway 14R

Runway 14L/32R

- Medium Intensity Runway Lights (MIRLs)
- Two-box PAPI – Each runway end
- REILs – Each runway end

According to guidance contained in AC 150/5300-13A, Change 1, an Approach Light System (ALS) is recommended, but not required for IAPs with visibility minimums not less than ¾ statute mile. Unless the ALS is a requirement to achieve the lower visibility minimums based on credit for lighting, they are not normally eligible for FAA Airport Improvement Program (AIP) funding. Future ALS improvements, if any, to Runway 14R/32L will be evaluated in conjunction with the findings of the obstruction survey and the alternatives development analysis presented in the following chapter. There are no future ALS improvements recommended for Runway 14L/32R.

Taxiway Design

Taxiways provide defined movement corridors for aircraft between the various functional landside areas on an airport and the runway system. Some taxiways are necessary simply to provide access between aircraft parking aprons and runways, whereas other taxiways become necessary to provide more efficient and safer use of the airfield. Parallel taxiways eliminate the use of the runway for taxiing, thus increasing capacity and protecting the runway under low visibility conditions. Taxiway turns and intersections are designed for safe and efficient taxiing by aircraft while minimizing excess pavement.

Taxiway Design Methodology. Taxiways are designed for "cockpit over centerline" taxing with pavement being of sufficient width to allow a certain amount of wander. Potential runway incursions should be kept to a minimum by proper taxiway design, choosing simplicity over complexity wherever possible. AC 150/5300-13A provides basic taxiway design concepts and methodologies that are outlined in the following narrative.

- *Increased Pilot Awareness.* Taxiway intersections should be kept simple by utilizing the "three-node concept", which means that a pilot is presented with no more than three choices at each intersection – ideally, left, right, and straight ahead. Intersection angles ideally should be 90° wherever possible, but standard angles of 30°, 45°, 60°, 120°, 135°, and 150° are acceptable.

- *Wide Expanses of Pavement.* Taxiway to runway interface encompassing wide expanses of pavement should be avoided, as wide pavements require placement of signs far from a pilot's eyes and reduce the conspicuity of other visual cues (e.g., the existing Taxiway A/A9 intersection that is identified as an existing airfield "hotspot" and the Taxiway A10, B5, and B10 connectors).

- *Limit Runway Crossing.* Opportunities for human error can be reduced by limiting the need for runway crossings, especially crossings within the middle third of runways defined as high energy intersections. Limiting runway crossings to the outer thirds of the runway (e.g., the Taxiway A4 – B3 and A10 – B6 crossings) keeps clear the portion of the runway where pilots can least maneuver to avoid collisions.

- *Increase Visibility.* Right angle intersections, both between taxiways and between taxiways and runways, provide the best visibility to the left and right for a pilot. A right angle turn at the end of the parallel taxiway is a clear indication of approaching a runway. Acute angle exit taxiways provide greater runway efficiency but should not be used for runway entrance or crossing points (e.g., Taxiways A4 & A5).

- *Avoid Dual Purpose Pavement.* Runways used as a taxiways and taxiways used as runways only lead to confusion and should be avoided. Runways should be clearly identified as a runway and only a runway.

- *Indirect Access.* Taxiways should not lead directly from an apron to a runway without requiring a turn. This layout only leads to confusion when a pilot typically expects to encounter a parallel taxiway (e.g., Taxiways A7, B1, and B10).

Each of the taxiway systems at BFI will be examined in consideration of these taxiway design concepts and methodologies in conjunction with the alternatives analysis presented in the following chapter, and potential taxiway reconfiguration recommendations will be identified. In addition, many of the existing taxiway intersections at BFI were constructed in consideration of "judgmental oversteering", with the new standard being "cockpit over centerline steering". Therefore, future taxiway reconstruction projects will be designed in accordance with the new cockpit over centerline guidelines.

Taxiway Dimensional Criteria

Taxiway and taxilane clearance requirements are the required distances between a taxiway/taxilane centerline and other objects, which are based upon the required wingtip clearance, a function of the wingspan, and therefore are determined by the ADG as it relates to the *Design Aircraft*. Taxiway and taxilane pavement design standards are related to the TDG, which is based on the overall MGW and the CMG distance of the *Design Aircraft*.

Taxiway Design Analysis. Using the data compiled from the aircraft operations and runway utilization analysis presented in the previous chapter, it was determined that ADG IV and TDG 5 were the appropriate design standard for the Airport's west parallel taxiway system (i.e., Taxiway B). However, due to existing property constraints on the Airport's east side, a combination of three design standards have been implemented on Taxiway A. These include:

- Taxiway A (Between A3 & A10) @ ADG IV and TDG 5
- Taxiway A (Between A1 & A3) @ ADG III and TDG 3
- Taxiway A (Between A10 & A11) @ ADG II and TDG 2
- Taxiway A (North of A1) @ ADG I and TDG 1A

These standards are presented in the **Tables C14** through **C17**. As can be noted, the taxiway system has existing non-standard dimensions for the taxiway object free area (TOFA) along the west side of Taxiway B, and along segments on the east side of Taxiway A (see list below).

- Taxiway A TOFA (between A1 & A3 and north of A1)
- Taxiway B TOFA

In addition, there are two documented hot spots at BFI that are associated with the east and west side parallel taxiway system. The first is located at the intersection of Taxiway B1 and is associated with the restricted access to the Taxiway Z PPRP. The second is located at the intersection of Taxiway A9 and Runway 14R/32L and has been identified as a risk for wrong way departures. These two hot spots, along with the various taxiway design standards, are graphically depicted on **Figures C15** through **C19**.

Table C14 **EAST SIDE TAXIWAY DESIGN STANDARDS MATRIX (ADG), IN FEET**

Item	Existing Dimension (ft)	ADG Standard (ft)	Standard Met
Taxiway A (Partial Parallel – Between A3 & A10)		**ADG IV**	
Taxiway Width	75	---	---
Taxiway Safety Area (TSA) [1]	171	171	Yes
Taxiway Object Free Area (TOFA) [2]	259	259	Yes
Taxilane Object Free Area	---	225	NA
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[3]	---	215	NA
Taxiway Centerline to Fixed or Movable Object	129.5	129.5	Yes
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	---	198	NA
Taxilane Centerline to Fixed or Movable Object	---	112.5	NA
Taxiway Wingtip Clearance	51.5	44	Yes
Taxilane Wingtip Clearance	---	27	Yes
Taxiway A (Partial Parallel – Between A1 & A3)		**ADG III**	
Taxiway Width	50	---	---
Taxiway Safety Area (TSA) [1]	118	118	Yes
Taxiway Object Free Area (TOFA) [2]	**174**	186	**No** [4]
Taxilane Object Free Area	---	162	NA
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[3]	---	152	NA
Taxiway Centerline to Fixed or Movable Object	**80**	93	**No** [4]
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	---	140	NA
Taxilane Centerline to Fixed or Movable Object	---	81	NA
Taxiway Wingtip Clearance	34	34	Yes
Taxilane Wingtip Clearance	27	27	Yes
Taxiway A (Partial Parallel – Between A10 & A11)		**ADG II**	
Taxiway Width	35	---	---
Taxiway Safety Area (TSA) [1]	79	79	Yes
Taxiway Object Free Area (TOFA) [2]	93.6	131	**No**[5]
Taxilane Object Free Area	---	115	NA
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[3]	---	105	NA
Taxiway Centerline to Fixed or Movable Object	28.0	65.5	**No**[5]
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	---	97	NA
Taxilane Centerline to Fixed or Movable Object	---	57.5	NA
Taxiway Wingtip Clearance	<26	26	**No**[5]
Taxilane Wingtip Clearance	---	18	Yes

Table C14 **EAST SIDE TAXIWAY DESIGN STANDARDS MATRIX (ADG), IN FEET - CONTINUED**

Item	Existing Dimension (ft)	ADG Standard (ft)	Standard Met
Taxiway A (Partial Parallel – North of A1)		**ADG I**	
Taxiway Width	30	---	---
Taxiway Safety Area (TSA) [1]	49	49	Yes
Taxiway Object Free Area (TOFA) [2]	74.5	89	**No**[5]
Taxilane Object Free Area	---	79	NA
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[3]	---	70	NA
Taxiway Centerline to Fixed or Movable Object	30	44.5	**No**[5]
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	---	64	NA
Taxilane Centerline to Fixed or Movable Object	---	39.5	NA
Taxiway Wingtip Clearance	12.1	20	**No**[5]
Taxilane Wingtip Clearance	---	15	NA

SOURCE: *FAA AC 150/5300-13A, Change 1, Airport Design.*

[1] TSA—A clear, graded, and drained area on both sides of a taxiway/taxilane intended to protect the landing gear in the event of an excursion from the taxiway pavement.

[2] Taxiway/Taxilane Object Free Area— An area on both sides of a taxiway/taxilane intended to protect the airplane wing.

[3] Dimension may need to be increased to comply with TDG standards when 180 degree turns between parallel taxiways are required.

[4] Non-Standard condition is mitigated with existing "aircraft wingspan use restriction" of 108' – based on BFI Facility Directory.

[5] Non-Standard condition caused by location of ground service vehicle road located adjacent to the east side of the taxiway.

NA – Not Applicable.

Table C15 **WEST SIDE TAXIWAY DESIGN STANDARDS MATRIX (ADG), IN FEET**

Item	Existing Dimension (ft)	ADG Standard (ft)	Standard Met
Taxiway B (Parallel) & Includes Taxiway Z		**ADG IV**	
Taxiway Width	75	75	Yes
Taxiway Safety Area (TSA) [1]	171	171	Yes
Taxiway Object Free Area (TOFA) [2]	**244.5**	259	**No** [4]
Taxilane Object Free Area	---	225	NA
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[3]	---	215	NA
Taxiway Centerline to Fixed or Movable Object	**103-125**	129.5	**No** [4]
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	---	198	NA
Taxilane Centerline to Fixed or Movable Object	---	112.5	NA
Taxiway Wingtip Clearance	37	44	**No** [4]
Taxilane Wingtip Clearance	---	27	Yes

SOURCE: *FAA AC 150/5300-13A, Change 1, Airport Design.*

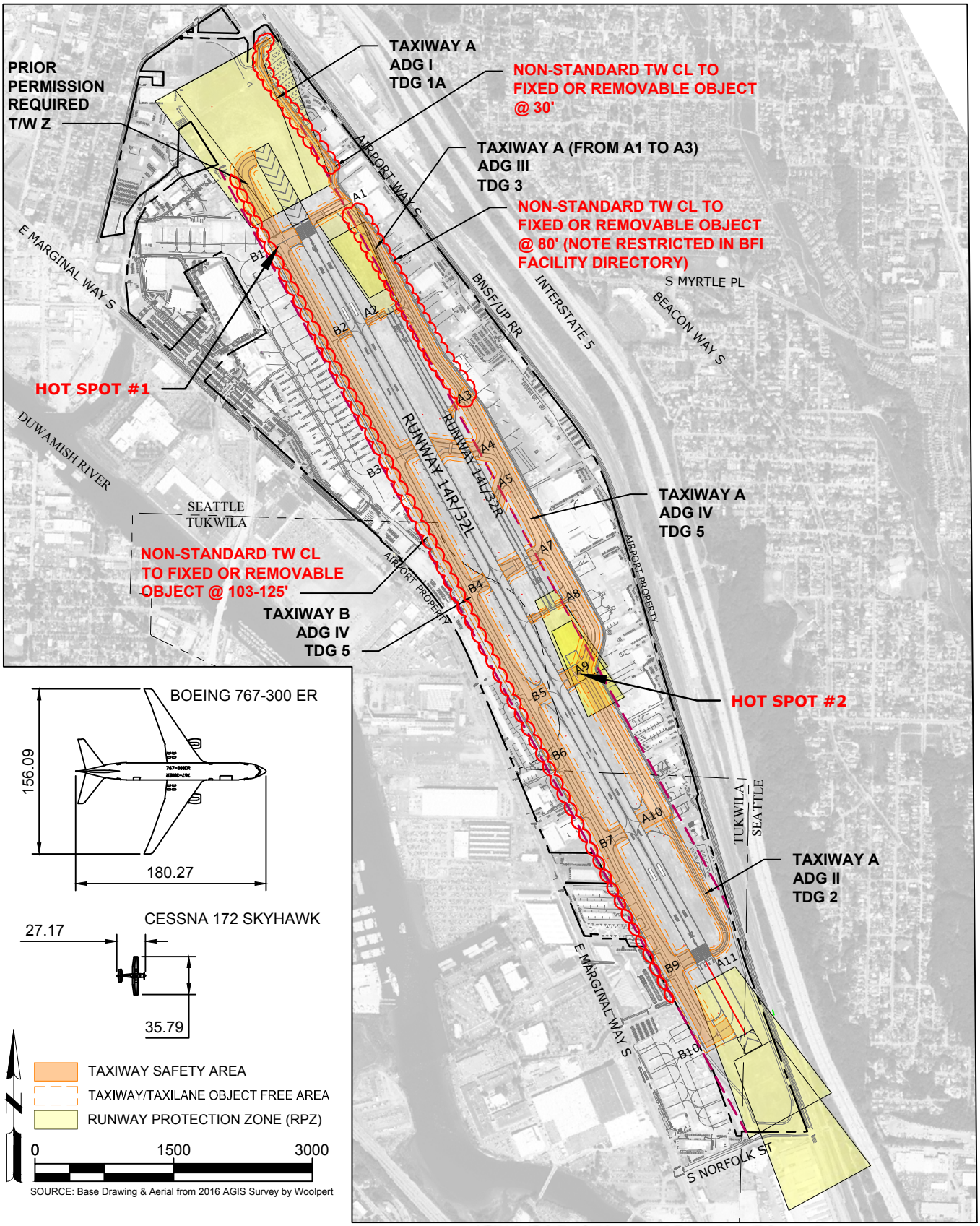
[1] TSA—A clear, graded, and drained area on both sides of a taxiway/taxilane intended to protect the landing gear in the event of an excursion from the taxiway pavement.

[2] Taxiway/Taxilane Object Free Area— An area on both sides of a taxiway/taxilane intended to protect the airplane wing.

[3] Dimension may need to be increased to comply with TDG standards when 180 degree turns between parallel taxiways are required.

[4] Non-Standard condition caused by location of ground service vehicle road located adjacent to the west side of the taxiway.

NA – Not Applicable.

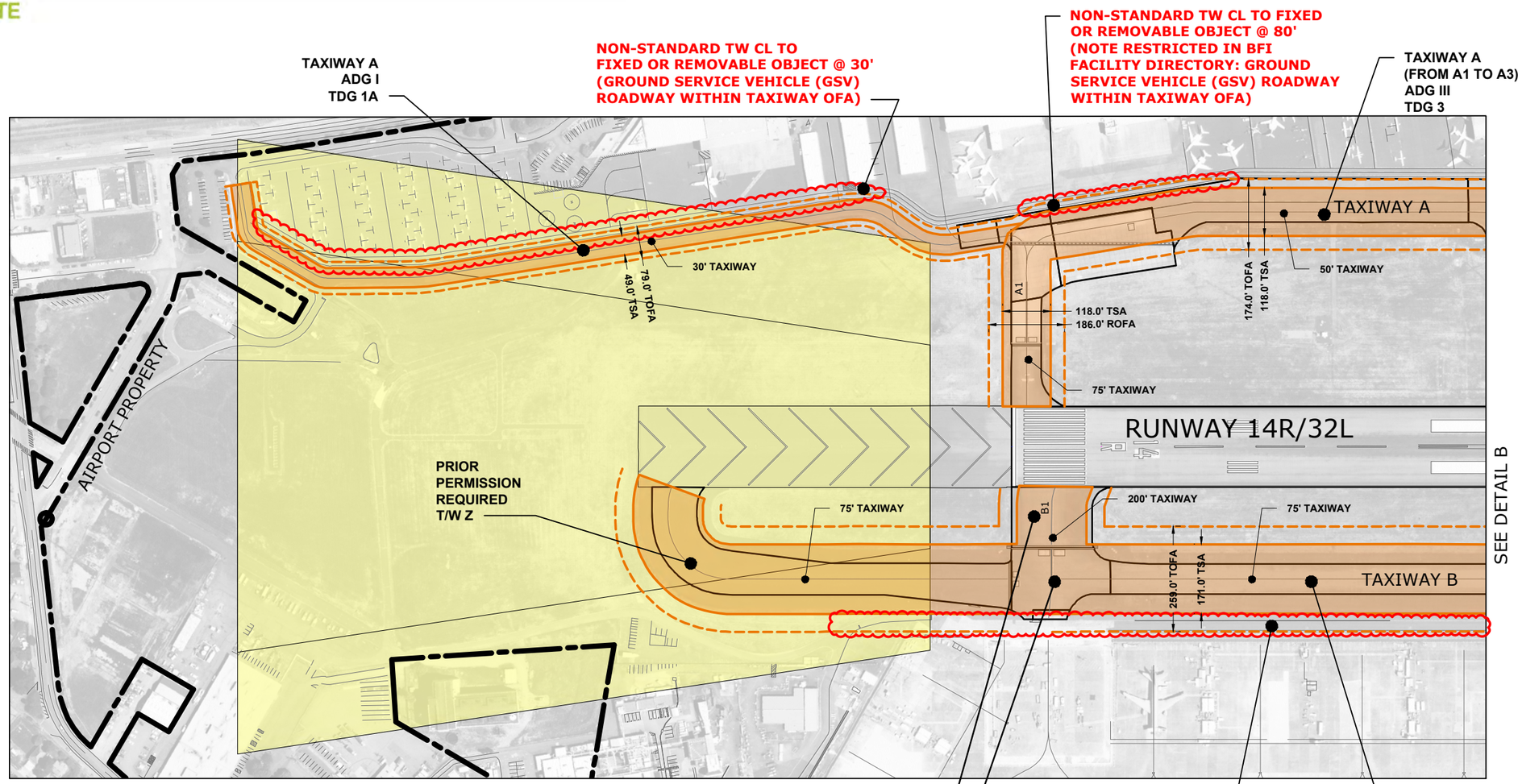


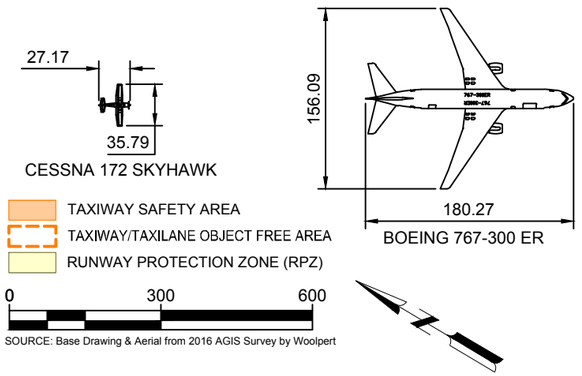
SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

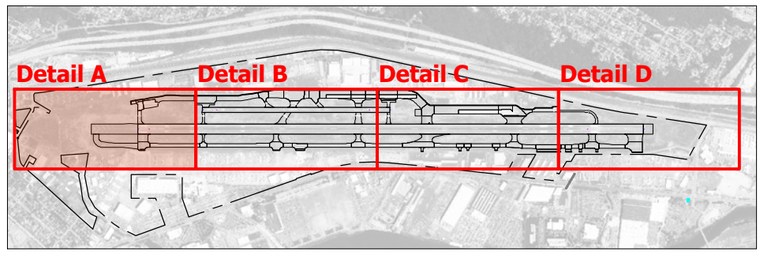
FIGURE C15 **Taxiway/Taxilane System Dimensional Standards**

Mead & Hunt

King County International Airport/ Boeing Field

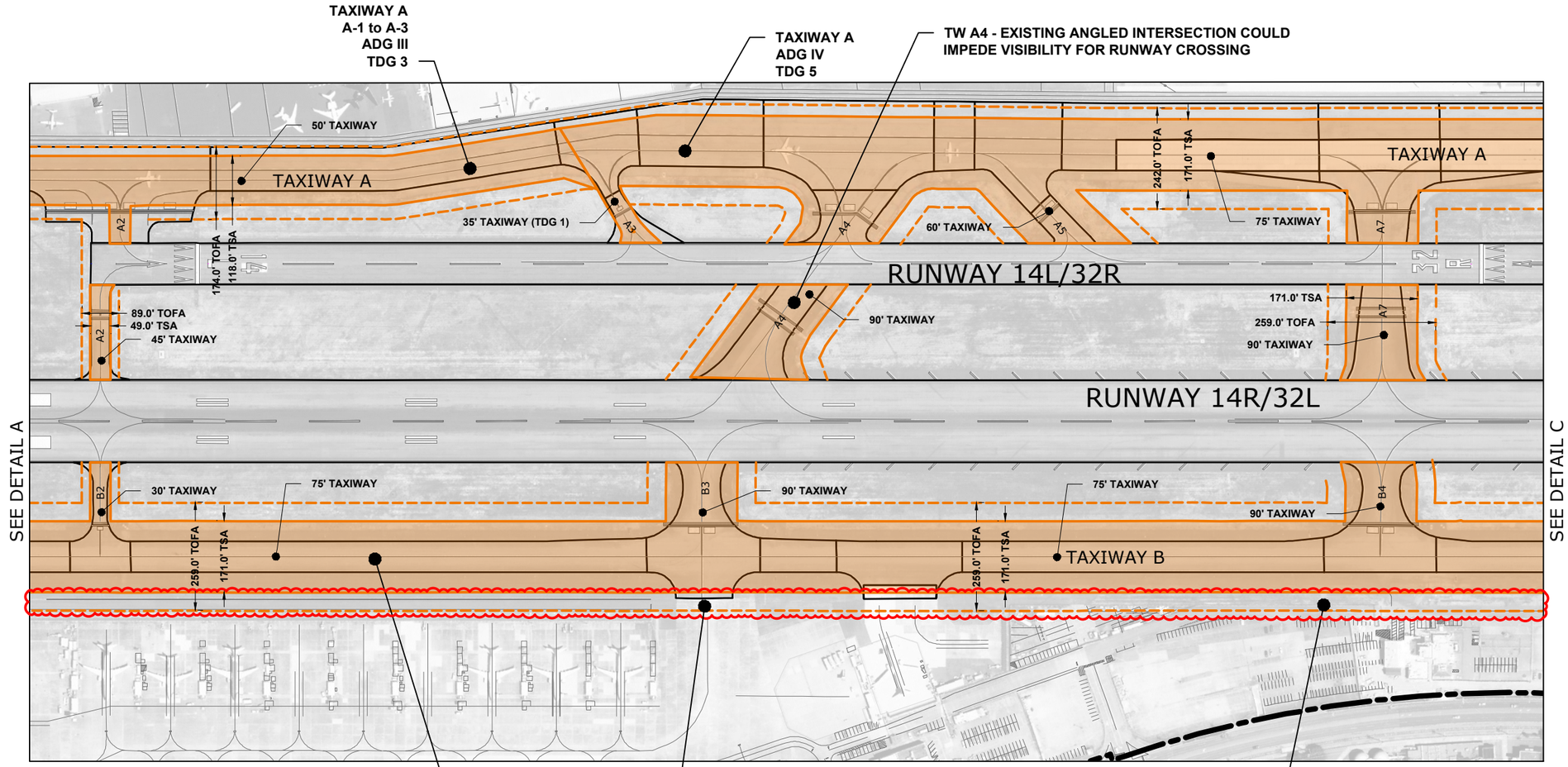


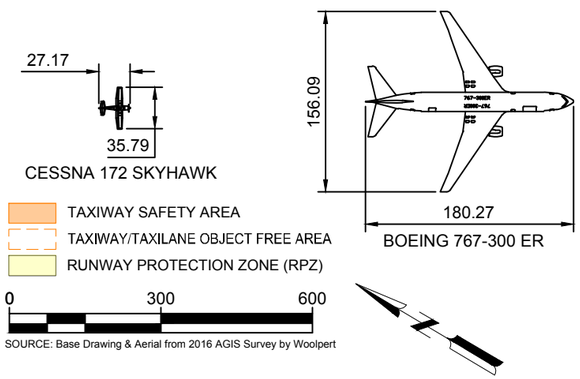


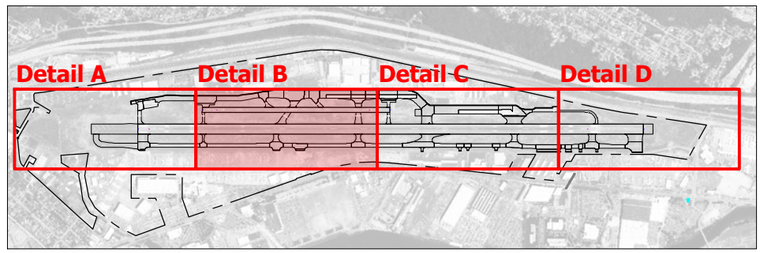


Keymap

FIGURE C16 **Taxiway/Taxilane System Dimensional Standards - Detail A**

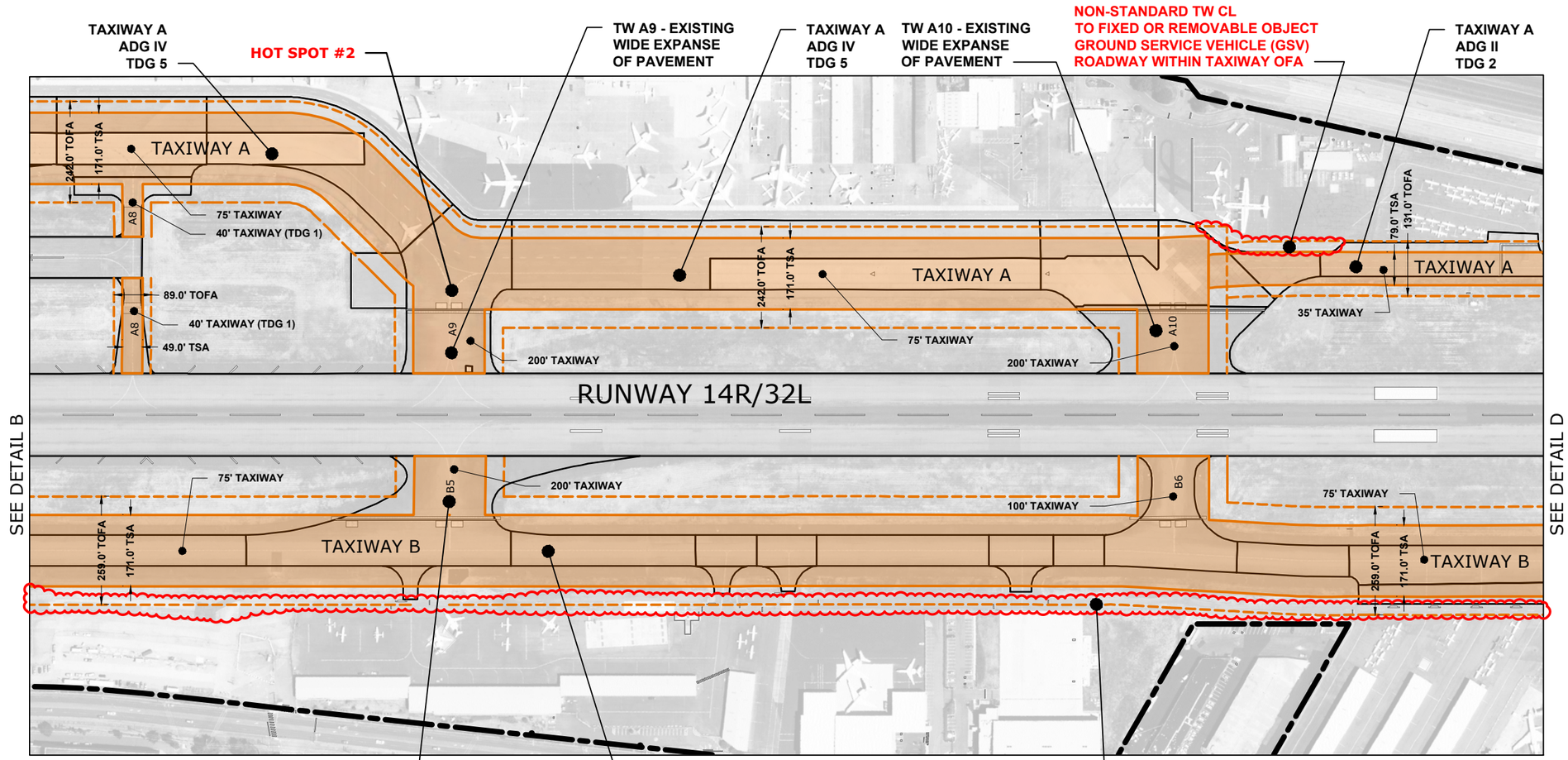


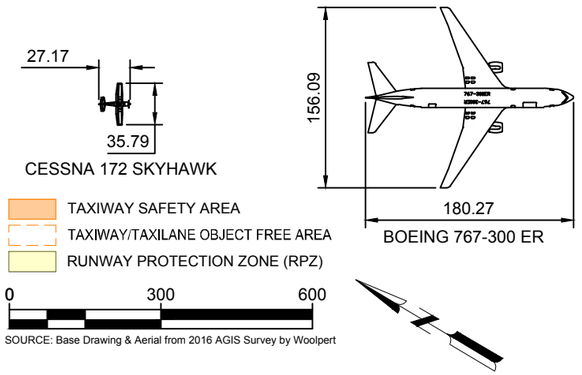


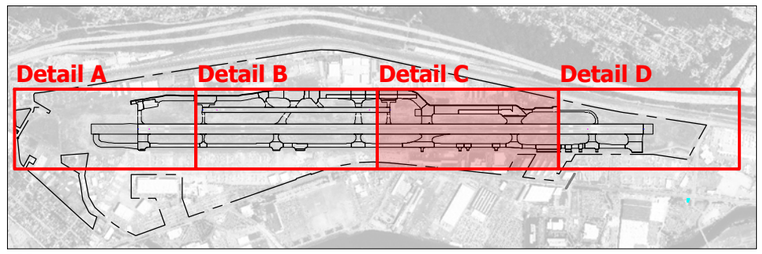


Keymap

FIGURE C17 **Taxiway/Taxilane System Dimensional Standards - Detail B**





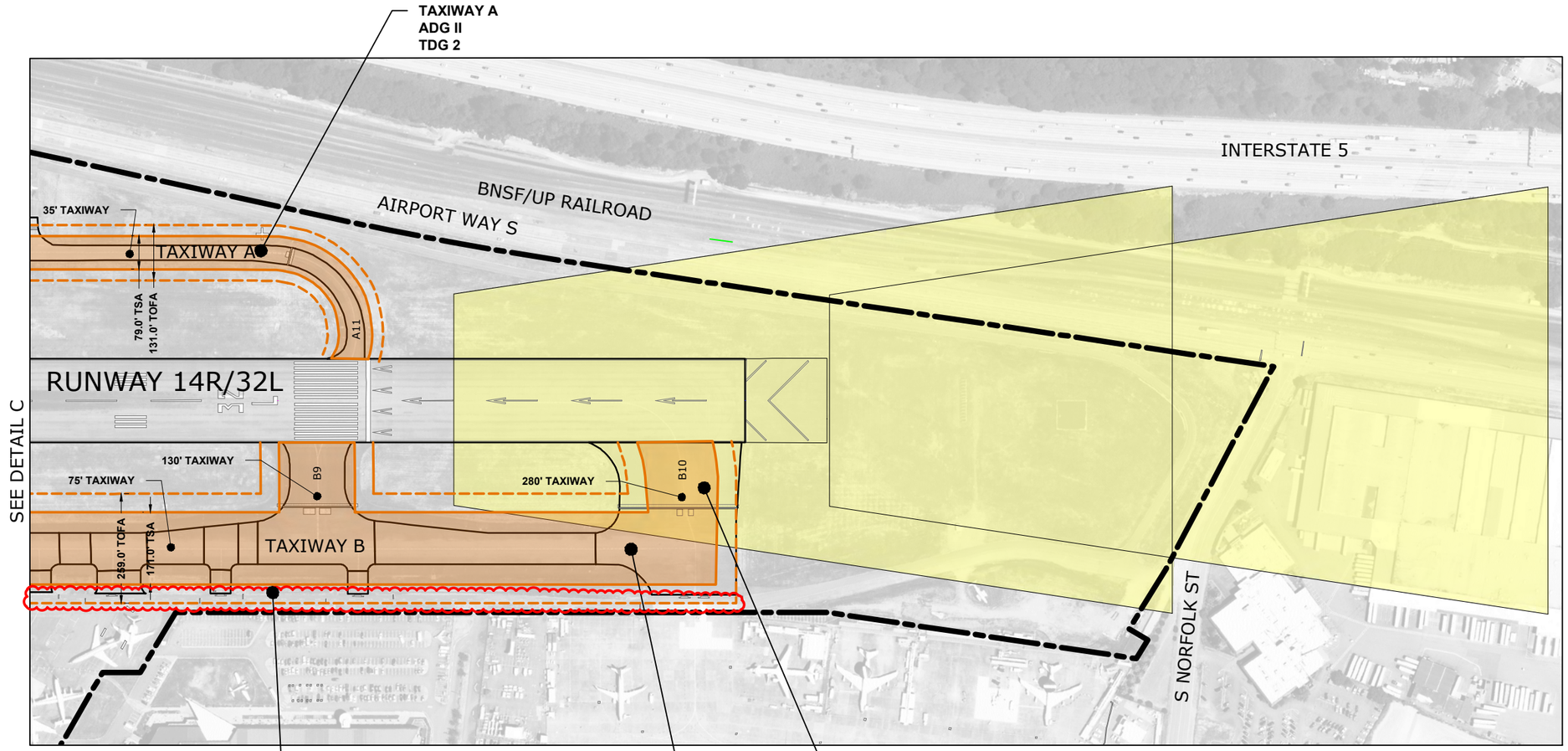


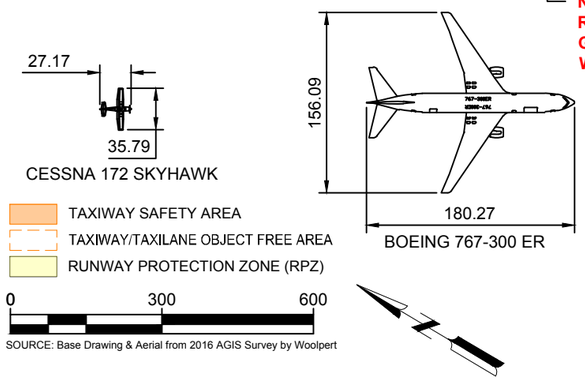
Keymap

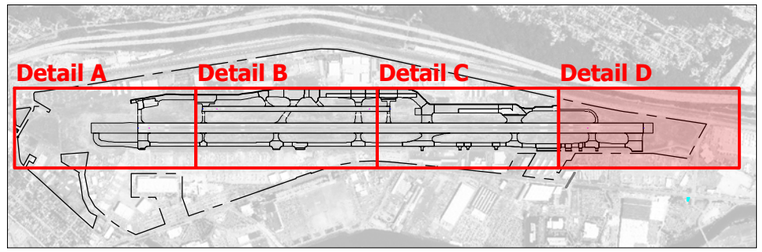
FIGURE C18 **Taxiway/Taxilane System Dimensional Standards - Detail C**

Mead & Hunt

King County International Airport/ Boeing Field







Keymap

FIGURE C19 **Taxiway/Taxilane System Dimensional Standards - Detail D**

Table C16 **EAST SIDE TAXIWAY DESIGN STANDARDS MATRIX (TDG), IN FEET**

Item	Existing Dimension (ft)	TDG Standard (ft)	Standard Met
Taxiway A (Partial Parallel – Between A3 & A10)		**TDG 5**	
Taxiway Width	75	75	Yes
Taxiway Edge Safety Margin[1]	15	15	Yes
Taxiway Shoulder Width	25	30	**No**
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[2]	---	240	NA
Taxiway A (Partial Parallel – Between A1 & A3)		**TDG 3**	
Taxiway Width	50	50	Yes
Taxiway Edge Safety Margin[1]	10	10	Yes
Taxiway Shoulder Width	**0**	20	**No**
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[2]	---	162	NA
Taxiway A (Partial Parallel – Between A10 & A11)		**TDG 2**	
Taxiway Width	35	35	Yes
Taxiway Edge Safety Margin[1]	7.5	7.5	Yes
Taxiway Shoulder Width	**0**	15	**No**
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[2]	---	162	NA
Taxiway A (Partial Parallel – North of A1)		**TDG 1A**	
Taxiway Width	30	25	Yes
Taxiway Edge Safety Margin[1]	5	5	Yes
Taxiway Shoulder Width	**0**	10	**No**
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[2]	---	70	NA

SOURCE: *FAA AC 150/5300-13A, Change 1, Airport Design.*

[1] Taxiway Edge Safety Margin— minimum pavement to be provided between the outer edge of the main gear tire and the edge of taxiway/taxilane pavement.

[2] TDG standards are more demanding than ADG standards when 180 degree turns between parallel taxiways are required.

Table C17 **WEST SIDE TAXIWAY DESIGN STANDARDS MATRIX (TDG), IN FEET**

Item	Existing Dimension (ft)	TDG Standard (ft)	Standard Met
Taxiway B (Parallel)		**TDG 5**	
Taxiway Width	75	75	Yes
Taxiway Edge Safety Margin[1]	15	15	Yes
Taxiway Shoulder Width	**25**	30	**No**
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline[2]	---	240	NA

SOURCE: *FAA AC 150/5300-13A, Change 1, Airport Design.*

[1] Taxiway Edge Safety Margin— minimum pavement to be provided between the outer edge of the main gear tire and the edge of taxiway/taxilane pavement.

[2] TDG standards are more demanding than ADG standards when 180 degree turns between parallel taxiways are required.

As noted above, the existing non-standard conditions associated with the BFI taxiway system are primarily associated with the taxiway object free areas (TOFAs), but also includes some taxiway shoulder widths. At present, the mitigation technique that has been applied to one of the non-standard TOFA dimensions has been the publication of aircraft use restrictions within the Airport's Facility Directory.

With regard to the existing non-standard taxiway shoulder dimensions, unprotected soils adjacent to runways and taxiways are susceptible to erosion due to jet blast. A dense, well-rooted turf cover can prevent erosion and support the occasional passage of aircraft, maintenance equipment, or emergency equipment under dry conditions. Paved shoulders are only required for taxiways, taxilanes, and aprons accommodating ADG IV and larger aircraft (e.g., the Boeing 767 series), and are recommended for taxiways, taxilanes, and aprons accommodating ADG III aircraft (e.g., the Boeing 737 series).

Each of these existing taxiway non-standard conditions will be evaluated in conjunction with the preparation of the airside alternatives, as well as a review of the basic taxiway design concepts and methodologies that were outlined in the previous section. All options to mitigate or resolve these existing non-standard conditions will be identified for potential implementation.

Exit Taxiway Analysis

As noted in the previous section, each of the runways at BFI are served by either parallel or partial parallel taxiway systems that serve both sides of the runway and are provided with connector/exit taxiways at various locations along the runway that are designed to varying standards and dimensions. According to the FAA taxiway design guidance provided in AC 150/5300-13A, Change 1 *AIRPORT DESIGN*, right-angled taxiways are the recommended standard for all runway/taxiway intersections, except where there is a need for high-speed or angled exit taxiways at congested airports to enhance throughput capacity. For example, at BFI, the angled exit taxiway that serves landings to Runway 14R (i.e., Taxiway A4), and the angled exit taxiways that serve Runway 14L/32R (i.e., Taxiways A3, A4, and A5) facilitate quick and efficient exit off the runway.

Optimally located/aligned exit taxiways minimize runway occupancy times and allow the airfield to be used more efficiently. Table 4-13 from AC 150/5300-13A provides the cumulative percentages of aircraft typically able to exit runways at specific exit taxiway locations, in 500-foot increments. Percentages for both wet and dry runway conditions are included as are right-angled and acute-angled exit taxiway configurations.

As presented in **Tables C18** and **C19**, the performance capabilities of the existing exit taxiway system for both runways at BFI has been evaluated and are graphically depicted in **Figures C20** and **C21**. Based upon this analysis, the optimal exit taxiway location for small multi-engine aircraft weighing less than 12,500 lbs. is between 1,750 and 3,500 feet, between 5,500 and 7,000 feet for large aircraft weighing between 12,500 pounds and 300,000 pounds, and between 6,000 and 7,500 feet for heavy aircraft weighing greater than 300,000 pounds. It should be noted that since the percentages provided in Tables 4 through 13 of the AC are based on 500-foot increments, the approximate exit percentage for those exit taxiways located in between the 500-foot increments have been interpolated. The findings of this analysis will be coordinated with input from the BFI ATC and Airport Operations Staff, and subsequently incorporated into the preparation of airside development alternatives that will include any recommended taxiway improvements.

Table C18 **RUNWAY 14R/32L EXIT TAXIWAY ANALYSIS**

Exit	Distance from Landing Threshold (In Feet)	Percentage of Aircraft Exiting Runway							
		Dry Conditions (%)				Wet Conditions (%)			
		S	T	L	H	S	T	L	H
Runway 14R (East Side)		**R or A**	**R or A**	**R or A**	**R or A**	**R&A**	**R&A**	**R&A**	**R&A**
Taxiway A (R)	1,290	22	0	0	0	14	0	0	0
Taxiway A4 (A)	2,800	99	25	0	0	90	5	0	0
Taxiway A7 (R)	4,350	100	99	5	0	100	88	3	0
Taxiway A8 (R)	4,950	100	100	49	9	100	100	12	0
Taxiway A9 (R)	5,700	100	100	83	48	100	100	37	5
Taxiway A10 (R)	7,400	100	100	100	100	100	100	95	74
Taxiway A11 (R)	9,100	100	100	100	100	100	100	100	100
Runway 14R (West Side)		**R or A**	**R or A**	**R or A**	**R or A**	**R&A**	**R&A**	**R&A**	**R&A**
Taxiway B2 (R)	1,290	22	0	0	0	14	0	0	0
Taxiway B3 (R)	2,750	99	25	0	0	90	5	0	0
Taxiway B4 (A)	4,350	100	99	5	0	100	88	3	0
Taxiway B5 (R)	5,800	100	100	84	49	100	100	38	6
Taxiway B7 (R)	7,400	100	100	100	100	100	100	95	74
Taxiway B9 (R)	9,000	100	100	100	100	100	100	100	100
Taxiway B10 (R)	9,850	100	100	100	100	100	100	100	100
Runway 32L (East Side)		**R or A**	**R or A**	**R or A**	**R or A**	**R&A**	**R&A**	**R&A**	**R&A**
Taxiway A10 (R)	1,670	40	0	0	0	24	0	0	0
Taxiway A9 (R)	3,400	100	78	1	0	98	39	0	0
Taxiway A8 (R)	4,150	100	99	14	0	100	82	2	0
Taxiway A7 (R)	4,750	100	100	36	5	100	98	8	0
Taxiway A4 (R)	6,370	100	100	95	81	100	100	64	23
Taxiway A2 (R)	7,800	100	100	100	100	100	100	100	88
Taxiway A1 (R)	9,100	100	100	100	100	100	100	100	100
Runway 32L (West Side)		**R or A**	**R or A**	**R or A**	**R or A**	**R&A**	**R&A**	**R&A**	**R&A**
Taxiway B7 (R)	1,670	40	0	0	0	24	0	0	0
Taxiway B5 (R)	3,300	100	75	1	0	97	38	0	0
Taxiway B4 (A)	4,750	100	100	36	5	100	98	8	0
Taxiway B3 (R)	6,300	100	100	95	81	100	100	64	23
Taxiway B2 (R)	7,800	100	100	100	100	100	100	100	88
Taxiway B1 (R)	9,100	100	100	100	100	100	100	100	100

SOURCE: *FAA Advisory Circular 150/5300-13A, Change 1, Airport Design (February 2014), Tables 4-13.*

Note: S – Small, single engine (12,500 lbs. or less). T – Small, twin engine (12,500 lbs. or less).
L – Large (12,500 lbs. to 300,000 lbs.). H – Heavy (> 300,000 lbs.).
R – Right Angled Exit. A – Acute Angled Exit.

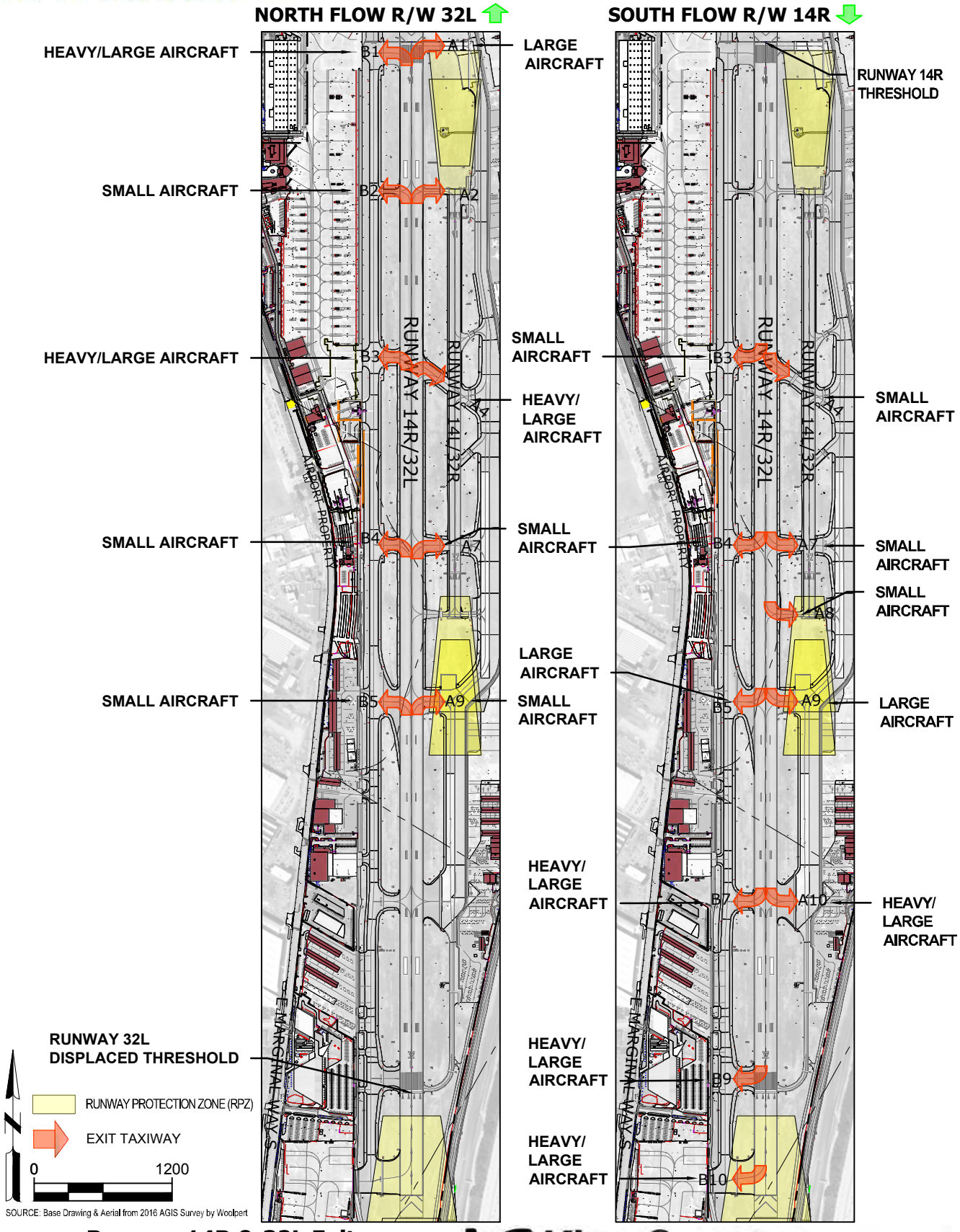


FIGURE C20 **Runway 14R & 32L Exit Taxiway System**

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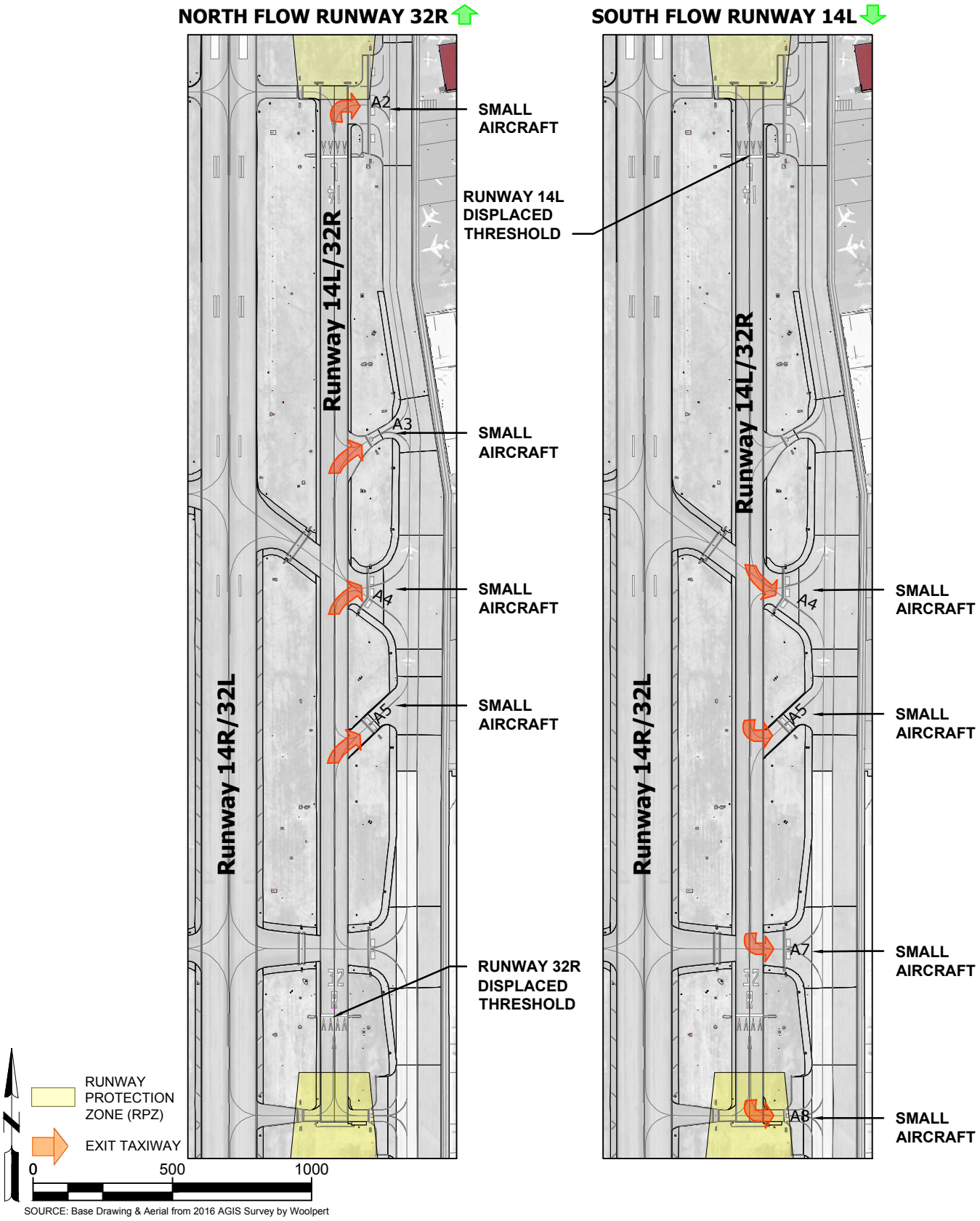
Table C19 **RUNWAY 14L/32R EXIT TAXIWAY ANALYSIS**

Exit	Distance from Landing Threshold (In Feet)	Percentage of Aircraft Exiting Runway					
		Dry Conditions (%)			Wet Conditions (%)		
		S	T	L	S	T	L
Runway 14L (East Side)		**R or A**	**R or A**	**R or A**	**R&A**	**R&A**	**R&A**
Taxiway A4 (A)	1,500	39	0	---	23	0	---
Taxiway A7 (R)	2,800	100	30	---	90	5	---
Taxiway A8 (R)	3,400	100	78	---	98	39	---
Runway 14L (West Side)		**R/A**	**R/A**	**R/A**	**R&A**	**R&A**	**R&A**
Taxiway A4 (R)	1,500	39	0	---	23	0	---
Taxiway A7 (R)	2,800	100	30	---	90	5	---
Runway 32R (East Side)		**R/A**	**R/A**	**R/A**	**R&A**	**R&A**	**R&A**
Taxiway A5 (A)	950	13	0	---	4	0	---
Taxiway A4 (R)	1,560	39	0	---	23	0	---
Taxiway A3 (A)	2,000	90	1	---	60	0	---
Taxiway A2 (R)	3,300	100	76	---	97	36	---
Runway 32R (West Side)		**R/A**	**R/A**	**R/A**	**R&A**	**R&A**	**R&A**
Taxiway A4 (A)	1,560	39	0	---	23	0	---
Taxiway A2 (R)	3,300	100	76	---	97	36	---

SOURCE: *FAA Advisory Circular 150/5300-13A, Change 1, Airport Design (February 2014), Tables 4-13.*

Note: S- Small, single engine (12,500 lbs. or less). T – Small, twin engine (12,500 lbs. or less).
L – Large (12,500 lbs. to 300,000 lbs.). R – Right Angled Exit.
A – Acute Angled Exit.



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE C21 **Runway 14L & 32R Exit Taxiway System**

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Landside Facility Requirements

Landside facilities are those facilities which support the airside facilities but are not actually a part of the aircraft operating surfaces. These consist of such facilities as terminal buildings, hangars, aprons, access roads, and support facilities. Following an analysis of these facilities, current deficiencies can be noted in terms of accommodating both existing and future aviation needs at the Airport.

Passenger Terminal Area Requirements

Components of the passenger terminal complex include the terminal building, gate/parking positions, apron area, vehicular access, and auto parking, which are presented in **Figure C22**. As noted in the **Inventory of Existing Conditions** chapter, the Airport is served by a combination of scheduled and non-scheduled commercial air carrier operators (i.e., one scheduled commuter airline operator - Kenmore Air, including non-scheduled "on-demand" passenger service). Each of these airline operations are conducted in the lower level of the passenger terminal building, with Kenmore Air's commuter operation representing approximately 54 percent of the BFI passenger counts.

After comparing Kenmore Air's existing and projected operational levels (the commuter carrier currently operates five daily departures) to the generalized terminal building space planning guidelines for Level-of-Service C peak hour passengers referenced in the draft version of AC 150/5360-13A *Airport Terminal Planning and Design* and presented in Airport Cooperative Research Program (ACRP) Report 25 *Airport Passenger Terminal Planning and Design*, it was determined that the existing facilities[11] allocated for accommodating scheduled passenger throughput (i.e., Check-In Queue Area, Wait/Circulate, Hold Room, Baggage Claim, and Government Inspection Services) would be able to accommodate all forecast commercial operations and enplanements throughout the 20-year planning period. In addition, because Kenmore Air provides commercial passenger service with aircraft that do not exceed the 12,500-pound weight classification or loadings in excess of 30 passengers, and there are no forecast changes in this service level, the airline and the Airport are not required to provide a security program that is administered by the Transportation Security Administration (TSA). Therefore, there are no expansion or modifications planned for the passenger terminal building within the planning period of this MP Update.

Passenger Terminal Apron. Consisting of about 1.6 acres, the existing passenger terminal apron is utilized primarily by Kenmore Air (providing commercial passenger service with Cessna 208 Caravans), and international aircraft operations that require Federal Inspection Services provided by the U.S. Customs Service. With the potential increase in commercial service charter operations to Kenmore Air's projected operational levels, BFI could potentially benefit from the addition of aircraft parking apron area in the vicinity of the passenger terminal building during the 20-year planning period of this Study.

[11] Kenmore Air currently leases just over 600 ft^2 within the lower level of the passenger terminal building, which does not include the common areas associated with the entry area of the building (e.g., overflow waiting areas, café facilities, restrooms, etc.).

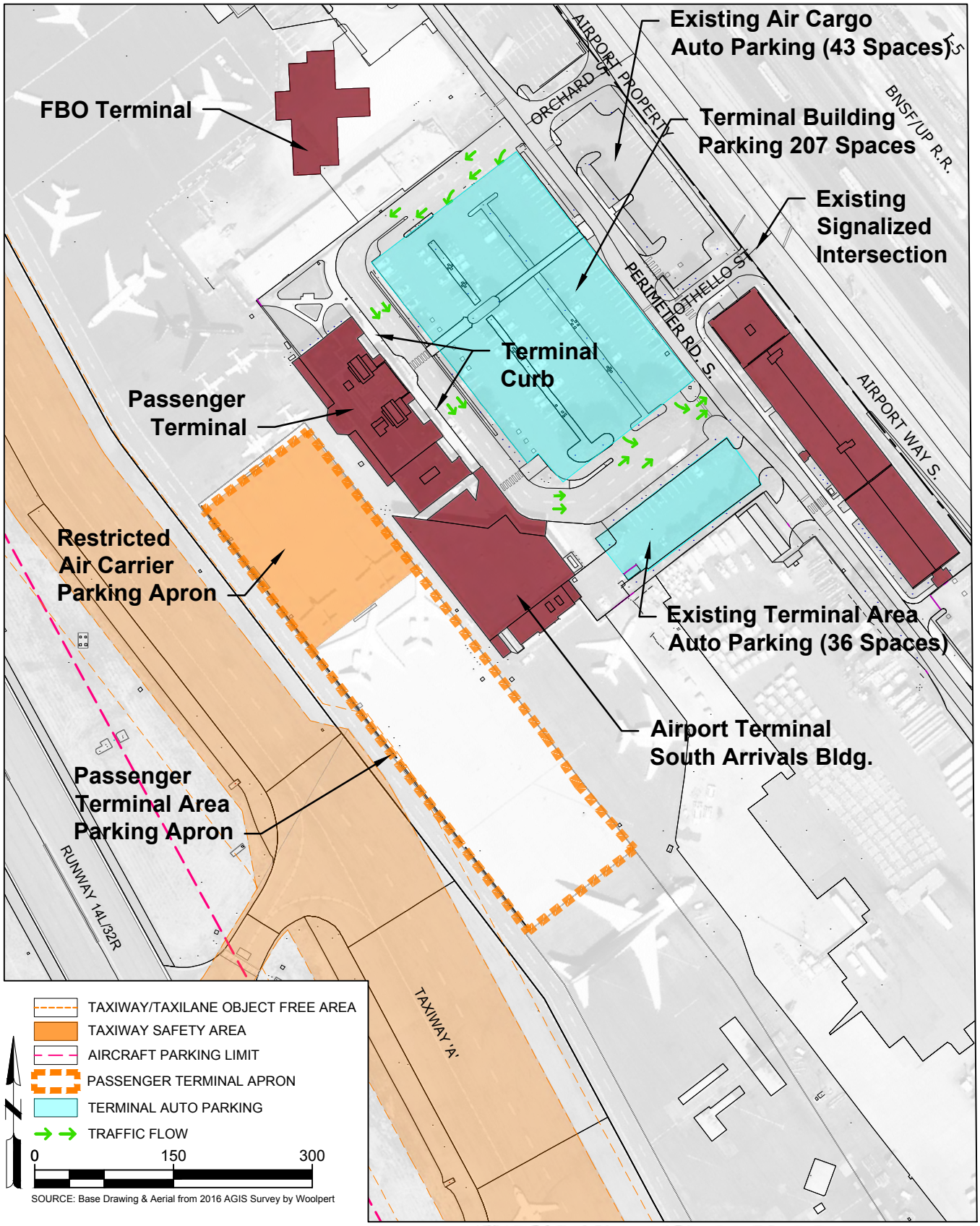

FIGURE C22 **Existing Passenger Terminal Development Area**

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Ground Access and Parking Requirements

The Airport's roadway access system consists of three components:

- Terminal area entrance and local access roadways (e.g., King County Airport Access Road, Airport Way South, Interstate 5, etc.)
- Passenger terminal vehicle parking (i.e., ground level parking for 207 vehicles)
- Terminal building curb frontage (i.e., 250 linear feet)

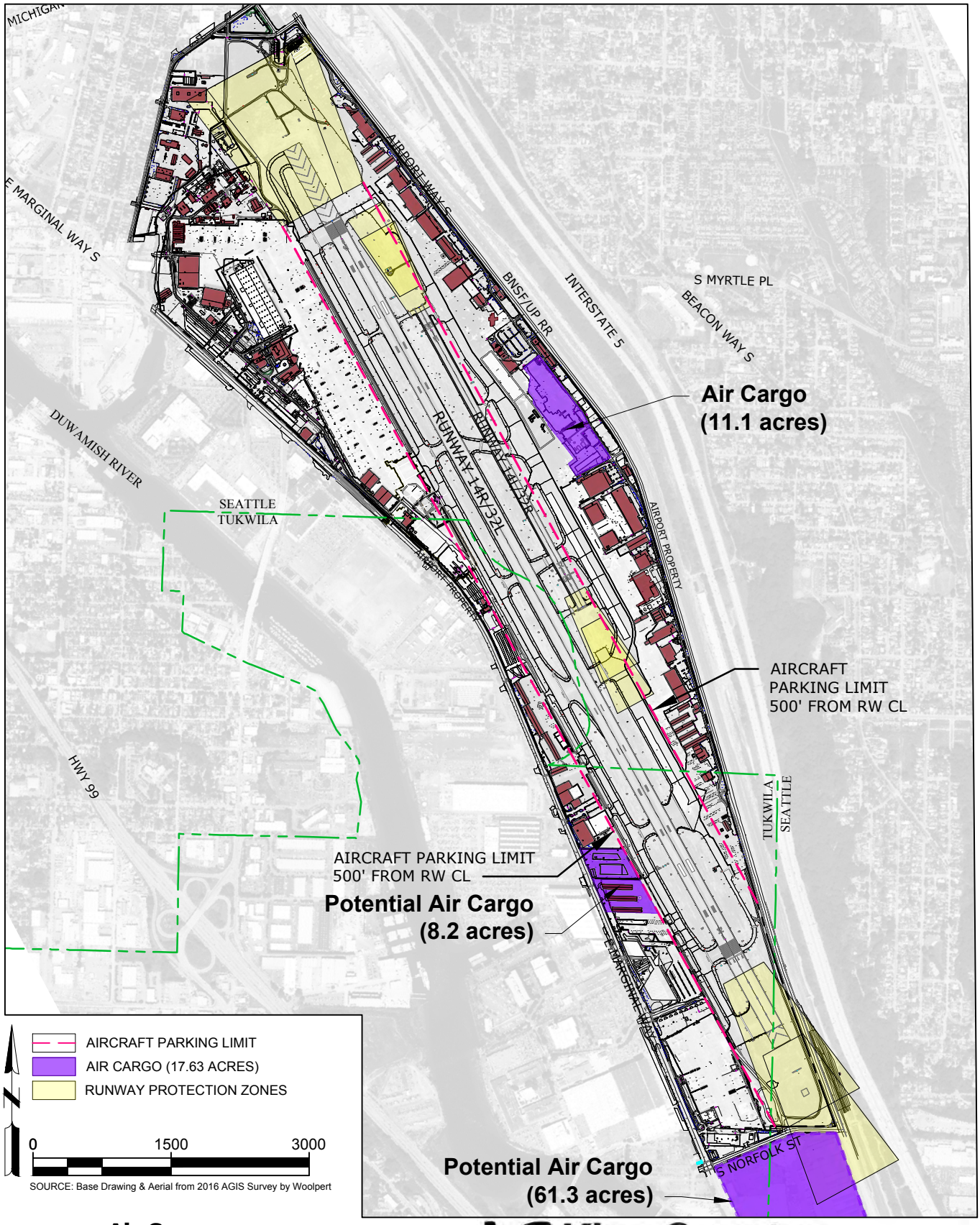
Based upon the relatively low passenger counts generated by Kenmore Air at five daily flights with 9-seat aircraft, the throughput capacity of the terminal entrance road and terminal curb will be adequate through the planning period. It should also be noted that other public transit options to the east side of the Airport (e.g., City bus service along Airport Way South with designated stops at the terminal building) are not currently provided.

The *Ground Access Capacity* section of this chapter also identified the potential development of the Boeing Access Road (BAR) Link/Sounder Infill Transfer Station located along the south side of South Boeing Access Road, between I-5 and the BNSF/UP Rail lines, which would have to be approved by voters on the November 2016 ballot. The Transfer Station could also be served with shuttle bus service to link the various employment centers associated with the Airport, including the passenger terminal building, and the surrounding Industrial Corridor. In addition, the existing passenger terminal parking facility, which consists of ground level parking for 207 vehicles that also serves the tenant employees of the terminal and the King County Airport offices, is projected to have sufficient capacity through the 20-year planning period.

Air Cargo

The BFI air cargo activity is currently represented by three carriers that operate a variety of aircraft, ranging in size from smaller general aviation (e.g., the Piper Chieftain PA-31) operated by AIRPAC Airlines to large widebody air carrier aircraft (e.g., B-767-300F) operated by UPS. The primary BFI air cargo area, which is utilized exclusively by UPS and its affiliated feeder carriers (e.g., Ameriflight), is located just south of the passenger terminal. It consists primarily of apron area, accommodating parking positions for four large air carrier aircraft and several smaller aircraft, as well as a variety of small storage/office buildings and vehicle parking/cargo transfer areas. This existing air cargo development area is presented in **Figure C23**.

In 2015, approximately 134,371 tons of cargo (97 percent freight and 3 percent mail, both enplaned and deplaned) was handled at the Airport, with 73 percent of the air cargo transport operations being conducted on wide-body aircraft. As presented in the previous **Forecasts of Aviation Activity** chapter, air cargo tons at the Airport are projected to increase at an annual rate of 1.3 percent through the planning period, increasing to approximately 173,671 tons by 2035. In 2015, 12,336 air cargo aircraft operations were recorded at BFI. Total air cargo aircraft operations are projected to increase 1.0 percent annually, representing a total of 15,052 operations in 2035. Based upon the projected air cargo transport growth rates, the existing cargo apron areas are anticipated to be adequate in size to accommodate the increasing air cargo operation counts through the planning period.



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE C23 **Air Cargo Development Areas**

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Aviation Industrial/Maintenance Facilities

These facilities at BFI are currently highlighted by the Boeing Company's various civilian and military aircraft operations, which include the Boeing 737 Flight Test Facility & Delivery Center and the Boeing Military Flight Center & Test Facility. Boeing currently leases approximately 106 acres located in the northwest quadrant of the Airport (consisting of apron, hangars, and offices) that are associated with the Boeing 737 Flight Test Facility & Delivery Center. However, Boeing also has existing facilities located adjacent to this area, but outside the Airport boundary (i.e., approximately 16.2 acres), which are accessed via a "through-the-fence" agreement with the Airport. An additional 96.6 acres of Boeing property, with office and parking support facilities, is located on the west side of E. Marginal Way S. In addition, a portion of the existing Boeing Company's Military Flight Center & Test Facility, consisting of approximately 25.3 acres, is operated with a "through-the-fence" agreement with the Airport and provided airfield access using the Taxiway B10 connector. An additional 86.9 acres of Boeing property adjacent to this area is located on the west side of E. Marginal Way S., and provided with large hangar, office, and parking support facilities. The Airport also maintains a separate aircraft access lease with Boeing for the occasional movement of aircraft from Airport property, via the Taxiway B6 connector, west across E. Marginal Way S. to existing off-Airport Boeing facilities. Existing vehicular access to the area is provided from East Marginal Way South.

These various existing aviation industrial development areas related to the Boeing Company (both on and off-Airport property) are presented in **Figure C24**. In addition, King County recognizes the Airport is land-constrained for future aviation development and is investigating future land acquisition and/or additional through-the-fence development options to accommodate additional aviation development demands (e.g., future aircraft parking requirements in response to increased aircraft production rates). According to current planning activities, the Boeing Company is investigating various options for increasing the number of large aircraft apron parking positions to support both their civilian and military operations at BFI. Alternatives will be examined in the following chapter to potentially accommodate this future airfield development requirement, and the existing Prologis (former Sabey) property redevelopment site, located directly south of the Airport, is one of the off-Airport properties that will be investigated.

General Aviation Aircraft Storage

The majority of existing general aviation aircraft storage facilities at BFI, consisting of approximately 78.8 acres are located on the east side of the Airport and provided with direct access to the east side partial parallel taxiway system (Taxiway A). However, additional general aviation property is located within the southwest quadrant of the Airport, consisting of approximately 28.2 acres, that are provided with direct access to the west side parallel taxiway system (Taxiway B). Aircraft based at BFI are stored in a variety of large commercial hangars (i.e., Fixed Base Operator and charter hangar storage facilities), large private corporate hangars, and smaller aircraft T-hangars or tiedown apron. Over the course of the 20-year planning period the number of based aircraft is forecast to decrease slightly from 380 to 372 based aircraft, which typically indicates that a decrease in storage facilities will be required. However, the projected continuation in decline of single and twin-engine piston aircraft could be offset by slight increase in business turbine/jet aircraft that would increase the aircraft storage requirements.

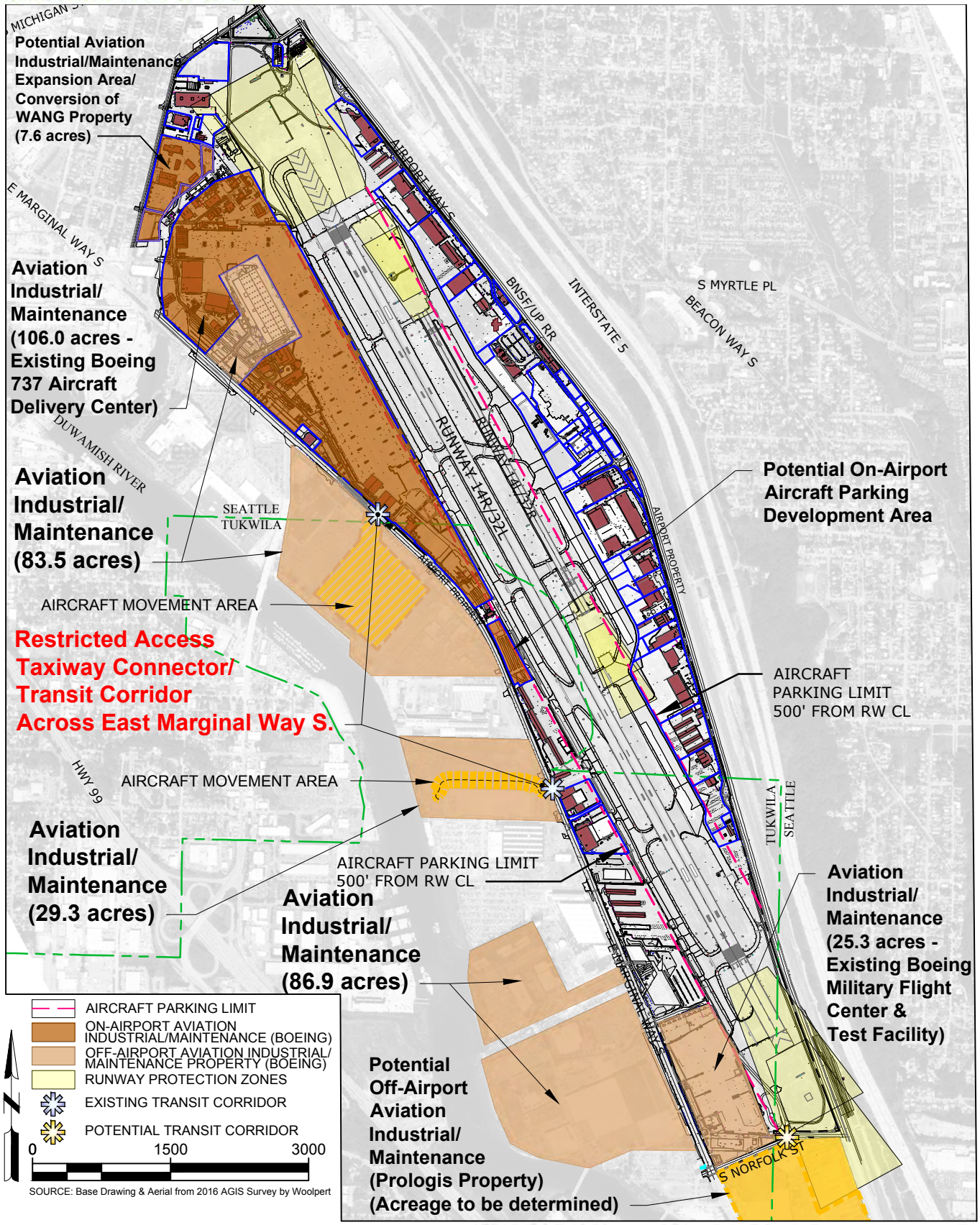

FIGURE C24 **Aviation Industrial/Maintenance Development Areas**

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It is assumed that the future storage space requirements will reflect many of the same characteristics of current storage patterns, with the majority of the based aircraft fleet being stored in hangars, and the trend of increasing general aviation aircraft size also playing a role in defining future development needs.

Perhaps the most important influence contributing to the need for a comprehensive analysis of the future development needs for general aviation is the configuration of the existing facilities in consideration of space currently available for development. As can be noted on **Figure C25**, there are essentially no remaining undeveloped parcels of Airport property that can be identified for future general aviation development. However, there are a few existing areas that could be evaluated for reconfiguration to better accommodate future hangar demand. In addition, there is one out-parcel located on the west side of the Airport (i.e., the Woods Meadow property), consisting of approximately 3.7 acres, which has been identified for acquisition in the Airport's current CIP, and will be evaluated for aviation uses.

Following are several storage options that will be considered in the new development or reconfiguration of future general aviation facilities at the Airport.

Tiedown Storage Requirements/Based Aircraft. Aircraft tiedowns are provided for those aircraft that do not require, or do not desire to pay the cost for, hangar storage. It is projected that the number of based aircraft using apron tiedown spaces will total approximately 106 (equating to approximately 6.6 acres) during the 20-year planning period. Space calculations for based aircraft apron requirements typically use 360 square yards of apron for each aircraft to be tied down. This amount of space typically allows for aircraft parking and circulation between the rows of parked aircraft. As presented in **Table C20**, the existing based aircraft tiedown apron provided at BFI would accommodate the projected amount needed throughout the 20-year planning period.

Tiedown Storage Requirements/Itinerant Aircraft. In addition to the needs of the based aircraft tiedown areas, transient aircraft also require apron parking areas at BFI. The Airport is served by three full service Fixed Base Operators, and several provide apron tiedown storage options for both transient and based aircraft. Based upon projected general aviation itinerant operation counts, the itinerant apron requirements at BFI are expected to increase slightly to approximately 54 tiedown spaces (equating to approximately 9.0 acres) during the 20-year planning period. Space calculations for itinerant aircraft apron requirements typically use 400 square yards of apron for each aircraft. This allows for aircraft parking and circulation between rows of parked aircraft, accommodates aircraft that tend to be larger than based aircraft, and provides additional maneuvering space for users who are not as familiar with the layout and circulation patterns. As presented in the following table, the existing itinerant aircraft tiedown apron provided at the Airport would also accommodate the forecasted amount throughout the 20-year planning period.

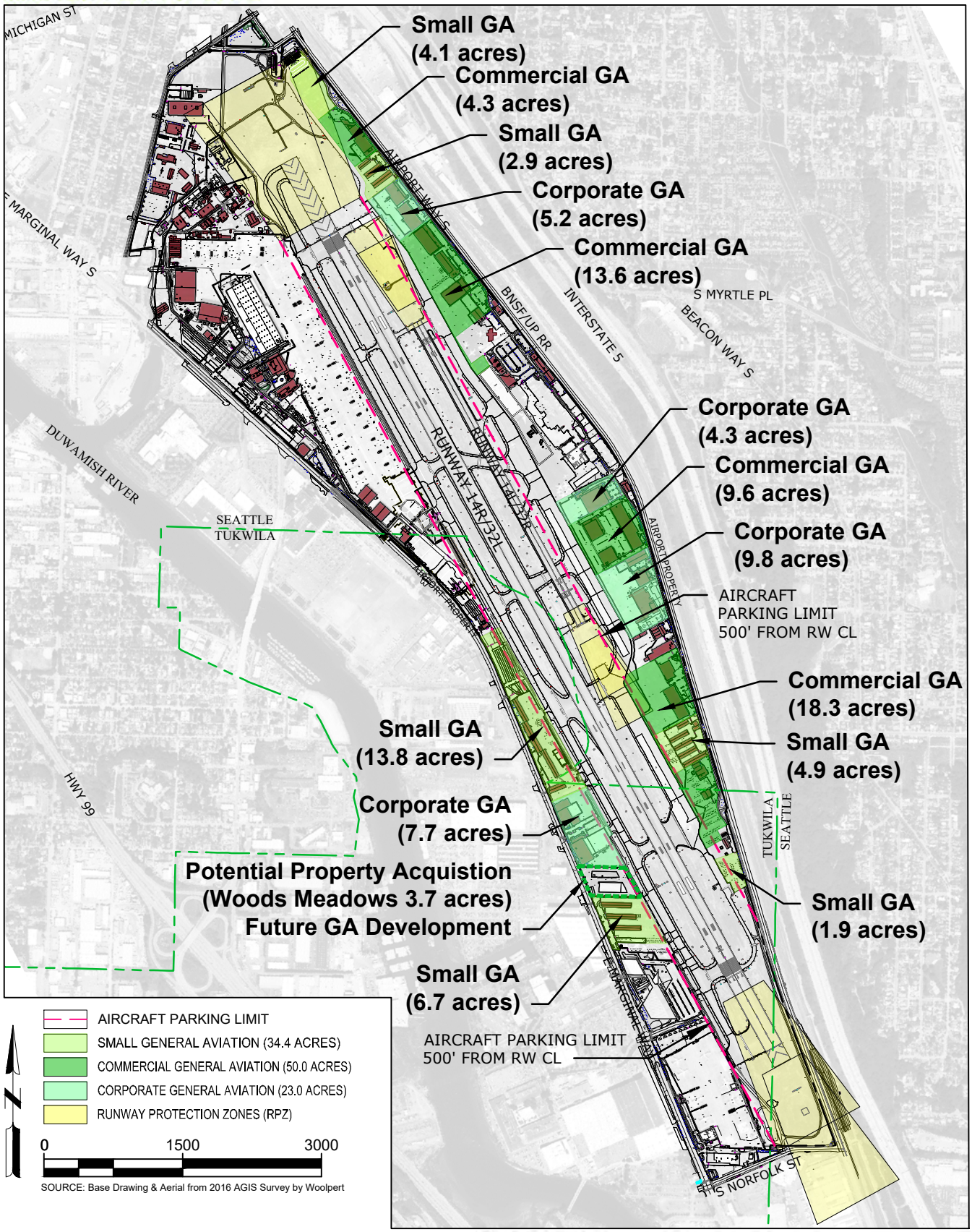

FIGURE C25 **General Aviation Development Areas**

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Table C20 **APRON STORAGE REQUIREMENTS, 2015-2035**

Apron/Tiedown Spaces	2015[1]	2020	2025	2030	2035
Based Aircraft Apron Tiedown Spaces (no/acres)	159/11.1	97/6.0	101/6.3	103/6.4	106/6.6
Itinerant Aircraft Apron Tiedown Spaces (no./acres)	101/7.8	52/8.6	49/8.1	52/8.5	54/9.0
Total Apron Tiedown Spaces	260/18.9	149/14.6	150/14.4	155/14.9	160/15.6

SOURCE: *BFI records & Mead & Hunt analysis.*
[1] Actual.

In consideration of future apron tiedown modifications that may be required in this planning effort, several apron design and planning guidelines are presented as follows:

- Aprons and associated taxilanes should be designed based on a specific *Design Aircraft* and/or the combination of aircraft that will use the facility. Itinerant aprons should be designed for easy access by the aircraft under power. Aprons designed to handle jet aircraft should consider the effects of jet blast and allow sufficient space for safe maneuvering.
- The primary design consideration is to provide adequate wingtip clearance for the aircraft positions and the associated taxilanes. Parked aircraft must remain clear of the Object Free Areas (OFAs) of runways and taxiways and no part of the parked aircraft should penetrate the runway approach and departure surfaces.
- The layout of aprons on the Airport should be grouped according to the aircraft wingspans. This allows the taxilane OFA width to be optimized for the aircraft using the area. It is also a good practice to separate corporate jets and heavy jets from lighter propeller powered aircraft to minimize the effects of jet blast and prop wash.
- Recommended surface gradients have been developed to ease aircraft towing and taxiing while promoting positive drainage. The maximum allowable grade in any direction is 2.0 percent for AACs A and B and 1.0 percent for AACs C, D, and E.

Hangars. As stated previously, large aircraft hangars are the preferred storage facility for existing based aircraft owners at BFI, and the projected increase in based business jets suggests a continued trend in these storage practices. Therefore, it is important that the Airport continue to plan for and reserve space for these facilities, also considering both the vehicular and taxiway access requirements associated with each proposed development area.

Non-Aeronautical Development

In efforts to maximize and/or diversify the revenue generating capabilities of airport property that is not well-suited to accommodate direct aviation uses, airport sponsors can proactively pursue the development of aviation-compatible/non-aviation development areas on the airport. Examples of existing non-aeronautical development areas at BFI include the Washington National Guard (WANG) Unit, the former Rosso Property, and the Museum of Flight (MOF) facilities. A brief description of these facilities is presented in the following text, along with **Figure C26**. It should also be noted that FAA has established a specified protocol for airport sponsors to follow regarding the designation and approval of airport property that is developed for non-aeronautical uses.

Washington Army National Guard Facilities. The Washington Army National Guard (WANG) facilities, which consist of about 7.6 acres, is located in the far northwest portion of the Airport and provided direct vehicular access from Ellis Avenue South via South Willow Street and South Warsaw Street. The Base includes a variety of parking areas for both civilian autos and military vehicles, as well as administrative buildings, industrial/service buildings, and numerous base support facilities. Because the existing land lease for the WANG property expires in the year 2023, this parcel has been identified as a candidate site for potential redevelopment.

Former Rosso Property. The former Rosso property, which consists of approximately 3.6 acres, is located at the north end of the Airport and represents one of the last remaining undeveloped parcels at BFI. The potential development site is located outside the existing boundary of the runway protection zone, but within the extended approach surface to Runway 14R. Thus, the site is somewhat development restricted due to both height restrictions and aircraft overflights. Given the scarcity of Airport property, the existing ALP identified this area for future small aircraft storage facilities (both hangar and apron areas), which is still an option, but the site should also be evaluated for potential aviation-related or Airport support uses.

Museum of Flight. Though not technically on Airport property, the Museum of Flight (MOF) facilities are located on 20.8 acres of property adjacent to the Airport, with approximately 75 percent of the acreage being located just west of the approach end to Runway 32L, and the balance of the property being located on the west side of East Marginal Way South. The MOF does currently lease approximately 1.5 acres of existing Airport tiedown property for static aircraft displays and the existing museum apron area is also provided with airside access to Taxiway B (i.e., the west side parallel taxiway system serving Runway 14R/32L.

Support Facilities Requirements

In addition to the facilities described above, there are several Airport support facilities that have quantifiable requirements and that are vital to the efficient and safe operation of the Airport. At BFI, these include the Airport Traffic Control Tower (ATCT), the Fuel Storage Facility, the Aircraft Rescue and Fire Fighting (ARFF) Facility, and the Airport Maintenance Facility. A brief description of these facilities is presented in the following text, which includes an illustration (i.e., **Figure C27***)* that identifies the location of these facilities at BFI.

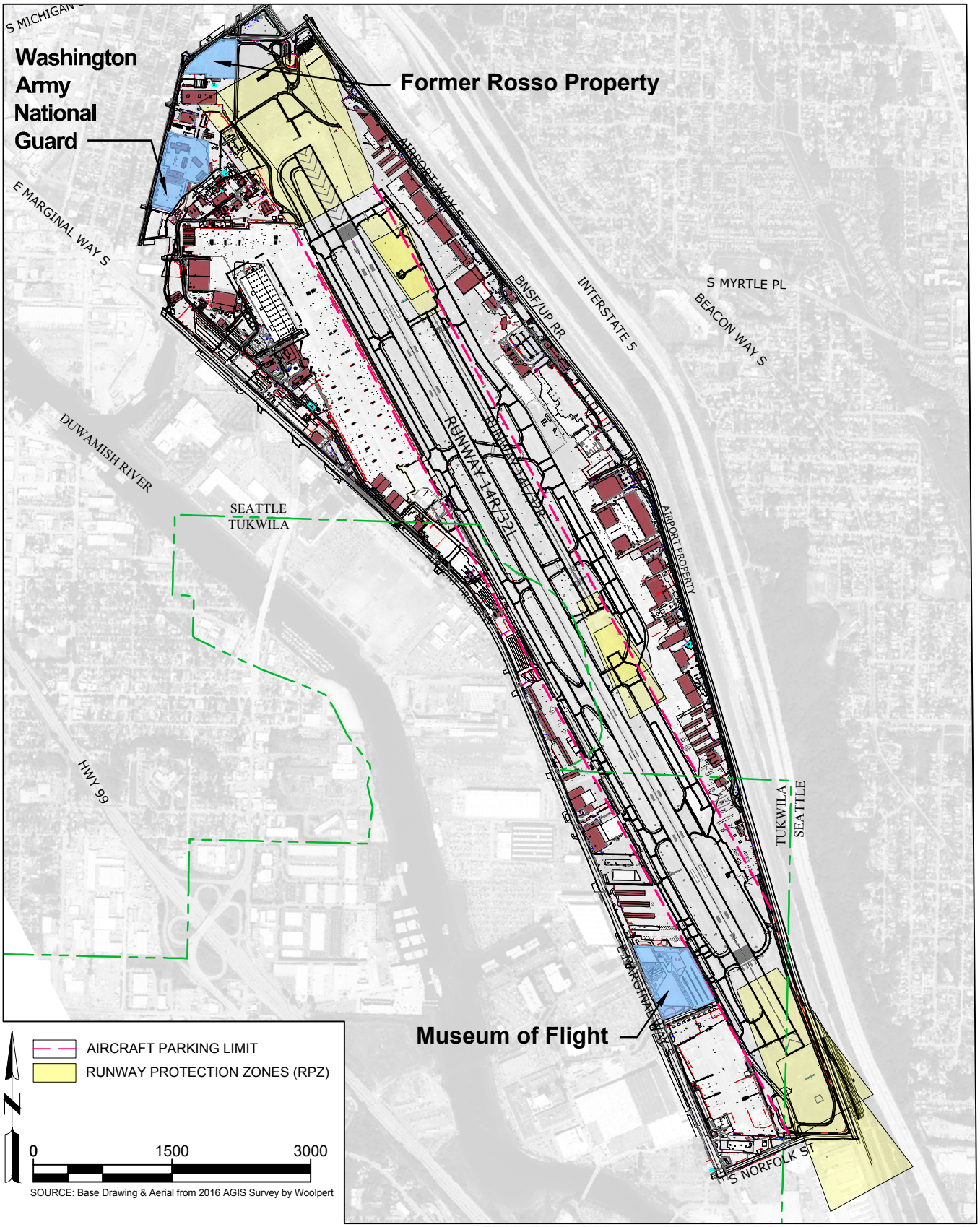

FIGURE C26 **Non-Aeronautical Development Areas**

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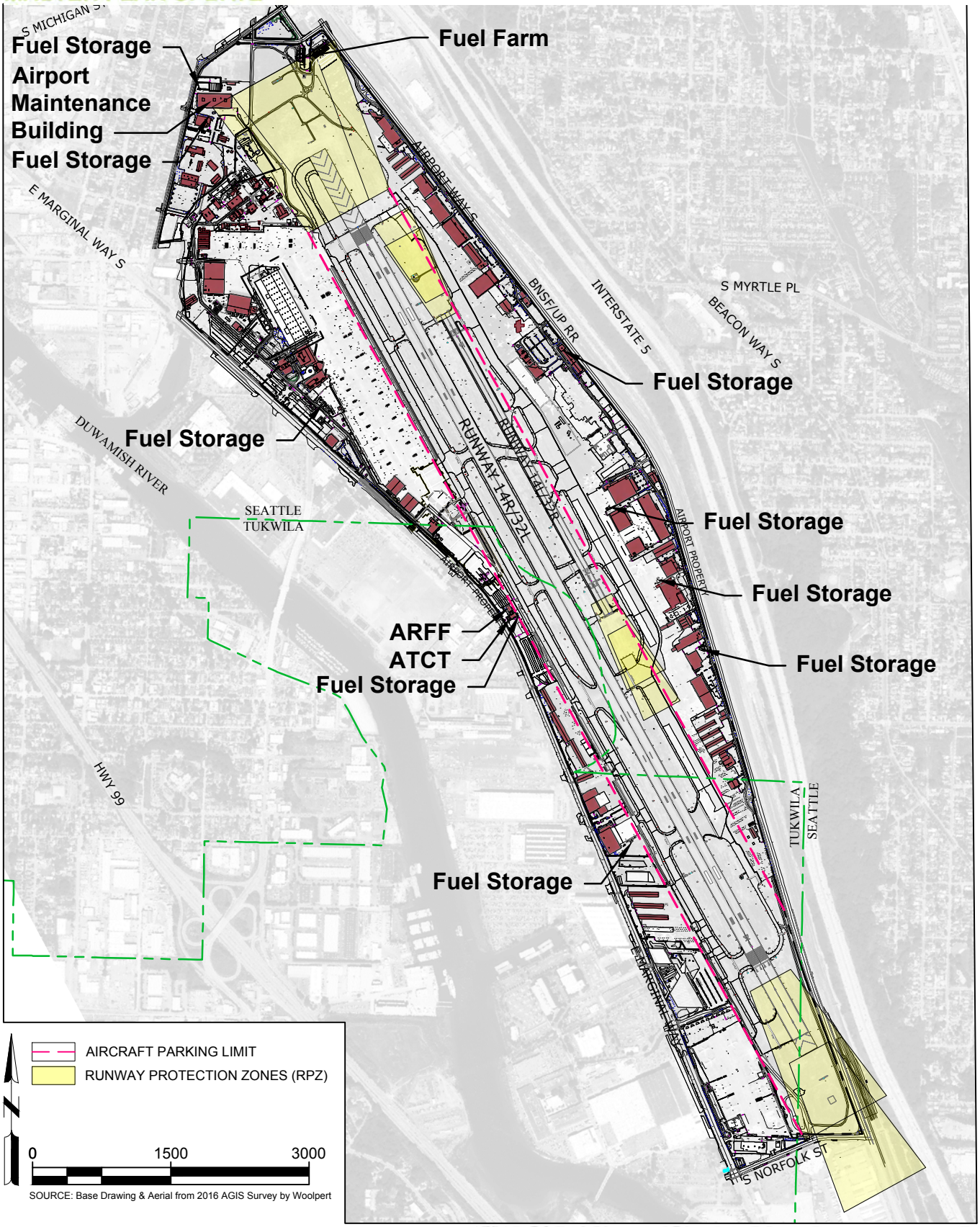

FIGURE C27 **Airport Support Facility Areas**

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Airport Traffic Control Tower (ATCT). The BFI ATCT is located at mid-field, on the west side of the Airport (adjacent to the ARFF building). The ATCT is defined as a "Tower with Display (VFR)" with Class B airspace that is operated by FAA personnel twenty-four hours daily. An ATCT Line of Sight Shadow Study was prepared for BFI in 2006 utilizing FAA's "ATC Visibility Tool", and it was determined that all areas of the airfield within the Airport Operations Area (AOA) defined "visibility zone" maintain a clear Line of Sight for the ATCT controller.

Fuel Storage Facility. BFI currently offers aircraft fueling services and products ranging from Avgas, Jet A, Military Jet fuel, unleaded, and diesel. These products are provided by three Fixed Base Operators (FBOs) from fuel storage/dispensing facilities that are sited at various locations on Airport property. In addition, there are several based corporate aircraft operators and the Boeing Company that also maintain private fuel storage facilities used for self-fueling both corporate and Boeing aircraft.

According to fuel sale records provided by Airport management, there has been an average of 602,360 gallons of AVGAS and 24,973,227 gallons of Jet A sold per year, over the past ten years. Based on 2015 total operation counts, this equates to just under 13 gallons of AVGAS fuel sold per piston-powered aircraft operation, and just under 200 gallons of Jet A fuel sold per turbine-powered aircraft operation. Typically, as operations increase, fuel storage requirements can be expected to increase proportionately. Current operational trends at BFI reflect that more general aviation aircraft are being used for business purposes and less for pleasure and leisure purposes, and the distance travelled is typically longer for business aircraft compared to aircraft flown for pleasure and leisure. Therefore, it is expected the ratio of AVGAS gallons sold per operation will slightly increase throughout the 20-year planning period. It is also projected that the number of business jet and Boeing-related aircraft operations will increase in the future, thus the ratio of Jet A gallons of fuel sold per operation will also increase throughout the planning period.

Using the increasing gallons sold per operation ratio, an estimate of future fuel storage needs can be calculated as a two-week supply during the peak month of operations, which is an industry rule-of-thumb planning standard. As can be seen in **Tables C21** and **C22**, it appears that the Airport's existing Jet A fuel storage facility is somewhat undersized, based upon this generalized planning standard, and that the storage requirements will steadily increase throughout the planning period. As noted in previous sections, the existing BFI fuel storage facility is partially located within the Runway 14R RPZ and any future expansion considerations would also likely include a relocation of the existing facility. Therefore, the identification and evaluation of alternative Airport fuel storage development sites will be included in following chapter of this document.

Table C21 **ESTIMATED AVGAS FUEL STORAGE REQUIREMENTS, 2015-2035**

AVGAS Fuel	2015 [1]	2020	2025	2035
Average Day of Peak Month Operations	102	100	98	102
Two Week Operations	1,421	1,399	1,376	1,422
Gallons per Operation	12.9	13.0	13.5	14.0
Fuel Storage (Total Gallons)	**35,000** [2]	**18,188** [3]	**18,573** [3]	**19,912** [3]

SOURCE: *BFI Fuel Storage/Sales records & Mead & Hunt.*
[1] Base year estimates.
[2] Existing fuel storage capacity.
[3] Typical 2-week storage supply estimates.

Table C22 **ESTIMATED JET A FUEL STORAGE REQUIREMENTS, 2015-2035**

Jet A Fuel	2015 [1]	2020	2025	2035
Average Day of Peak Month Operations	449	442	435	449
Two Week Operations	6,284	6,186	6,083	6,289
Gallons per Operation	200.0	210	230	250
Fuel Storage (Total Gallons)	**517,100** [2]	**1,299,092** [3]	**1,399,180** [3]	**1,572,228** [3]

SOURCE: *BFI Fuel Storage/Sales records & Mead & Hunt.*
[1] Base year estimates.
[2] Existing fuel storage capacity.
[3] Typical 2-week storage supply estimates.

Aircraft Rescue and Fire Fighting (ARFF) Facility. The ARFF facility serving BFI is located near mid-field, on the west side of the Airport (adjacent to the ATCT and across from the Taxiway B4 connector). In accordance with FAA Part 139 guidelines, BFI is designated as a Class IV airport, which serves unscheduled passenger operations of large air carrier aircraft. Based upon this level of passenger service, Index A ARFF facilities and equipment are required at the Airport and these ARFF facility requirements are projected to remain unchanged through the 20-year planning period. However, the Airport currently offers equipment and staff to meet the higher Index B ARFF criteria. The following table presents the various ARFF Index, length criteria, and representative air carrier aircraft for comparison. In addition, the site is provided with excellent access to the airfield via the west side parallel taxiway system (i.e., Taxiway B) and vehicular access to E. Marginal Way S.

Table C23 **REPRESENTATIVE AIR CARRIER AIRCRAFT LENGTHS AND ARFF INDEX**

ARFF Index	Length Criteria	Representative Aircraft
A	<90 Feet	ATR-72, CRJ-200
B	90 Feet <126 Feet	B-737, A-319, B-717, CRJ-700
C	126 Feet <159 Feet	B-757, MD-80, Longer B-737 models
D	159 Feet < 200 Feet	B-767, A330-200
E	>200 Feet	B-747, B-787

SOURCE: *Part 139, Section 1390.315.*

Airport Maintenance Facility. The Airport's maintenance facility development area is located at the northwest corner of the airfield, southwest of the Runway 14R localizer antenna. The development area, which consists of 3.75 acres, includes a large storage facility and an adjacent yard area for bulk storage of materials and equipment, as well as fuel storage and dispensing facilities. Vehicular access is provided via South Warsaw Street, which extends east from Ellis Avenue South. Airside vehicular access is provided via the Airport's perimeter roadway system that connects directly to the east and west side parallel taxiway system. The facility currently satisfies the majority of the maintenance-related storage requirements of the Airport and will continue to be utilized throughout the planning period. However, the Airport's existing CIP includes the construction of a Snow Removal Equipment (SRE) Building, and the identification/evaluation of alternative development sites will be included in following chapter of this document.

Summary

The information provided in this chapter provides the basis for understanding the facility improvements that are needed at the Airport to accommodate future aviation demands efficiently and safely. Following are the major improvement considerations that have been identified.

Airside Considerations

- Confirm and document applicable existing/future airside dimensional criteria (both runway and taxiway)
- Confirm and document all existing non-standard runway and taxiway dimensional standards (see **Table C24** below for summary of findings)
- Evaluate improvements to taxiway system layout to reduce runway incursion potential, correct hot spots, increase safety and efficiency of the airfield system, improve aircraft movement patterns, and provide access to future development areas
- Confirm Airport's future IFR operational capabilities in consideration of updated airport obstruction data and future NextGen instrument approach procedure (IAP) considerations (e.g., evaluate potential IAP enhancement opportunities for Runway 14R/32L)
- Incorporate potential upgrades of airside dimensional criteria, resulting from Runway 14R/32L IAP enhancement, into the evaluation of future airside development alternatives
- Document future airside facilities needed to accommodate Airport's air cargo operations
- Document future airside facilities needed to accommodate the Boeing Company's additional large aircraft parking positions

Table C24 **EXISTING RUNWAY & TAXIWAY NON-STANDARD CONDITIONS SUMMARY MATRIX**

Non-Std. Condition	Existing Condition vs. Standard [1]
1) Parallel Runway Centerline Separation (Current separation is mitigated by existing ATC Operational Waiver that restricts same direction simultaneous operations by Category II aircraft (i.e., twin-engine propeller driven aircraft weighing less than 12,500 lbs.) during VFR/daytime only conditions)	375' Existing vs. 700' Min. Standard (RDC D-IV-4000) The minimum parallel runway centerline separation distance specified by ATC for Category II aircraft is 500 feet.
2) Runway 14R/32L Object Free Area (ROFA) Width	ROFA width at South end of Runway tapers from 800' to 650' Existing vs. 800' Standard (RDC D-IV-4000)
3) Runway 14R/32L Centerline to Parallel Taxiway A Centerline Separation	350' Existing vs. 400' Standard (RDC D-IV-4000)
4) Runway 14R/32L Centerline to Parallel Taxiway B Centerline Separation	325' - 350' Existing vs. 400' Standard (RDC D-IV-4000)
5) Runway 14R/32L Centerline to Aircraft Parking Area Separation	Some marked aircraft parking positions are located within the required 500-foot setback from runway centerline (east of TW A and west of TW B). (RDC D-IV-4000)
6) Runway 14R Approach RPZ Land Uses	Georgetown Steam Plant & Fuel Farm are located within existing boundary of the RPZ (RDC D-IV-4000)
7) Runway 14R Departure RPZ Land Uses	Existing roadways, railway, and industrial land uses are located within boundary of the RPZ (RDC D-IV-4000)
8) Runway 32L Approach RPZ Land Uses	Existing roadway and railway are located within boundary of the RPZ (RDC D-IV-4000)
9) Taxiway A Centerline (between A1 & A3) Separation to Fixed or Moveable Object	80' Existing vs. 93' Standard (ADG III/TDG 3) All or portion of the Airport's east side GSV roadway is located within the Taxiway A Object Free Area (OFA)
10) Taxiway A Centerline (north of Taxiway A1) Separation to Fixed or Moveable Object	30' Existing vs. 44.5' Standard (ADG I/TDG 1A) Portion of the Airport's east side GSV roadway is located within the Taxiway A Object Free Area (OFA)
11) Taxiway B Centerline Separation to Fixed or Moveable Object	103' - 125' Existing vs. 129.5' Standard (ADG IV/TDG 5) All or portion of the Airport's west side GSV roadway is located within the Taxiway B Object Free Area (OFA)

Note: [1] As specified in FAA AC 150/5300-13A, Change 1, *Airport Design*.

Landside Considerations

- Protect and plan for additional general aviation hangar expansion/redevelopment to accommodate projected transitional growth in based aircraft fleet (e.g., fleet transition to larger aircraft)
- Document future landside facilities needed to accommodate Airport's air cargo operations
- Document future landside facilities needed to accommodate the Boeing Company's additional large aircraft parking positions
- Maximize revenue generating capabilities of Airport property for non-aeronautical development that lack existing or potential airside access opportunities (e.g., redevelopment of the WANG and Former Rosso properties)
- Identify future opportunities to improve Public Transit service connections between Airport and surrounding communities
- Identify potential alternatives to accommodate relocation of Airport's existing fuel storage facility
- Identify potential alternatives to accommodate development of Airport's new SRE facility
- Identify/evaluate potential strategic properties (on and off-airport) to accommodate future aviation development requirements
- Incorporate environmentally sensitive design features into future Airport development projects in accordance with King County's Green Building Ordinance, Strategic Climate Change Action Plan, and other County environmental goals

It is important to note that the recommendations in this MP Update are provided to convey what facility improvements might be needed at the Airport, and where those facilities might best be located. In other words, this Study provides comprehensive planning recommendations on how various areas of the Airport can be developed, in consideration of potential demand and community/environmental influences. One of the basic assumptions for a master plan (for a complex facility like an airport) is that if a future improvement is identified on the recommended development plan, it will only be built if there is actual demand, if the project is financially feasible, and if the environmental impacts are not significant. In summary, the facility needs information provided in this chapter will be used to develop alternatives for the configuration of future Airport facilities.

D Alternatives Analysis and Development Concepts

INTRODUCTION. The purpose of this chapter is to present and evaluate the Development Plan alternatives for BFI in terms of both concept and reasoning that meet the needs of airport users, as well as the strategic vision established by King County. Therefore, several basic assumptions have been established, which are intended to direct the future development and maintenance of the Airport. These assumptions, which have been formulated from input provided by stakeholders, management, and the FAA, are supported by the aviation activity forecasts and include a commitment for continued airport development that supports the economic and sustainable planning objectives of the region.

Following a detailed review of these alternatives by Airport Staff, FAA, and the Airport Working Group, the purpose of which is to fulfill major facility requirements (basic runway and taxiway configuration), the selected airfield alternative components and recommendations for landside development have been consolidated and presented.

Development Assumptions

Assumption One. The first assumption states that the existing non-standard dimensional criteria that were identified for Runway 14R/32L in the previous chapter will be evaluated separately for mitigation options and integrated into the airside alternatives formulated for this Master Plan Update (see additional information provided below in the Airside Development Alternatives section of this document).

Assumption Two. Assumption Two states the future development of the Airport will continue to safely accommodate the existing variety of aviation users and activities, ranging from air cargo, commercial service passenger operations, commercial service aircraft deliveries, all sectors of the existing general aviation users, and military training operations with facilities properly sized to accommodate the projected forecast demand.

Assumption Three. The third assumption is future land acquisition priorities (i.e., fee simple and/or easement, as necessary) will be identified that are related to airport safety, future airport development, and land use compatibility.

Assumption Four. The fourth assumption is to encourage the protection of existing public and private investment in land and facilities and advocate the resolution of any potential land use conflicts, both on and off airport property.

Assumption Five. Assumption Five is to provide effective direction for the future development of the Airport through the preparation of a rational plan and adherence to the adopted development program that incorporates the defined air transportation planning goals and objectives of King County.

Development Goals

Accompanying these basic assumptions are the County's Strategic Plan Goals and Objectives, as defined in the *King County Strategic Plan* and the *King County International Airport Strategic Plan 2014-2020*, that have been utilized to formulate the framework of the Master Plan Update alternatives and serve as an Airport Management business decision-making tool (i.e., the roadmap) for the selection of development recommendations, identification of capital projects, sustainability considerations, and customer service. These goals account for several categorical considerations relating to the needs of the facility, both in the short-term and long-term timeframes, including safety enhancement, capital improvements, land use compatibility, financial and economic conditions, public interest and investment, and community recognition and awareness. While all are project-oriented, some obviously represent more tangible activities than others. However, all are deemed important and appropriate to the future of the Airport.

The following goals, which were also presented in the *Inventory of Existing Conditions* chapter are intended to guide the preparation of the Master Plan Update, and direct the future development of BFI:

- ***Goal 1: Support Economic Vitality in the Region***
  - ***Boeing Retention.*** Continue to work with Boeing to ensure that their property and business needs are integrated into the airport's long-term property plans.
  - ***Property Development and Redevelopment.*** Conduct assessments of key strategic properties, both on and off the airport footprint to determine the uses that best align with KCIA's long-term vision.
  - ***Decision Tools.*** Develop decision tools that will provide the necessary information to support critical policy choices and clearly show how individual decisions relate to the dual mandates to maximize economic impact and financial capacity to invest.
  - ***Economic Development.*** Collaborate with other County departments to ensure that KCIA's efforts are appropriately aligned with broader County economic development goals and initiatives.

- ***Goal 2: Financial Performance***
  - ***Value Pricing.*** Develop a comprehensive pricing structure that will appropriately reflect the value that customers and tenants are receiving. The pricing structure should bring into alignment all of KCIA's fees and charges to ensure that customers and tenants are paying in proportion to their use of facilities and the value they derive from that use.
  - ***Cost Containment.*** Aggressively manage costs to support net operating income.

- ***Cost recovery.*** Identify opportunities for KCIA to allocate costs to tenants and customers, where such pass-throughs are authorized by County code and can be justified using appropriate cost allocation methods.
- ***Financial Targets.*** Develop specific financial performance targets that will support current investment plans and ensure that KCIA is generating an appropriate rate of return on its assets.

- ***Goal 3: Maintain a World-Class Facility***
  - ***Facility Investment.*** Invest in capital replacement based on needs identified using appropriate asset management standards and based on life cycle costs of airport facilities.
  - ***Customer service.*** Ensure that there is a customer-oriented focus throughout the organization and that customer and tenant needs are factored into operational and policy decisions.
  - ***Security and safety.*** Provide for the security and safety needs of the airport, including customers, tenants, employees, and the broader community.

- ***Goal 4: Organizational Development and Capacity***
  - ***Invest in Organizational Capacity.*** Identify organizational capacity needs to support an enhanced focus on business development and strategic investment decisions.
  - ***Organizational Structure.*** Align the organizational structure and core competencies to support implementation of the strategic plan and to maximize cost effectiveness of KCIA's operations.
  - ***Continuous Improvement.*** Build the efficiency and core competencies of the organization through application of continuous improvement and application of Lean principles.

- ***Goal 5: Environmental Stewardship***
  - ***Noise Impacts and Mitigation.*** Continue to implement and enhance the noise mitigation program.
  - ***Climate Change.*** Align KCIA programs and services with County climate change goals.
  - ***Environmentally Sensitive Design.*** To the maximum extent possible, incorporate environmentally sensitive design into KCIA capital projects.

- ***Goal 6: Communications and Community Partnerships***
  - ***Transparency.*** Operate in an open and transparent way to build trust with customers, tenants, stakeholders, decision makers, and the broader community.
  - ***Stakeholder engagement.*** Ensure appropriate level of consultation with key stakeholders and work collaboratively to foster mutually beneficial solutions.
  - ***Industry leadership.*** Increase KCIA's influence within the aviation industry through effective participation in select membership and trade organizations.

- ***Neighborhood & community.*** Act as a partner to neighboring residents, businesses, and organizations.

Airside Development Alternatives

Because all airport functional elements relate to and revolve around the basic airfield layout, runway, and taxiway (i.e., airside) development alternatives must be examined and evaluated first. Guiding elements of the alternatives evaluation process include alternative identification that address the facility requirements presented in the previous chapter, sufficient analysis to gain a thorough understanding of the strengths, weaknesses, and other implications of each alternative, and the improvement of the entire airport system in a comprehensive fashion that addresses operational, safety, environmental, fiscal, and sustainable objectives. The alternatives analysis has been prepared to provide King County and the Airport Working Group with a comprehensive outline of the key components of each alternative to assist with the identification of a preferred long-term development plan for BFI.

The runway alternative considerations at BFI that require evaluation include runway operational capabilities (e.g., runway length), instrument approach procedure protection/enhancement, and specific recommendations to improve or resolve the Airport's existing non-standard conditions related to the runway and taxiway dimensional criteria, hot spots, and airfield geometry. The primary objectives of the airside alternative analysis are to examine the options that will result in an improved/sustainable aircraft operating environment and to support forecasted use through the planning period.

The specific design components/features presented below are not necessarily exclusive to an individual alternative. Each of the alternative concepts is a collection of potential development recommendations, many of which can be transferred (i.e., mixed, and matched) between alternatives.

Non-Standard Runway/Taxiway Design Conditions

Non-Standard Dimensional Criteria. As documented in the previous chapter and noted above in the *Development Assumptions* section, the Airport's primary runway (i.e., Runway 14R/32L) has eight existing non-standard design conditions for the currently specified FAA RDC D-IV-4000 dimensional standards, two existing Flight Procedures waivers, and three existing non-standard design conditions for the Runway 14R/32L parallel taxiway system.

These include:

Runway

1) Parallel Runway Centerline Separation (Runways 14R/32L and 14L/32R)
2) Runway 32L Object Free Area (ROFA) Width
3) Runway 14R/32L Centerline to Parallel Taxiway A Centerline Separation
4) Runway 14R/32L Centerline to Parallel Taxiway B Centerline Separation
5) Runway 14R/32L Centerline to Aircraft Parking Area Separation
6) Runway 14R Approach RPZ Land Uses
7) Runway 14R Departure RPZ Land Uses

8) Runway 32L Approach RPZ Land Uses

Runway 14R Flight Procedures Waivers

1) Runways 14R ILS or Localizer Approach Threshold Crossing Height (TCH)[1]
2) Maximum altitude restriction at OCEZE waypoint for Runway 14R Missed Approach Procedure[2]

Taxiway

1) Taxiway A OFA (between Taxiways A1 and A3)
2) Taxiway A OFA (north of Taxiway A1)
3) Taxiway B OFA

It has been confirmed through this planning process that the previous review of these non-standard conditions, which were documented in previous planning documents (i.e., the 2004 *NEPA ENVIRONMENTAL ASSESSMENT/SEPA ENVIRONMENTAL IMPACT STATEMENT FOR PROPOSED MASTER PLAN IMPROVEMENTS AT BFI* and the 2006 *MODIFICATION OF STANDARDS ALTERNATIVE ANALYSIS* document for BFI) and recorded as Modification of Standards (MOS) on the approved 2007 Airport Layout Plan Drawing Set, were never "officially" approved by the FAA. In addition, copies of the signed 2002 and 2004 FAA ATC operational waiver to mitigate the existing non-standard parallel runway centerline separation was also included in the appendix of the 2006 *MODIFICATION OF STANDARDS ALTERNATIVE ANALYSIS* document.

A short description of each non-standard condition, the specified design standard, and the potential compliance/mitigation options available to resolve the specified non-standard condition is presented in the following text. A summary matrix for both the runway and taxiway non-standard conditions is also presented in **Tables D1** and **D2**. The tables provide a brief analysis of the available improvement options, along with the Sponsor's preferred recommendation to be carried forward in the formulation of the airside runway and taxiway alternatives. As can be noted, it's anticipated that some of the existing non-standard conditions can likely be resolved or mitigated in conjunction with future development projects identified in the Master Plan Update, while others will require the preparation of MOS requests for submittal to the FAA to seek a potential "Acceptable Level of Safety" determination.

To facilitate the MOS preparation effort, a supplemental planning study will be undertaken to further define the long-term improvement/resolution options (beyond the 20-year planning period of the Master Plan Update) for the Airport's existing non-standard airport design conditions. For those non-standard conditions that can be initially considered for mitigation with a MOS, applications will be prepared and submitted to FAA for review and determination (as an element of the supplemental planning effort) in accordance with the FAA Order 5300.1G.

Non-Standard Runway Design Criteria

1) **Parallel Runway Centerline Separation (Runways 14R/32L and 14L/32R).** Current separation is mitigated by an existing ATC Operational Waiver that permits same direction simultaneous operations by Category II

[1] Existing waiver was to be maintained until Runway 14R glide slope (GS) antenna was modified to provide standard 50-foot TCH. However, subsequent to the completion of this draft chapter of the MP Update, the required GS antenna modifications could not be implemented.

[2] Waiver is to be maintained to provide adequate air traffic operational separation between BFI and SEA.

aircraft (i.e., twin-engine propeller driven aircraft weighing less than 12,500 lbs.) during VFR/daytime only conditions.

- ***Existing Condition vs Standard:*** 375' Existing vs. 700' Min. Standard (RDC D-IV-4000)/The minimum parallel runway centerline separation distance specified by ATC for Category II aircraft is 500 feet.
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Maintain parallel runways and pursue reauthorization of previous ATC Operational Waiver.
  - ***Option 2*** - Maintain parallel runways and cancel previous ATC Operational Waiver (eliminates option for simultaneous operations).
  - ***Option 3*** - Close Runway 14L/32R.

2) Runway Object Free Area (ROFA) Width (Runway 14R/32L).

- ***Existing Condition vs Standard:*** ROFA width at south end of runway tapers from 800' to 650' Existing vs. 800' Standard (RDC D-IV-4000)
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Reduce Runway 14R/32L available length by 880-feet (at south end).
  - ***Option 2*** - Realign segment of Airport Way and railroad corridor (at south end).
  - ***Option 3*** - Request FAA MOS.

3) Runway Centerline to Parallel Taxiway A Centerline Separation - Between Taxiways A9 and A11 (Runway 14R/32L).

- ***Existing Condition vs Standard:*** 335' - 350' Existing vs. 400' Standard (RDC D-IV-4000).
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Relocate/reconstruct segment of Taxiway A (between Taxiways A9 and A11) to 400-foot centerline separation.
  - ***Option 2*** - Request FAA MOS.

4) Runway Centerline to Parallel Taxiway B Centerline Separation - Full Length (Runway 14R/32L).

- ***Existing Condition vs Standard:*** 325' - 350' Existing vs. 400' Standard (RDC D-IV-4000).
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Relocate/reconstruct segment of Taxiway B (full length) to 400-foot centerline separation.
  - ***Option 2*** - Request FAA MOS.

5) Runway Centerline to Aircraft Parking Area Separation (Runway 14R/32L).

- ***Existing Condition vs Standard:*** Some marked aircraft parking positions are located within the required 500-foot setback from runway centerline - east of TW A and west of TW B (RDC D-IV-4000).
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Relocate or modify existing non-standard aircraft parking positions.

6) Runway 14R Approach RPZ Land Uses.

- ***Existing Condition vs Standard:*** Georgetown Steam Plant, located off-airport property, and Fuel Farm located on-airport are positioned within the existing boundary of the RPZ (RDC D-IV-4000).
- ***Potential Compliance/Mitigation Options:***

- *Option 1* - Relocate the fuel farm and undertake the required environmental documentation to address the location of the Georgetown Steam Plant within the Runway 14R approach RPZ.
- *Option 2* - Relocate the fuel farm and increase the IAP visibility minimums to eliminate the RPZ impacts to the Georgetown Steam Plant.

7) Runway 14R Departure RPZ Land Uses.

- ***Existing Condition vs Standard:*** Existing roadways, railway, and industrial land uses are located off airport property, but within the boundary of the RPZ (RDC D-IV-4000).
- ***Potential Compliance/Mitigation Options:***
  - *Option 1* - Relocate existing transportation facilities and Industrial buildings outside of RPZ boundary.
  - *Option 2* - Maintain location of existing transportation facilities, but purchase RPZ easement for industrial land uses.
  - *Option 3* - Maintain location of existing transportation facilities but modify existing declared distances to permit repositioning of the departure RPZ onto airport property.

8) Runway 32L Approach RPZ Land Uses.

- ***Existing Condition vs Standard:*** Existing roadway and railway are located off-airport property, but within the boundary of the RPZ (RDC D-IV-4000).
- ***Potential Compliance/Mitigation Options:***
  - *Option 1* - Relocate existing transportation facilities outside of RPZ boundary.
  - *Option 2* - Maintain location of existing transportation facilities.

Table D1 **RUNWAY 14R/32L NON-STANDARD CONDITIONS SUMMARY MATRIX**

Non-Std. Conditions	Existing Condition vs. Standard [1]	Analysis of Potential Compliance/Mitigation Options	Sponsor Recommendation
1) Parallel Runway Centerline Separation	375' Existing vs. 700' Min. Standard. (RDC D-IV-4000)	Compliance with the standard parallel runway centerline separation would be cost prohibitive and closure of Runway 14L/32R would restrict the operational capabilities of the Airport.	Prepare update request for ATC Operational Waiver[2] (Option 1) to seek FAA confirmation that "Acceptable Level of Safety" can be provided. *Pursuant to FAA Oder 5300.1G, a MOS for non-standard runway centerline separation is not applicable but may be required to support ATC waiver.*
2) Runway Object Free Area (ROFA) Width	ROFA width at south end of Runway tapers from 800' to 650' Existing vs. 800' Standard. (RDC D-IV-4000)	A runway length reduction could restrict the operational payload of some aircraft and the segment realignment of the roadway and railroad corridor would be cost prohibitive.	New MOS Request will be prepared[2] (Option 3) to seek FAA confirmation that "Acceptable Level of Safety" can be provided. *Pursuant to FAA Oder 5300.1G, the FAA Region can approve a MOS for non-standard ROFA dimensions.*

Note: [1] As specified in FAA AC 150/5300-13A, Change 1, *Airport Design*.
[2] MOS and/or waiver submittal to be prepared in a supplemental study to the Master Plan Update.

Table D1 **RUNWAY 14R/32L NON-STANDARD CONDITIONS SUMMARY MATRIX (CONTINUED)**

Non-Std. Conditions	Existing Condition vs. Standard [1]	Analysis of Potential Compliance/Mitigation Options	Sponsor Recommendation
3) Runway Centerline to Parallel Taxiway A Centerline Separation (between Taxiways A9 and A11)	335' - 350' Existing vs. 400' Standard. (RDC D-IV-4000)	The relocated taxiway, associated TOFA, and ASR would encroach upon the existing leaseholds for two of the Airport's FBOs (Clay Lacy and Kenmore Aero Services).	New MOS Request will be prepared[2] (Option 2) to seek FAA confirmation that "Acceptable Level of Safety" can be provided. *Pursuant to FAA Oder 5300.1G, FAA HQ must approve a MOS for non-std. RW to parallel TW sep.*
4) Runway Centerline to Parallel Taxiway B Centerline Separation (full length)	325' - 350' Existing vs. 400' Standard. (RDC D-IV-4000)	The relocated taxiway, associated TOFA, and ASR would encroach upon several existing leaseholds along the west side of the Airport (significantly impacting Boeing ramp operations).	New MOS Request will be prepared[2] (Option 2) to seek FAA confirmation that "Acceptable Level of Safety" can be provided. *Pursuant to FAA Oder 5300.1G, FAA HQ must approve a MOS for non-std. RW to parallel TW sep.*
5) Runway Centerline to Aircraft Parking Area Separation	Some marked aircraft parking positions are located within the required 500-foot setback from runway centerline (east of TW A and west of TW B). (RDC D-IV-4000)	Aircraft parking positions that encroach upon the 500-foot setback should be programmed for relocation.	Development alternatives will be evaluated (Option 1) to comply with aircraft parking area separation standards and facility demand. *Pursuant to FAA Oder 5300.1G, a MOS for non-std. aircraft parking area separation is not applicable.*
6) Runway 14R Approach RPZ Land Uses	Georgetown Steam Plant located off airport property, and Fuel Farm, located on-airport, are positioned within the existing boundary of the RPZ. (RDC D-IV-4000)	Airport has existing plans to relocate fuel farm outside of the RPZ boundary. However, application of FAA's *Interim Guidance on Land Uses within a Runway Protection Zone* could require additional environmental review and documentation to assess the land use compatibility of the Steam Plant.	Implement Option 2 to permit reduction in RPZ boundary dimensions that would provide compliance with RPZ land use compatibility standards.[3] *Pursuant to FAA Oder 5300.1G, a MOS for non-standard RPZ land uses is not applicable.*
7) Runway 14R Departure RPZ Land Uses	Existing roadways, railway, and industrial land uses are located off airport property, but within the boundary of the RPZ. (RDC D-IV-4000)	Location of existing transportation facilities and Industrial buildings within RPZ are grandfathered (per current FAA guidance) and relocation would be cost prohibitive.	The purchase of RPZ easement (Option 2) and the declared distances alternative (Option 3) to reposition the departure RPZ onto airport property will be evaluated to improve RPZ land use compatibility. *Pursuant to FAA Oder 5300.1G, a MOS for non-standard RPZ land uses is not applicable.*
8) Runway 32L Approach RPZ Land Uses	Existing roadway and railway are located off airport property, but within the boundary of the RPZ. (RDC D-IV-4000)	Location of existing transportation facilities within RPZ are grandfathered (per current FAA guidance) and relocation would be cost prohibitive.	Maintain location of existing transportation facilities (Option 2) *Pursuant to FAA Oder 5300.1G, a MOS for non-standard RPZ land uses is not applicable.*

Note: [1] As specified in FAA AC 150/5300-13A, Change 1, *Airport Design*.
[2] MOS submittal to be prepared in a supplemental study to the Master Plan Update.
[3] Subsequent to the preparation of this draft chapter, the decision was made to retain the existing IAP visibility minimums and address the existing RPZ land use compatibility issues in a supplemental study to the Master Plan Update..

Non-Standard Taxiway Design Criteria

1) Taxiway A Centerline Separation (between A1 and A3) to Fixed or Moveable Object.

- ***Existing Condition vs Standard:*** 80' Existing vs. 93' Standard (ADG III/TDG 3) - A portion of the Airport's east side airport service road (ASR) is located within the Taxiway A Object Free Area (OFA). Based on BFI Facility Directory, this existing non-standard condition is mitigated with "108-foot aircraft wingspan use restriction".
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Relocate segment of ASR to accommodate Taxiway A OFA.
  - ***Option 2*** - Relocate segment of Taxiway A.
  - ***Option 3*** - Request FAA MOS.

2) Taxiway A Centerline Separation (north of Taxiway A1) to Fixed or Moveable Object.

- ***Existing Condition vs Standard:*** 30' Existing vs. 44.5' Standard (ADG I/TDG 1A) - A portion of the Airport's east side ASR is located within the Taxiway A OFA.
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Relocate segment of ASR to accommodate Taxiway A.
  - ***Option 2*** - Relocate segment of Taxiway.
  - ***Option 3*** - Request FAA MOS.

3) Taxiway B Centerline Separation (full length) to Fixed or Moveable Object.

- ***Existing Condition vs Standard:*** 103' – 125' Existing vs. 129.5' Standard (ADG IV/TDG 5) – All or portion of the Airport's west side ASR is located within the Taxiway B OFA.
- ***Potential Compliance/Mitigation Options:***
  - ***Option 1*** - Relocate segment of ASR to accommodate Taxiway B OFA.
  - ***Option 2*** - Request FAA MOS.

Table D2 **TAXIWAY A & B NON-STANDARD CONDITIONS SUMMARY MATRIX**

Non-Std. Condition	Existing Condition vs. Standard [1]	Analysis of Potential Compliance/Mitigation Options	Sponsor Recommendation
1) Taxiway A Centerline Separation (between A1 & A3) to Fixed or Moveable Object	80' Existing vs. 93' Standard (ADG III/TDG 3) A portion of the Airport's east side ASR is located within the Taxiway A Object Free Area (OFA). [2]	The expanded taxiway TOFA and relocated ASR would encroach upon existing leaseholds.	Waiting for the updated 13B design standards to be adopted before determining the best course of action. *Pursuant to FAA Oder 5300.1G, the FAA Region can approve a MOS for non-standard TOFA.*
2) Taxiway A Centerline Separation (north of Taxiway A1) to Fixed or Moveable Object	30' Existing vs. 44.5' Standard (ADG I/TDG 1A) Portion of the Airport's east side ASR is located within the Taxiway A OFA.	The expanded taxiway TOFA and relocated ASR would encroach upon existing leaseholds.	Recommended Option TBD *Pursuant to FAA Oder 5300.1G, the FAA Region can approve a MOS for non-standard TOFA.*

Table D2 **TAXIWAY A & B NON-STANDARD CONDITIONS SUMMARY MATRIX (CONTINUED)**

Non-Std. Condition	Existing Condition vs. Standard [1]	Analysis of Potential Compliance/Mitigation Options	Sponsor Recommendation
3) Taxiway B Centerline Separation to Fixed or Moveable Object	103' - 125' Existing vs. 129.5' Standard (ADG IV/TDG 5). Portion of the Airport's west side ASR is located within the Taxiway B OFA.	Full relocation of the ASR to achieve compliance with the TOFA standards would encroach upon existing leaseholds and be cost prohibitive.	Project has been designed to narrow and reposition the ASR outside of the TOFA boundary. *Pursuant to FAA Oder 5300.1G, the FAA Region can approve a MOS for non-standard TOFA.*

Note: [1] As specified in FAA AC 150/5300-13A, Change 1, *Airport Design*.
[2] Based on BFI Facility Directory, existing non-standard condition is mitigated with "108-foot aircraft wingspan use restriction".
[3] MOS submittal to be prepared in a supplemental study to Master Plan Update.

Hot Spots

The previous chapters also documented the location of three hot spots at BFI that result in an increased risk for runway incursions or incidents during aircraft surface operations. The typical causes of hot spot-related runway incursions or incidents can be attributed to airfield layout, traffic flow, airport marking/signage/lighting, situational awareness, and training. A short description of each hot spot and the potential mitigation options available is presented in the following text. A summary matrix of the existing BFI hot spots is presented in the following table. The table provides a brief analysis of the available improvement options for each hot spot, along with the Sponsor's preferred recommendation to be carried forward in the formulation of the airside runway and taxiway alternatives.

1) **Hot Spot #1 - Taxiway B/B1 Intersection.**
- ***Compliance Issue:*** Occasional inadvertent access to the restricted Taxiway Z Prior Permission Required Pavement (PPRP).
- ***Potential Mitigation/Resolution Options:***
  - ***Option 1*** - Eliminate PPRP designation and convert to full-use pavement with displaced threshold.
  - ***Option 2*** - Provide additional markings, lighting, and signage to better inform pilots of PPRP designation.

2) **Hot Spot #2 - Taxiway A9 - Runway 14R/32L Intersection.**
- ***Compliance Issue:*** Wrong runway departure risk and occasional encroachment of Taxiway A9 holdline due to alignment jog of Taxiway A.
- ***Potential Mitigation/Resolution Options:***
  - ***Option 1*** - Realign segment of Taxiway A at Taxiway A9 intersection to increase radius of alignment jog and reduce width of Taxiway A9.
  - ***Option 2*** - Install Taxiway A centerline lights and reduce width of Taxiway A9.

3) Hot Spot #3 - Taxiway B5 Helicopter Training Activity.

- ***Operational Issue:*** Extensive helicopter training activity on Taxiway B that is concentrated in vicinity of Taxiway B5.
- ***Potential Mitigation Options:***
  - ***Option 1*** – Continue on-going Airport Staff publications and ATC communications to better inform local and transient pilots of existing helicopter training activity.

Table D3 **EXISTING BFI HOT SPOT SUMMARY MATRIX**

Hot Spot/ Location [1]	Compliance/Operational Issue	Analysis of Potential Mitigation/Resolution Options	Sponsor Recommendation
Hot Spot #1 - Taxiway B/B1 Intersection	Occasional inadvertent access to the restricted Taxiway Z PPRP.	PPRP designation was established to mitigate potential noise and vibration impacts to nearby Georgetown Steam Plant and neighborhood, as a recommendation of the 2004 EA/SEPA EIS to provide runway safety area compliance. A new EA may be required to change the PPRP designation.	The FAA has identified a preference to eliminate the PPRP designation and convert back to full-use pavement (Option 1). Recommendation TBD.
Hot Spot #2 - Taxiway A9/Runway 14R/32L Intersection	Wrong runway departure risk, and occasional encroachment of Taxiway A9 holdline due to alignment jog of Taxiway A.	Taxiway A segment realignment would encroach upon existing adjacent leasehold and Taxiway A9 width reduction would improve visibility of signage. Also, the addition of taxiway centerline lights would improve visibility of taxiways.	Improve ATCT communication for pilots requesting intersection departures.
Hot Spot #3 - Taxiway B5 Helicopter Training Activity	Extensive helicopter training activity.	Increase pilot awareness of existing helicopter training activity with on-going Airport Staff publications and ATC communications.	Continue on-going Airport Staff publications and ATC communications to better inform pilots.

Note: *[1] Information obtained from FAA's current Runway Safety Hot Spots List in the Airport/Facility Directory (A/FD).*

Airfield Geometry

In addition, the previous chapter documented several taxiway design methodologies from AC 150/5300-13A that should be employed to minimize the potential for runway incursions. A short description of each taxiway design issue at BFI and the potential mitigation options available is presented in the following text. A summary matrix of these existing design improvements applicable for BFI is presented in the following table. The table provides a brief analysis of the available improvement options for each taxiway under consideration, along with the Sponsor's preferred recommendation to be carried forward in the formulation of the airside runway and taxiway alternatives.

1) Taxiway A9, A10, B5, and B10 connectors.

- ***Compliance Issue:*** Wide expanses of taxiway pavement.
- ***Potential Mitigation/Resolution Options:***
  - ***Option 1*** - Redesign taxiway connectors at next reconstruction interval to reduce pavement width and improve visibility of signs.

2) Taxiway A4 and A5 connectors.

- ***Compliance Issue:*** Increase taxiway intersection visibility.
- ***Potential Mitigation/Resolution Options:***
  - ***Option 1*** - Realign segment of Taxiway A4 and remove Taxiway A5 to improve visibility at this defined runway crossing location.

3) Taxiway B1 and B10 connectors.

- ***Compliance Issue:*** Eliminate taxiway direct access.
- ***Potential Mitigation/Resolution Options:***
  - ***Option 1*** - Relocate existing apron taxilane connectors at Taxiways B1 and B10.

Table D4 **EXISTING TAXIWAY DESIGN IMPROVEMENTS SUMMARY MATRIX**

Taxiway Improvement/ Location	Compliance Issue [1]	Analysis of Potential Mitigation/Resolution Options	Sponsor Recommendation
1) Taxiway A9, A10, B5, and B10 connectors	Wide Expanses of Taxiway Pavement.	The taxiway design improvements specified in Option 1 have the potential to improve pilot visibility of signage/markings and reduce the Airport's quantity of impervious pavement.	Implement taxiway design improvements as specified in Option 1[2].
2) Taxiway A4 and A5 connectors	Increase Taxiway Intersection Visibility.	Right angle taxiway intersections provide the best visibility to the left and right for pilot.	Implement taxiway design improvements as specified in Option 1.
3) Taxiways B1 and B10	Eliminate Taxiway Direct Access.	Relocation of existing taxilane connectors would require modifications to Boeing's aircraft parking positions.	Implement taxiway design improvements as specified in Option 1 at next pavement reconstruction interval.

Note: [1] Identified compliance issues are referenced from FAA guidance provided in AC 150/5300-13A, Change 1, *Airport Design.*
[2] Subsequent to the preparation of this draft chapter during of the MP Update, the FAA elected to maintain the width of these connector taxiways.

Runway 14R/32L - Alternative One

Alternative One maintains the status quo of Runway 14R/32L; no changes to the existing design standards (i.e., RDC D-IV-4000), current airfield layout or operating conditions are proposed. However, several of the runway's existing non-standard conditions that were presented in **Table D1** and listed below have been identified for potential resolution with a future request for modification of standards and update of the existing ATC Operational Waiver.

- Parallel Runway Centerline Separation (Runways 14R/32L and 14L/32R)
- Runway Object Free Area (ROFA) Width (Runway 32L end)
- Runway Centerline to Parallel Taxiway A Centerline Separation (Between Taxiways A9 and A11)
- Runway Centerline to Parallel Taxiway B Centerline Separation (Full Length)

Figure D1 depicts the overall airport planning considerations for this alternative.

Figures D2 and **D3** both detail the close-in planning considerations associated with each runway end for Alternative One.

Runway Width. The existing Runway 14R/32L width of 200 feet exceeds the FAA design standard of 150 feet associated with RDC D-IV by 50 feet. Typically, the FAA will only provide Airport Improvement Program (AIP) funds for major runway pavement reconstruction projects based on appropriate dimensional standards. This alternative maintains the existing width of 200 feet but could transfer the future funding obligations for the reconstruction of the extra 50 feet of runway width to King County or other local funding sources exclusively.

Runway Length. This alternative maintains the runway's existing published declared distances, which are dictated by the 880-foot displaced landing threshold to Runway 32L and the specified Departure End of the Runway (DER) for Runway 14R. This alternative also maintains the existing PPRP[3] located at the north end of the runway. The PPRP runway is available to aircraft operators[4] for Runway 14R departures (with ATC permission) requiring an Accelerate Stop Distance Available (ASDA) runway length greater than 9,120 feet. According BFI records, aircraft operators have recorded on average less than 50 operations per year using the PPR pavement since its establishment in 2007.

The specified runway lengths for each runway end using declared distances is presented in **Table D5**.

[3] The PPRP runway was established in conjunction with the implementation of a runway safety area compliance project for the primary runway at BFI. The Environmental Assessment/SEPA Environmental Impact Statement for this project was completed in 2004.

[4] These operations are typically associated with Boeing aircraft deliveries that require departures to long-haul international destinations.

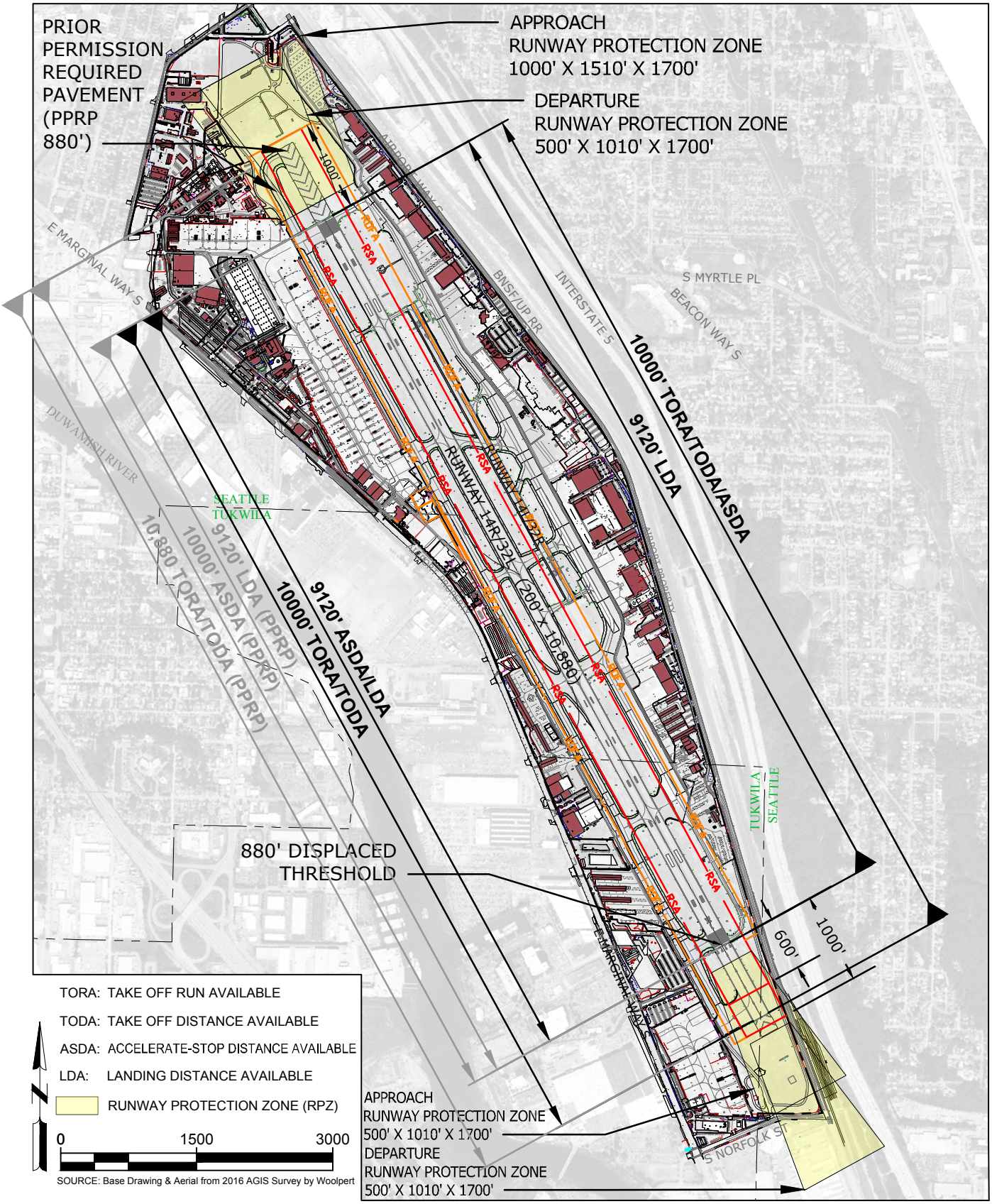

FIGURE D1 **RUNWAY 14R/32L DESIGN STANDARDS & DECLARED DISTANCES - ALTERNATIVE ONE**

Mead & Hunt

King County International Airport/ Boeing Field

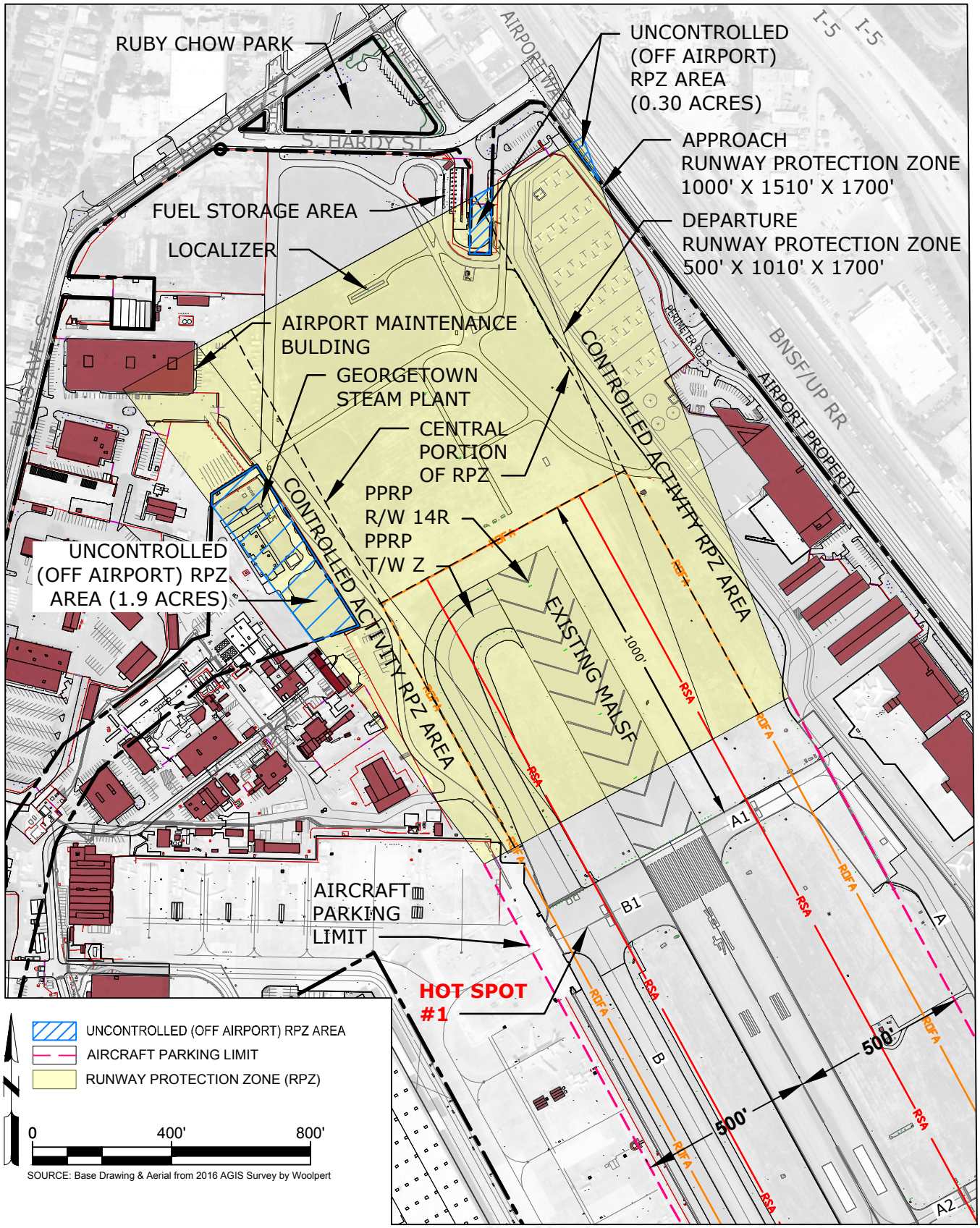

FIGURE D2 **RUNWAY 14R INSTRUMENT APPROACH PROCEDURE/ RUNWAY PROTECTION ZONE DETAIL - ALTERNATIVE ONE**

Mead & Hunt

King County International Airport/ Boeing Field

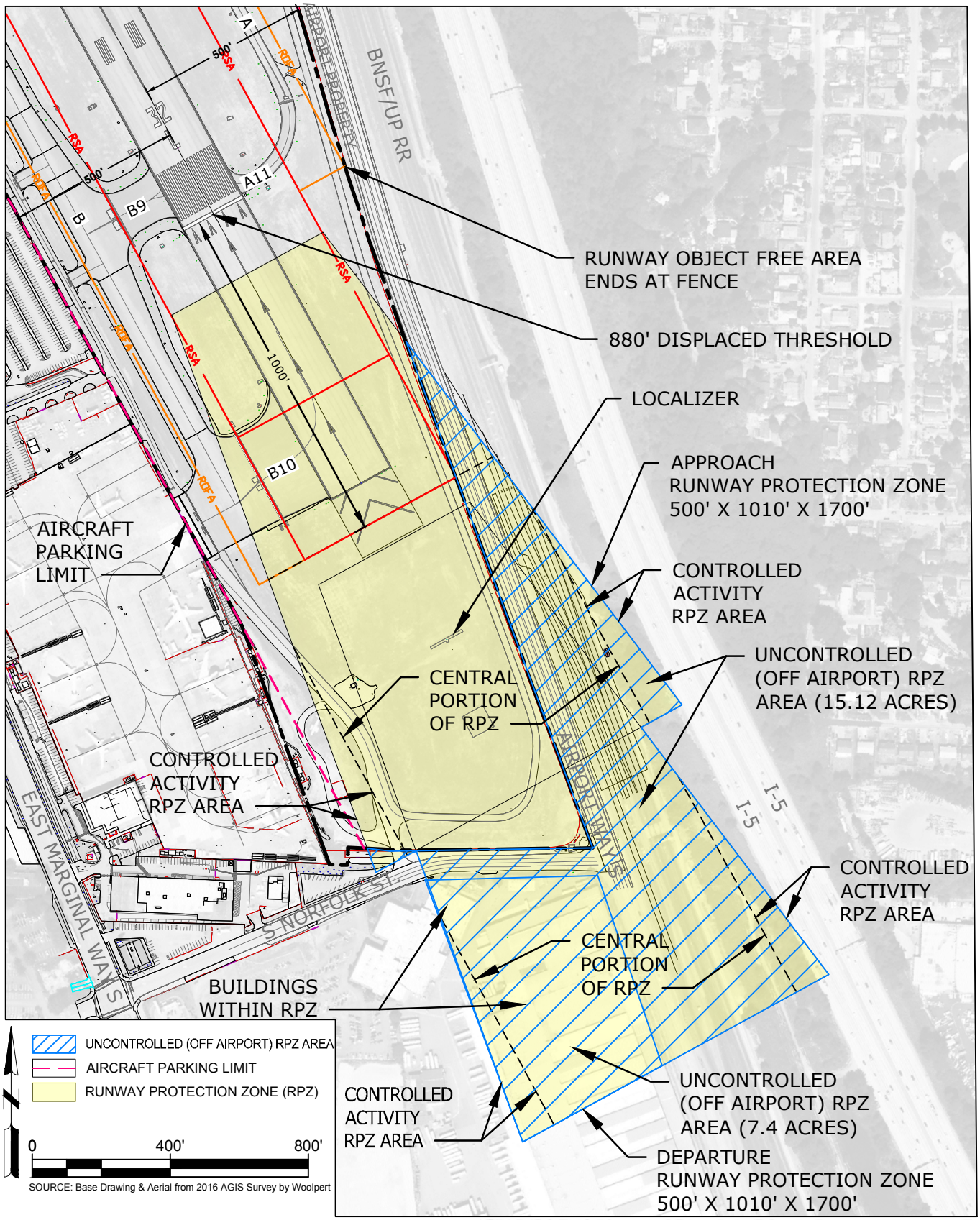

FIGURE D3 **RUNWAY 32L INSTRUMENT APPROACH PROCEDURE/ RUNWAY PROTECTION ZONE DETAIL - ALTERNATIVE ONE**

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King County International Airport/ Boeing Field

Table D5 **RUNWAY 14R/32L DECLARED DISTANCES - ALTERNATIVE ONE**

Facility	TORA	TODA	ASDA	LDA
Runway 14R[1]	10,000'/10,880	10,000'/10,880	9,120'/10,000'	9,120'
Runway 32L[2]	10,000'	10,000'	10,000'	9,120'

SOURCE: *2007 Airport Layout Plan & Mead & Hunt, Inc.*

Note: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available TODA: Takeoff Distance Available
ASDA: Accelerate Stop Distance Available LDA: Landing Distance Available

[1] The reduced ASDA and LDA lengths are dictated by RSA requirements at the departure end of runway (DER). However, the PPRP runway (880') is available to aircraft operators needing an ASDA of 10,000 feet.

[2] The reduced LDA length is dictated by the existing displaced landing threshold.

Instrument Approach Procedures. Currently, BFI is equipped with five published Instrument Approach Procedures (IAPs) that offer various ceiling and visibility minimums. Table C1, in the **Capacity and Facility Requirements** chapter presented the annual percentage of time the IAPs would be available at BFI given the local meteorological conditions. In addition, several of the IAPs were updated in August of 2017 due to criteria revisions in the various FAA Orders used by Flight Procedures to calculate the specified ceiling and visibility minimums. At present, the Runway 14R Instrument Landing System (ILS) offers the best IAP minimums, with a ceiling of 308 feet AGL and visibility of ¾-mile. Also, the recent update of the Runway 14R ILS visibility minimums from 1 mile to ¾-mile offers a potential IFR access improvement to BFI of approximately 0.1 percent annually, which equates to an additional 0.4 days or 8.8 hours. The single IAP available to Runway 32L (i.e. the ILS) provides ceiling and visibility minimums of 428 feet AGL and 1 ½-statute miles respectively. This alternative reflects maintenance of the IAPs to both runway ends but may require additional environmental documentation and approvals to support and retain the ¾-mile visibility minimums offered by the Runway 14R IAPs (see additional information in section below).

Approach and Departure Runway Protection Zones. As detailed in the previous chapter and presented in **Figures D2** and **D3**, the existing Runway Protection Zones (RPZs) for Runways 14R and 32L extend beyond the airport boundary, are not fully controlled by King County, and encompass land uses that are considered incompatible with RPZs, as defined in FAA Memorandum *Interim Guidance on Land Uses within a Runway Protection Zone*. On the north end of the runway, the larger size of the approach RPZ is dictated by the ¾-mile visibility minimums for the existing Runway 14R IAPs. On the south end of the runway, portions of both the approach and departure RPZs are not contained within the existing airport boundary. Following consultation with FAA representatives (i.e., from both the Airports District Office and Flight Procedures), it has been confirmed that additional environmental review and documentation would be required to address the location of the Georgetown Steam Plant within the existing Runway 14R approach RPZ[5].

[5] Subsequent to the preparation of this draft chapter during of the MP Update, the FAA elected to address the land use compatibility guidance from the Interim Guidance on Land Uses within a Runway Protection Zone in a separate follow-up study to the MP Update.

The uncontrolled RPZ areas for Alternative One are defined as follows:

Runway 14R

- Airport Way S. and 15th Avenue S. Right-Of-Way (R.O.W.) @ 0.3 acres
- Georgetown Steam Plant property @ 1.9 acres
- Existing airport fuel storage area (facility is located on airport property, but is designated as an incompatible land use within the RPZ)

Runway 32L

- Airport Way S., BNSF/UP Railroad, I-5, and S. Norfolk St. R.O.W. @ 15.1 acres
- Prologis property @ 7.4 acres

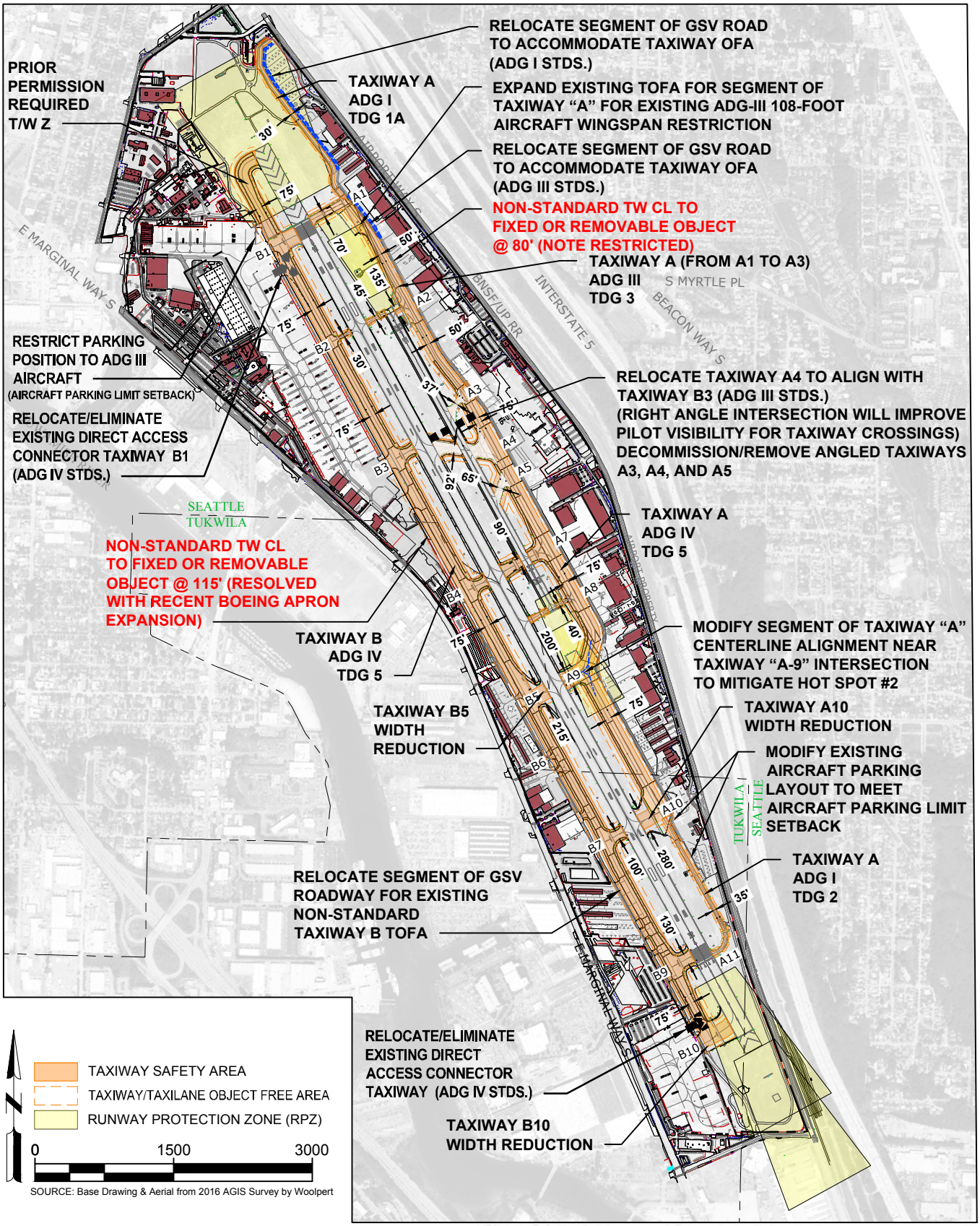
Property/RPZ Easement Acquisition. As detailed above, this alternative identifies approximately 2.2 acres of uncontrolled property to the north within the Runway 14R RPZ, and approximately 22.5 acres of uncontrolled property to the south within the Runway 32L PRZs. Most of the off-airport uncontrolled property is within roadway or railroad R.O.W., but approximately 1.9 acres to the north and 7.4 acres to the south is recommended for future RPZ easement or property acquisition to provide King County with land use controls.

Taxiway Improvements. Maintain the existing taxiway design standards for the existing parallel taxiway facilities and associated connector taxiways:

- Taxiway A @ Taxiway Design Groups (TDG) 5, 3, 1, & 1A/Airplane Design Groups (ADG) IV, III, & I
- Taxiway B @ TDG 5/ADG IV

As presented on **Figure D4** and detailed on **Figures D5** through **D8**, the recommended taxiway improvements include:

- Upgrade existing angled exit taxiways with 90° exit taxiways (Realign Taxiway A4 with Taxiway B3)
- Modify segment of Taxiway A centerline alignment near Taxiway A9 intersection to mitigate Hot Spot #2 (would also require adjacent leasehold modification)
- Expand existing TOFA for segment of Taxiway A (adjacent to and north of Taxiway A1) for existing ADG III and I design standards
- Potential Taxiway connector width reduction projects @Taxiways B5, A10, & B10
- Taxiway modifications would include revisions to taxiway lighting & signage



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D4 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE ONE**

Mead & Hunt

King County International Airport/ Boeing Field

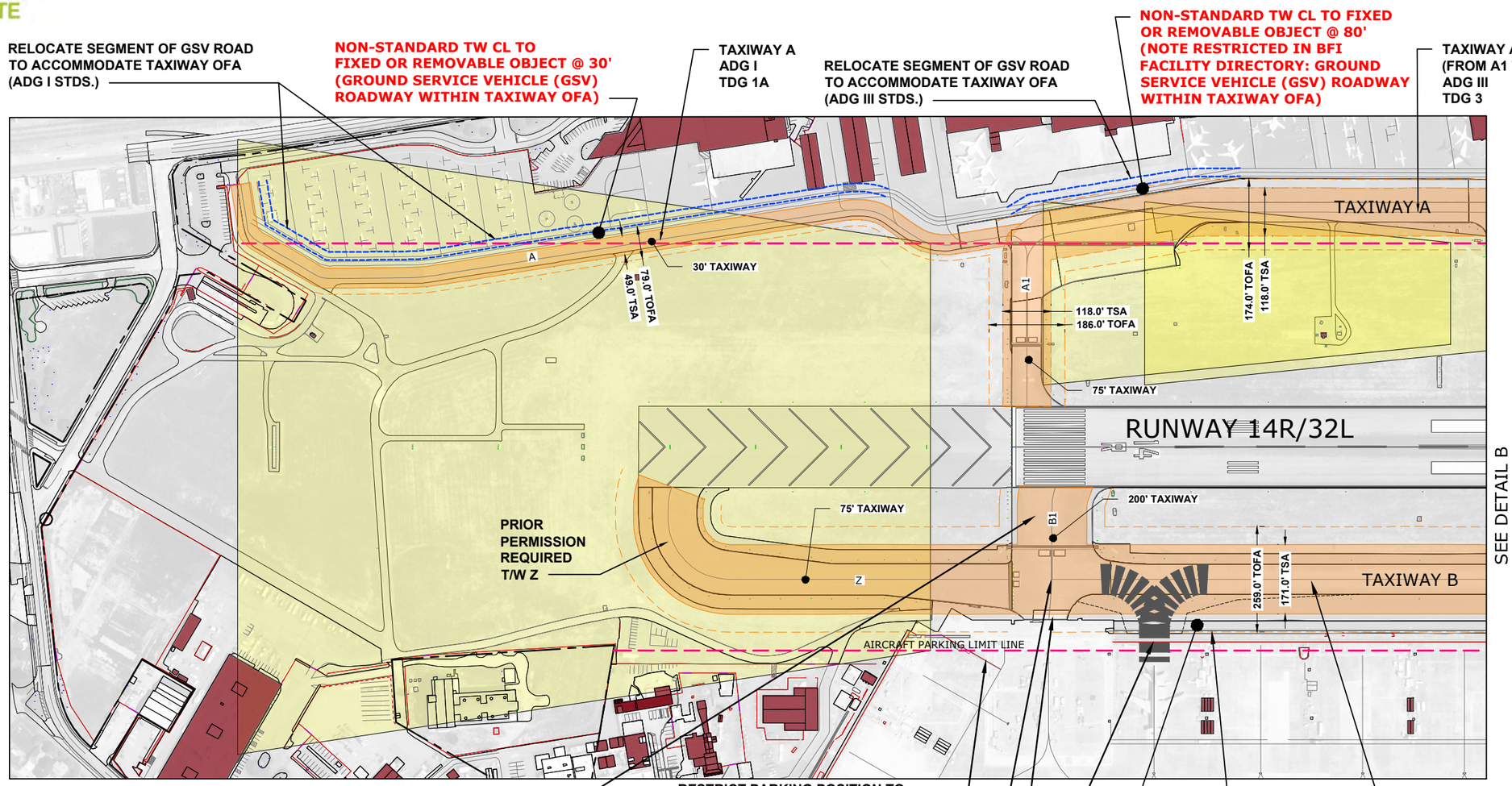
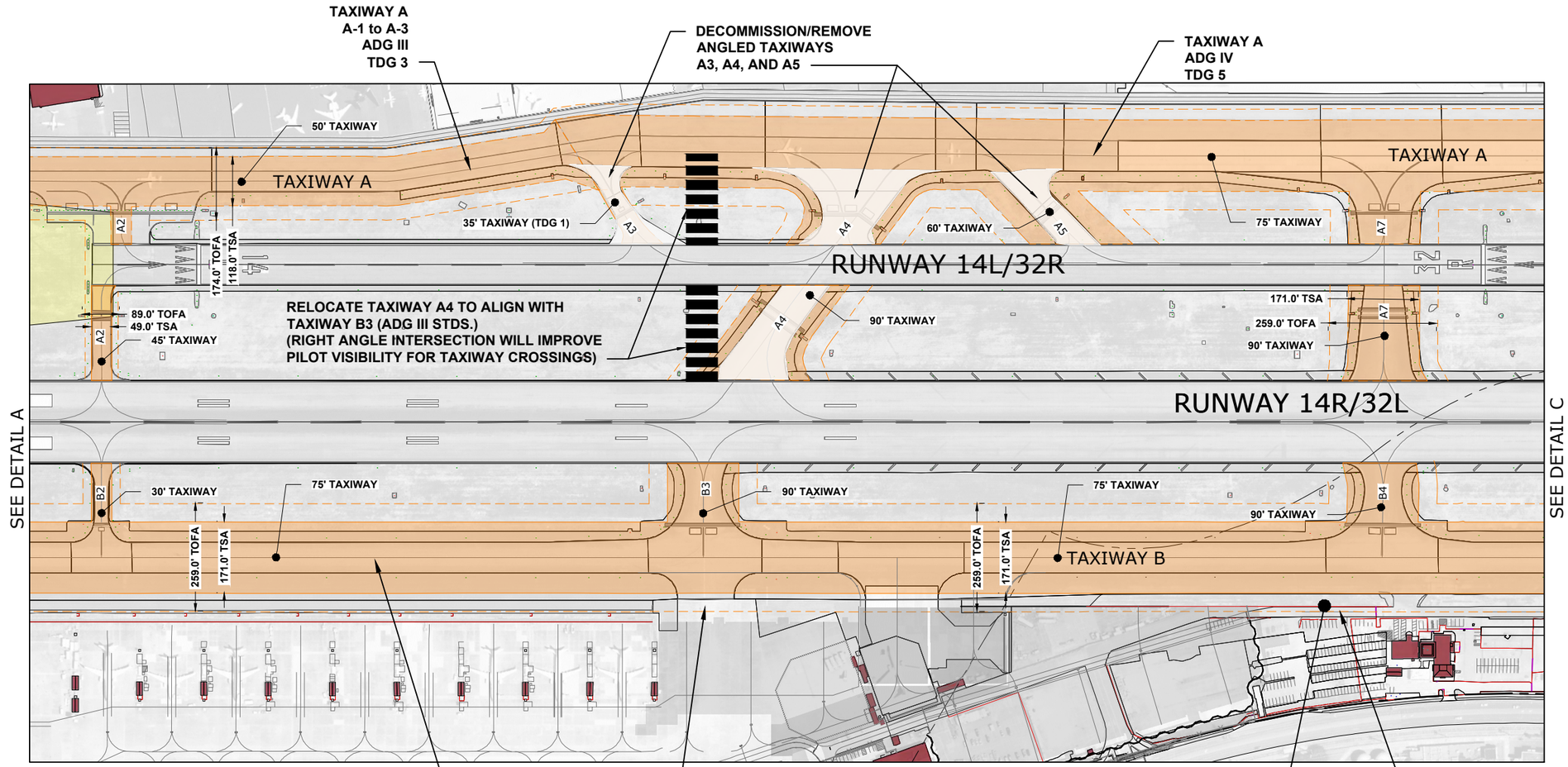
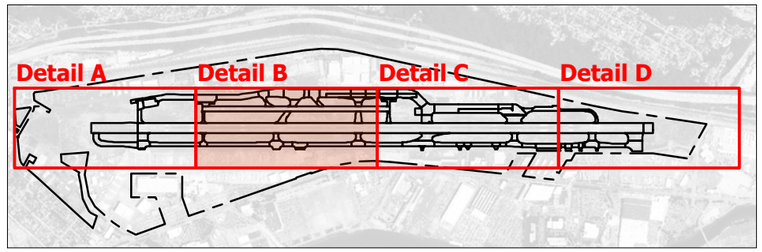


FIGURE D5 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE ONE - DETAIL A**

Mead & Hunt

King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

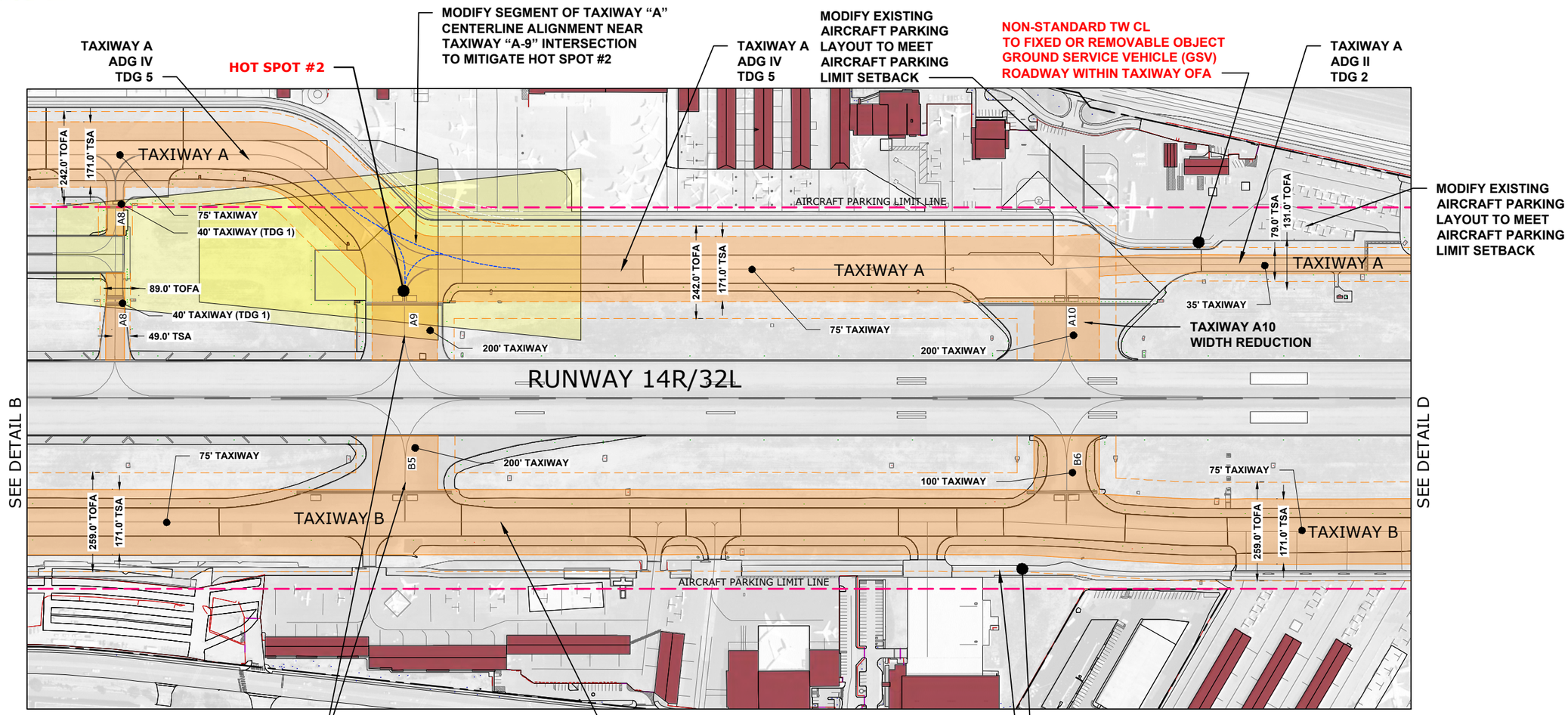
0 300 600

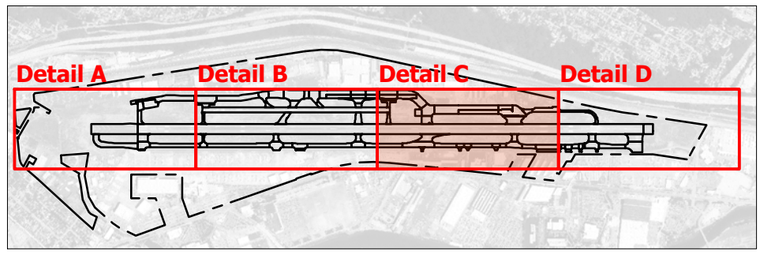
SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D6 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE ONE - DETAIL B**

Mead & Hunt

King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

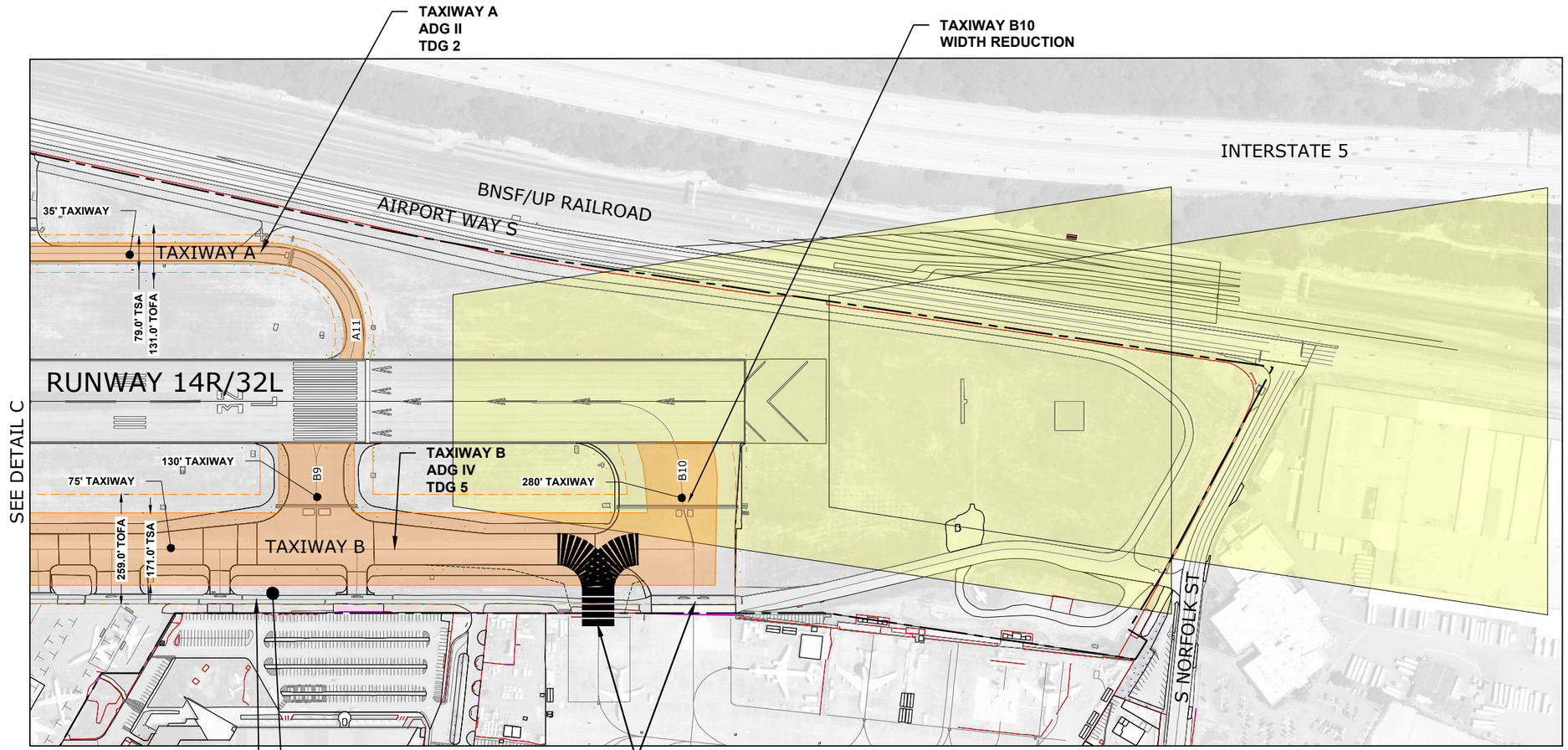
0 300 600

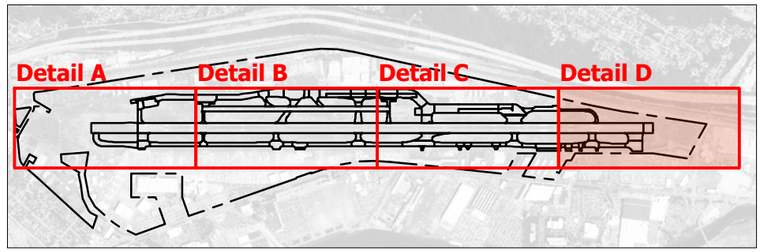
SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D7 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE ONE - DETAIL C**

Mead & Hunt

King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D8 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE ONE - DETAIL D**

Mead & Hunt

King County International Airport/ Boeing Field

Lighting and Navigational Aids. As presented on **Figure D9**, this alternative will require some revisions to the existing High Intensity Runway Lights (HIRLs) and Medium Intensity Taxiway Lights (MITLs) due to the proposed relocation and narrowing of some of the connector taxiway facilities. However, since no major airfield improvements are proposed with this alternative, the majority of the existing HIRLs, the four-light Precision Approach Path Indicators (PAPIs), the Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF), and the Glide Slope/localizer antennas would remain in place with no modifications required.

Potential Environmental Impacts. The encroachment of the Runway 14R approach RPZ onto adjacent property associated with the Georgetown Steam Plant (a structure listed on the National Register of Historic Properties), is a result of the existing ¾-mile visibility minimums for two of the Runway 14R instrument approach procedures (IAPs). Due to the fact the existing 2007 Airport Layout Plan (ALP) identifies only 1-mile visibility minimums for the existing and future Runway 14R IAPs, additional environmental coordination and documentation may be required by the FAA (likely an Environmental Assessment) to consider the various environmental impact categories defined in FAA Order 1050.1F, as well as the U.S. department of Transportation's Section 106 regulation regarding historic structures to support the larger Runway 14R approach RPZ requirements. In addition, the future relocation of the existing fuel farm from within the existing boundary of the Runway 14R approach RPZ to a new development site is also required and may include a Phase I EDDA and clean up/remediation due to potential contamination at the existing storage facility.

The key development components of this alternative, along with the screening criteria for their assessment is presented in **Table D6**.

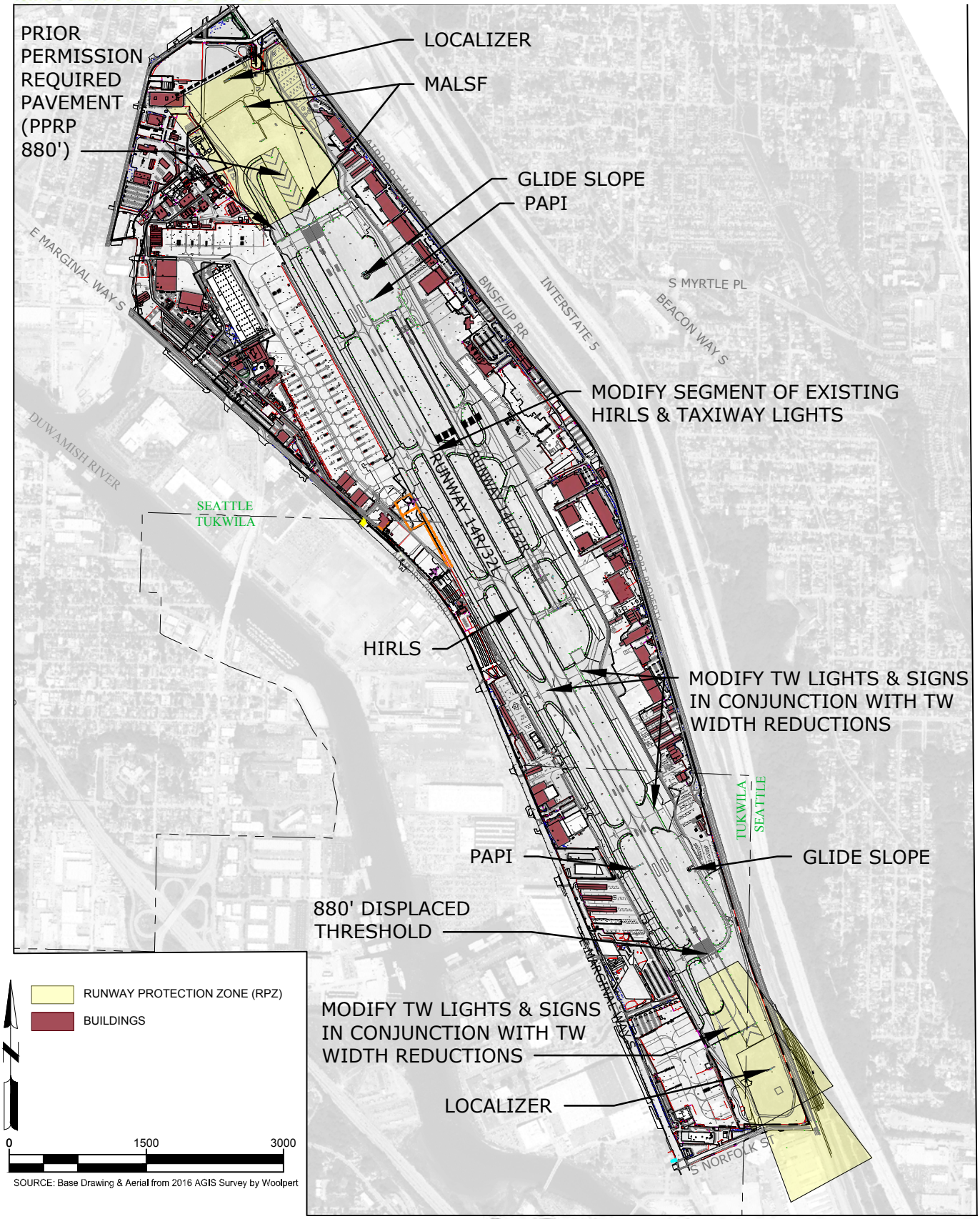


FIGURE D9 **RUNWAY 14R/32L LIGHTING & NAVIGATIONAL AIDS - ALTERNATIVE ONE**

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King County International Airport/ Boeing Field

Table D6 **RUNWAY 14R/32L SUMMARY MATRIX - ALTERNATIVE ONE**

Component/Consideration	Alternative One	Screening Criteria
Runway Design Code (RDC)	RDC D-IV-4000 *(No Change)*	Existing Non-Std. Conditions to be mitigated with combination of future dev. projects, MOS, & ATC waiver).
Runway Width	200' *(No Change)*	Extra 50' of runway width may not be eligible for FAA funding
Runway 14R Length	TORA – 10,000'/10,880' (PPRP) TODA – 10,000'/10,880' (PPRP) ASDA – 9,120'[1]/10,000' (PPRP) LDA – 9,120'/9,120' (PPRP) *(No Change)*	Existing runway declared distances, with PPRP option, satisfy operational requirements of current and projected aircraft fleet.
Runway 32L Length	TORA – 10,000' TODA – 10,000' ASDA – 10,000' LDA – 9,120' *(No Change)*	Existing runway declared distances satisfy operational requirements of current & forecast aircraft fleet.
Instrument Approach Procedure Visibility Minimums	RW 14R – ¾-mile vis. mins. RW 32L – >1-mile vis. mins. *(No Change)*	The existing RW 14R IAP ¾ mile vis. mins. offer an additional 8.8 hrs. of annual IFR capability over the 1-mile vis. mins.
Runway Protection Zones	RW 14R – 1,000' x 1,510' x 1,700' RW 32L – 500' x 1,010' x 1,700' *(No Change)*	RW 14R RPZ – ¾-mile vis. mins. RW 32L RPZ – ≥1-mile vis. mins.
Incompatible Land Uses within Runway Protection Zones	RW 14R – 2.2 acres. RW 32L – 22.5 acres. *(No Change)*	RW 14R Uncontrolled RPZ (Steam Plant & Roadway ROW). RW 32L Uncontrolled RPZ (Roadway R.O.W & Prologis Prop.).
RPZ Easement or Property Acquisition	RW 14R RPZ – 1.9 acres RW 32L RPZ – 7.4 acres *(Significant Change)*	RW 14R RPZ – Steam Plant Prop. RW 32L RPZ – Prologis Property
Taxiway System	Realigns Taxiway A centerline @ Taxiway A9 intersection, realigns Taxiway A4 with Taxiway B3 and reduces width of Taxiways B5, A10, & B10 *(Moderate Change)*	Standardizes taxiway design with 90° intersections, eliminates unnecessary taxiway connectors, reduces wide expanses of pavement at taxiway connectors, and mitigates Hot Spot #2.
Instrumentation/Lighting	Glide Slope & Localizer/HIRL, MITLs, Signs, PAPI, & MALSF *(Minor Change)*	Maintain existing navigational aids, with minor modification of lighting and signs.
Environmental Issues	RW 14R RPZ – (Encroachment on Steam Plant property) Existing Fuel Farm – (Location within RW 14R RPZ) *(Moderate Change)*	May require Environmental Assessment (EA) & Section 106 consultation. Requires Fuel Farm relocation & potential Phase I EDDA and clean up/remediation.

Note: [1] Existing PPRP provides aircraft operators with an ASDA of 10,000-feet on as-needed basis.

Runway 14R/32L - Alternative One Advantages.

- Maintains the runway's existing operational capabilities (i.e., both existing declared distances and PPRP) by retaining a minimum 10,000-foot length ASDA in each direction.
- Maintains the 200-foot runway width, providing an extra margin of safety for final testing of Boeing aircraft and operations during crosswind conditions.
- Provides opportunity to increase IFR access capability to the Airport by 8.8 hrs. annually if the existing Runway 14R ILS can receive environmental clearance for the ¾-mile visibility minimum approach procedures.

Runway 14R/32L - Alternative One Disadvantages.

- Retention of the 200-foot runway width increases long-term pavement maintenance costs for King County, and extra 50 feet of pavement width may not be eligible for future FAA AIP funding.
- Maintenance of the existing ¾-mile visibility minimums for the Runway 14R IAPs would require additional planning in consideration of the FAA Memorandum *Interim Guidance on Land Uses within a Runway Protection Zone,* as well as the preparation of an Environmental Assessment and a Section 106 consultation.
- Requires easement acquisition within existing Runway 14R approach and departure RPZs.

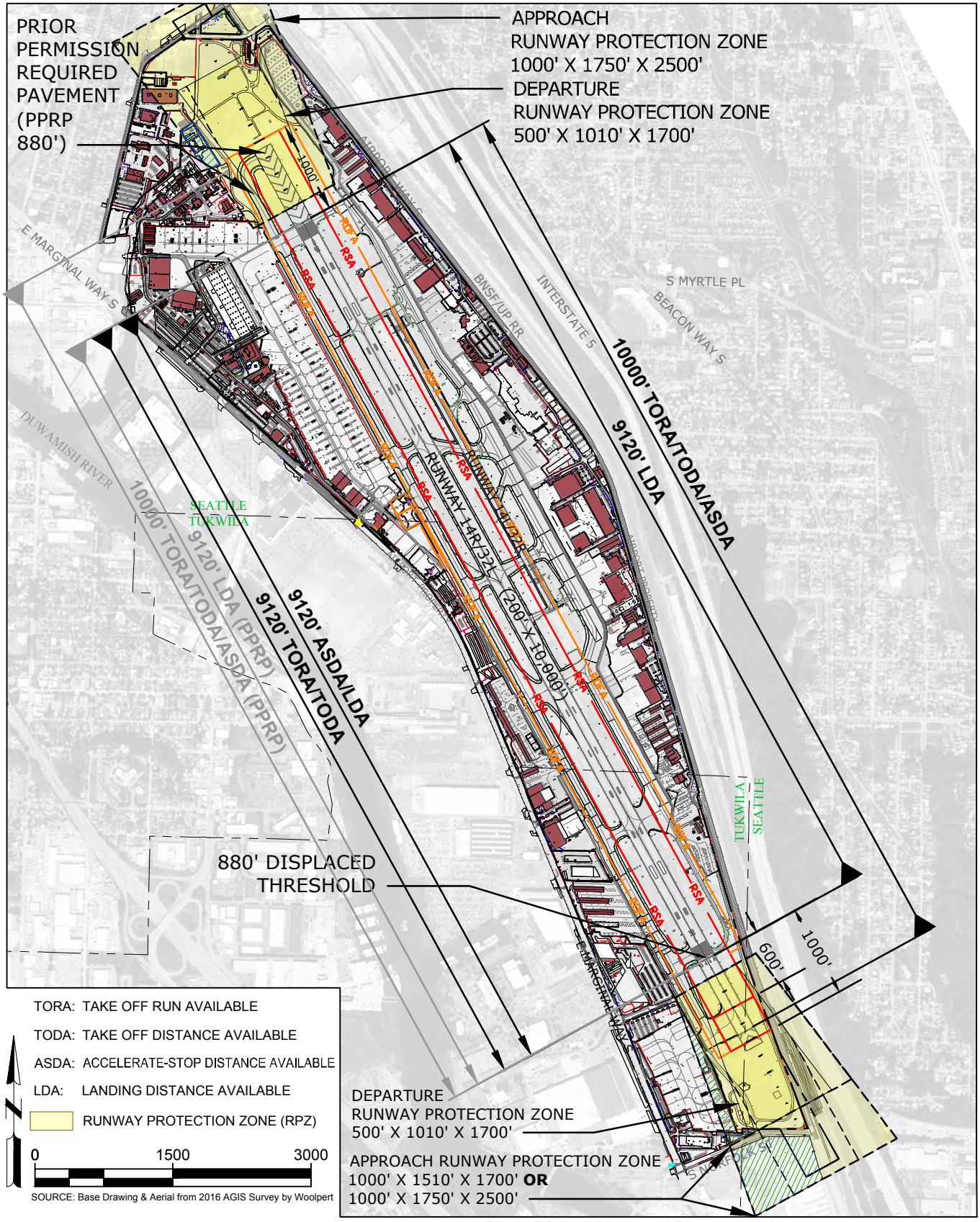
Runway 14R/32L - Alternative Two

Alternative Two would modify the runway's existing design standards from RDC D-IV-4000 to RDC D-IV-2400 by lowering the Instrument Flight Visibility Category from ¾-mile to ½-mile. This alternative also reduces the existing Runway 14R/32L width from 200 to 150 feet to comply with specified FAA design standards. It maintains the existing Runway 14R PPRP but modifies the existing declared distances by reducing the Runway 14R TORA and TODA. As noted above, the IAP visibility minimums would be lowered to both runway ends, with visibility minimums of ½ and ¾ statute mile proposed for Runways 14R and Runway 32L, respectively. As with Alternative One, several of the runway's existing non-standard conditions that were presented in **Table D1** have been identified for potential resolution with a future request for modification of standards and update of the existing ATC Operational Waiver.

Figure D10 depicts the overall airport planning considerations for this alternative, while **Figures D11** and **D12** detail the close-in planning considerations associated with each runway end for Alternative Two.

Runway Width. This alternative reduces the existing runway width from 200 to 150 feet to comply with FAA design standards. This proposed runway width reduction would ensure the future reconstruction costs of the runway would be 100 percent eligible for Federal Airport Improvement Program (AIP) funding and not require supplemental financing from King County or other local funding sources for the additional 50 feet of runway width.

Runway Length. Alternative Two maintains the existing Runway 14R PPRP but modifies the declared distances by reducing the Runway 14R TORA and TODA to 9,120 feet. This results in the following runway lengths for each runway end using declared distances, as presented in **Table D7**.



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D10 **RUNWAY 14R/32L DESIGN STANDARDS & DECLARED DISTANCES - ALTERNATIVE TWO**

Mead & Hunt

King County International Airport/ Boeing Field

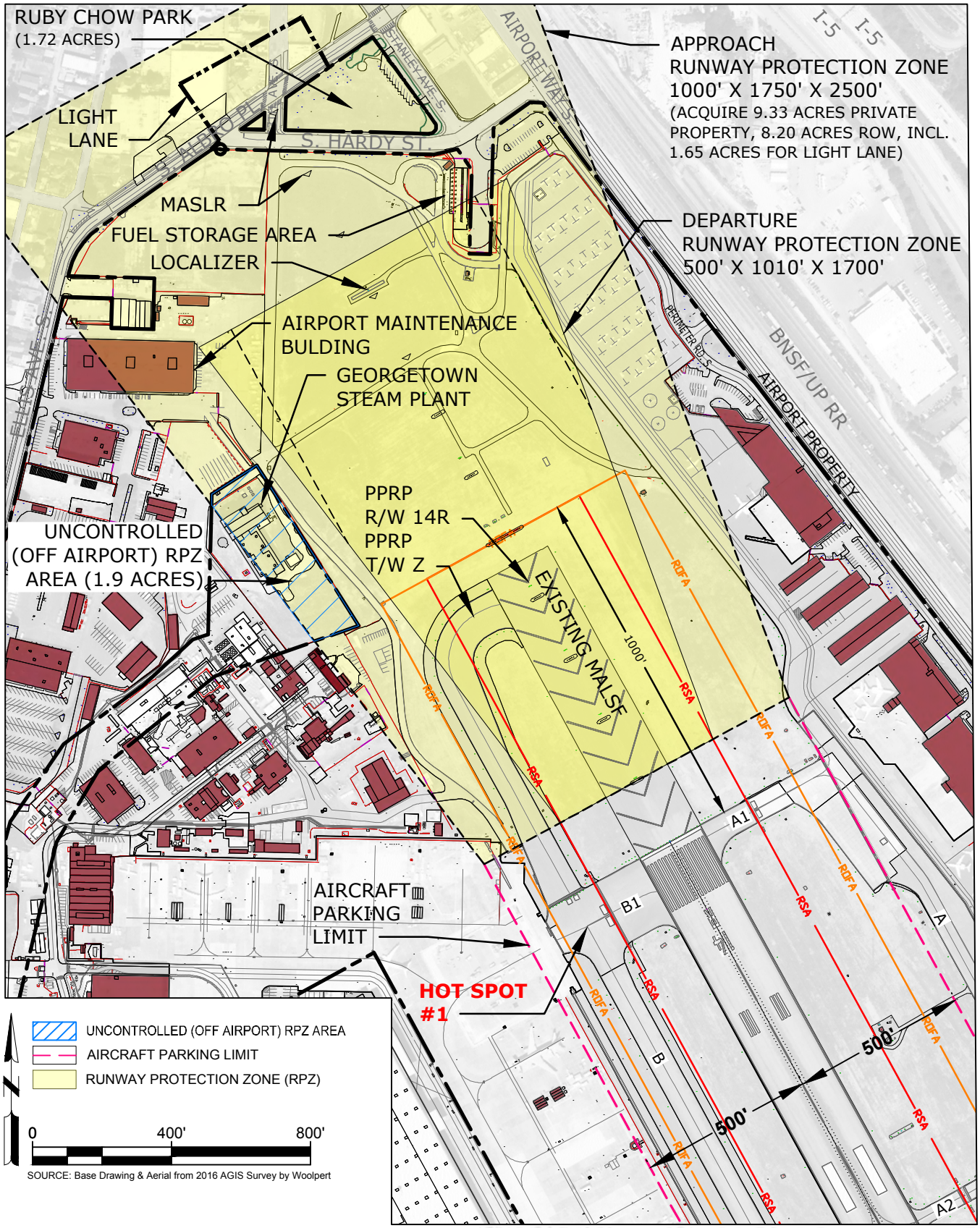
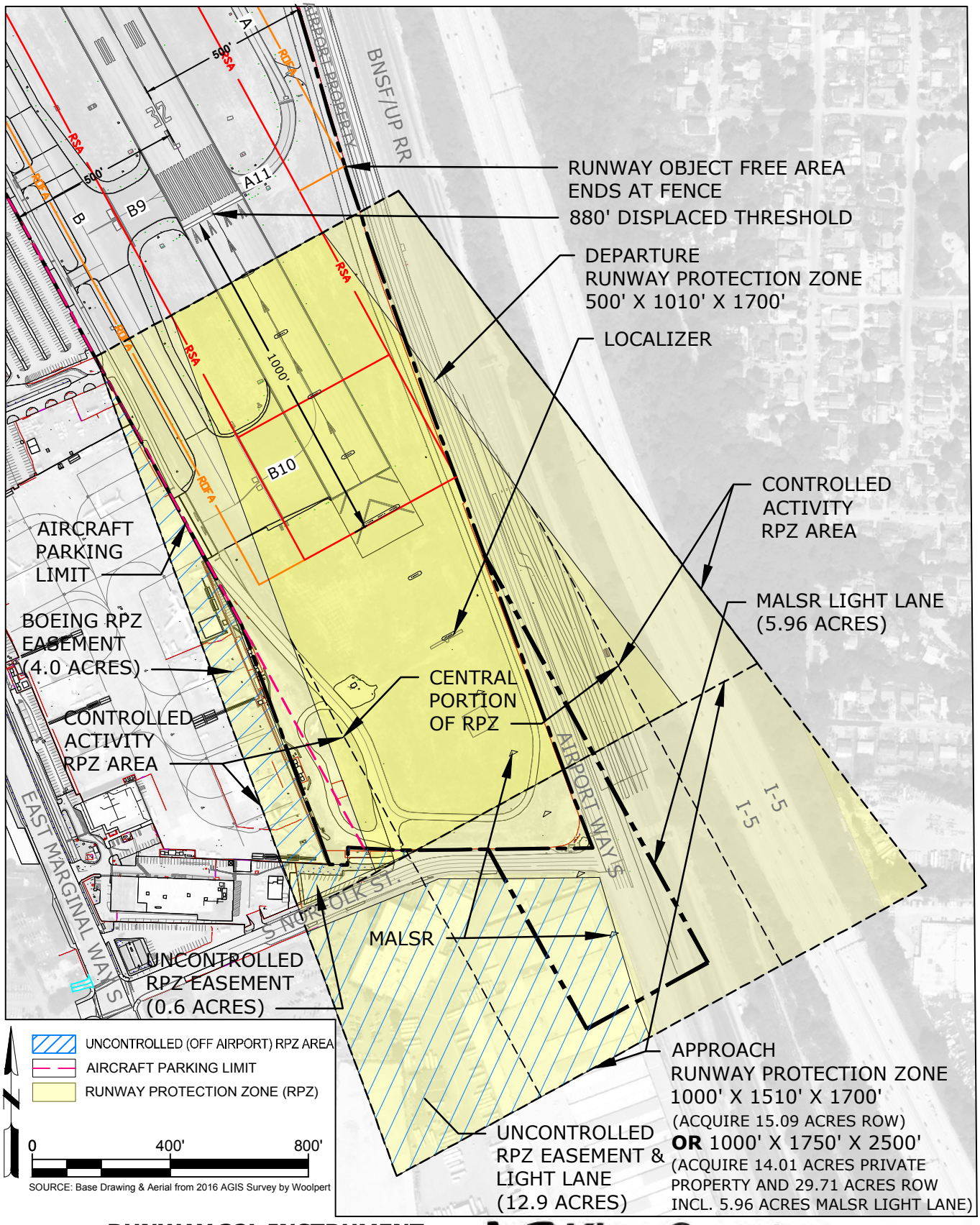


FIGURE D11 **RUNWAY 14R INSTRUMENT APPROACH PROCEDURE/ RUNWAY PROTECTION ZONE DETAIL - ALTERNATIVE TWO**

Mead & Hunt

King County International Airport/ Boeing Field



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D12 **RUNWAY 32L INSTRUMENT APPROACH PROCEDURE/ RUNWAY PROTECTION ZONE DETAIL - ALTERNATIVE TWO**

Mead & Hunt

King County International Airport/ Boeing Field

Table D7 **RUNWAY 14R/32L DECLARED DISTANCES - ALTERNATIVE TWO**

Facility	TORA	TODA	ASDA	LDA
Runway 14R	9,120'[1]	9,120'[1]	9,120'[2]	9,120'[2]
Runway 32L[3]	10,000'	10,000'	10,000'	9,120'

SOURCE: *2007 Airport Layout Plan & Mead & Hunt, Inc.*

Note: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available TODA:Takeoff Distance Available
ASDA: Accelerate Stop Distance Available LDA: Landing Distance Available

[1] The reduced TORA and TODA lengths compared to Alternative One are dictated by the repositioning of the departure RPZ to the departure end of runway (DER). However, the PPRP runway is available to aircraft operators needing a TORA and TODA of 10,000 feet.

[2] The reduced ASDA and LDA lengths are dictated by RSA requirements at the departure end of runway (DER). However, the PPRP runway is available to aircraft operators needing an ASDA of 10,000 feet.

[3] The reduced LDA length is dictated by the existing displaced landing threshold.

Instrument Approach Procedures. Pending a comprehensive evaluation of revised obstruction data for Runway 14R/32L at BFI by FAA Flight Procedures, this alternative identifies the potential improvement of the IAPs to both runway ends, with visibility minimums of ½-mile provided to Runway 14R and ¾-mile vs. ½-mile provided to Runway 32L. Runway 14R provides the best wind coverage during IFR weather conditions, thus this alternative affords the most benefit to BFI users. The potential improvement of the existing Runway 14R ILS to standard Category One ILS minimums (200' ceiling and ½-mile visibility) would improve IFR access by approximately 0.4 percent annually, which equates to an additional 1.8 days or 43.2 hours. In addition, improvement of the existing Runway 32L ILS visibility minimums would improve IFR access to BFI during north flow conditions. As with Alternative One, this alternative would require additional environmental documentation and approvals to support the proposed improved IAP visibility minimums, which would require larger RPZs (see additional information in section below).

Approach and Departure Runway Protection Zones. In conjunction with the potential Runway 14R IAP improvements, the associated approach RPZ increases in size from the existing 1,000' x 1,510' x 1,700' to 1,000' x 1,750' x 2,500'. For Runway 32L, IAP improvements would increase the size of the approach RPZ from the existing 500' x 1,010' x 1,700' to 1,000' x 1,510' x 1,700'. Also, because Alternative Two reduces the Runway 14R TORA and TODA, the departure RPZ at the south end of the runway would be repositioned to align with the Runway 32L approach RPZ and is fully encompassed by the larger Runway 32L approach RPZ. In addition, the larger size of the approach RPZs further extend beyond the airport boundary, increasing the amount of land not fully controlled by King County, and introducing other incompatible land uses within the RPZ.

The expanded uncontrolled RPZ areas for Alternative Two, compared to Alternative One are defined as follows:

Runway 14R

- Airport Way S., 15 Avenue S., S. Albro Place, S. Hardy Street, Ellis Avenue S., and Stanley Avenue S. R.O.W. @ 8.2 acres
- Georgetown Steam Plant property @ 1.9 acres
- Existing airport fuel storage area (facility is located on airport property, but is designated as an incompatible land use within the RPZ)
- Ruby Chow Park @ 1.7 acres
- Residential and commercial areas of Georgetown @ 9.2 acres

Runway 32L

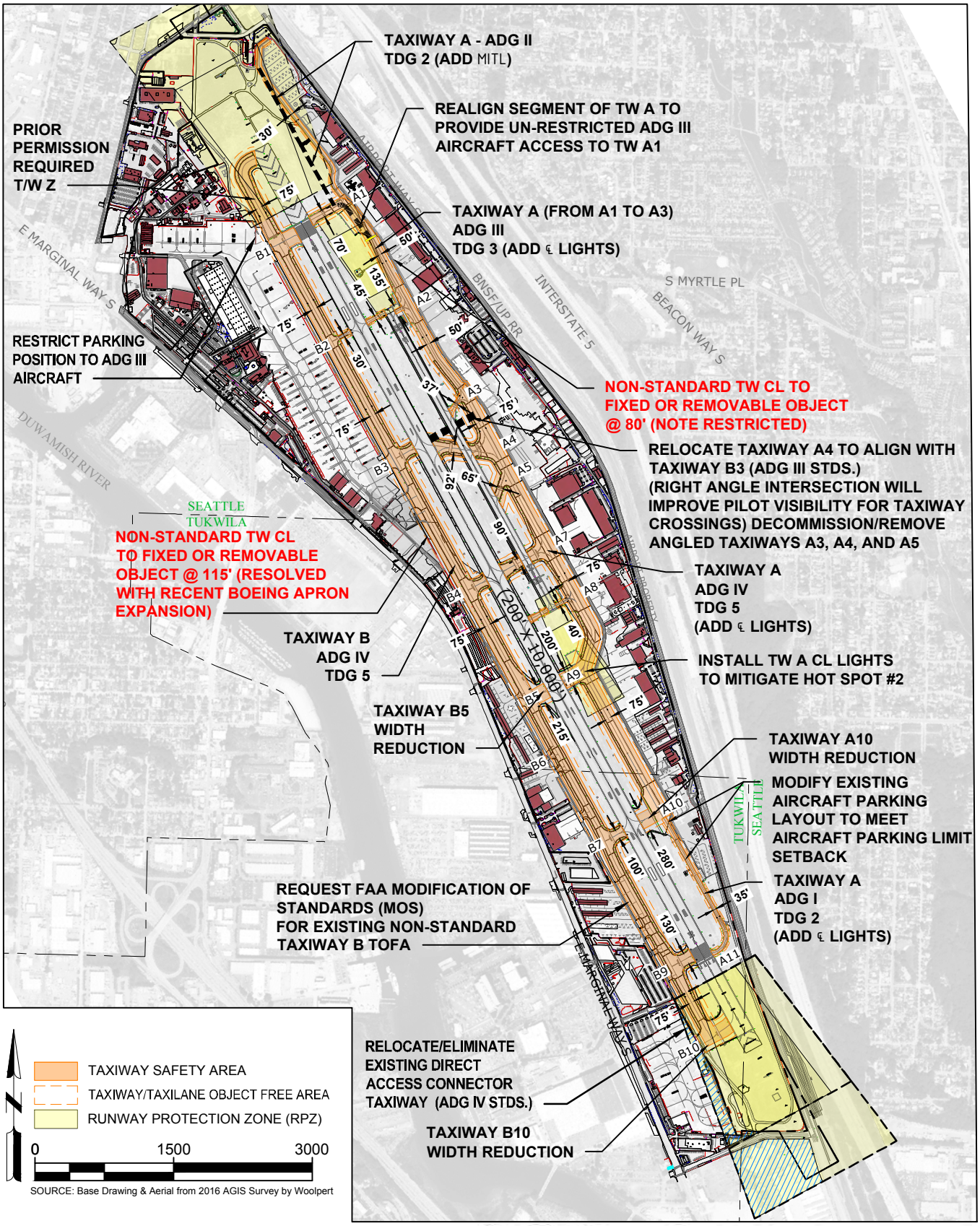
- Airport Way S., BNSF/UP Railroad, I-5, and S. Norfolk St. R.O.W. @ 15.1 acres (29.7 acres if IAP with visibility minimums are reduced to ½ statute mile)
- Boeing property @ 4.0 acres
- Prologis property @ 0.6 acres (12.9 acres if IAP with visibility minimums are reduced to ½ statute mile)

Property/RPZ Easement Acquisition. Alternative Two identifies approximately 12.8 acres of uncontrolled property for fee or easement acquisition to the north within the enlarged Runway 14R RPZ. There is also approximately 4.6 acres of off-airport property for easement acquisition to the south contained within the Runway 32L RPZs, associated with a potential future IAP having ¾-mile visibility minimums. If an IAP with visibility minimums as low as ½-mile is implemented, then approximately 19.9 acres of off-airport property would be required for acquisition (i.e., easement and/or fee simple) to accommodate the larger RPZ. As presented in **Figures D11** and **D12**, most of the off-airport property within the RPZs is located within existing road or railroad R.O.W., but the proposed RPZ easement or property acquisition would provide King County with additional land use controls within these critical inner approach areas of the runway.

Taxiway Improvements. Maintain the existing Taxiway B design standards (i.e., TDG 5/ADG IV) and upgrade segment of Taxiway A from a wingspan restricted ADG III to an unrestricted ADG III standard.

As presented on **Figure D13** and detailed on **Figures D14 through D17**, the recommended taxiway improvements include:

- Upgrade existing angled exit taxiways with 90° exit taxiways (Realign Taxiway A4 with Taxiway B3)
- Install Taxiway A centerline lights to mitigate Hot Spot #2 near Taxiway A9 intersection
- Realign segment of Taxiway A at Taxiway A1 to accommodate unrestricted ADG III access
- Realign segment of Taxiway A north of Taxiway A1 to accommodate unrestricted ADG II access
- Extend Taxiway A and construct new access taxiway linking potential North GA hangar development area
- Potential Taxiway connector width reduction projects at Taxiways B5, B10, & A10



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D13 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE TWO**

Mead & Hunt

King County International Airport/ Boeing Field

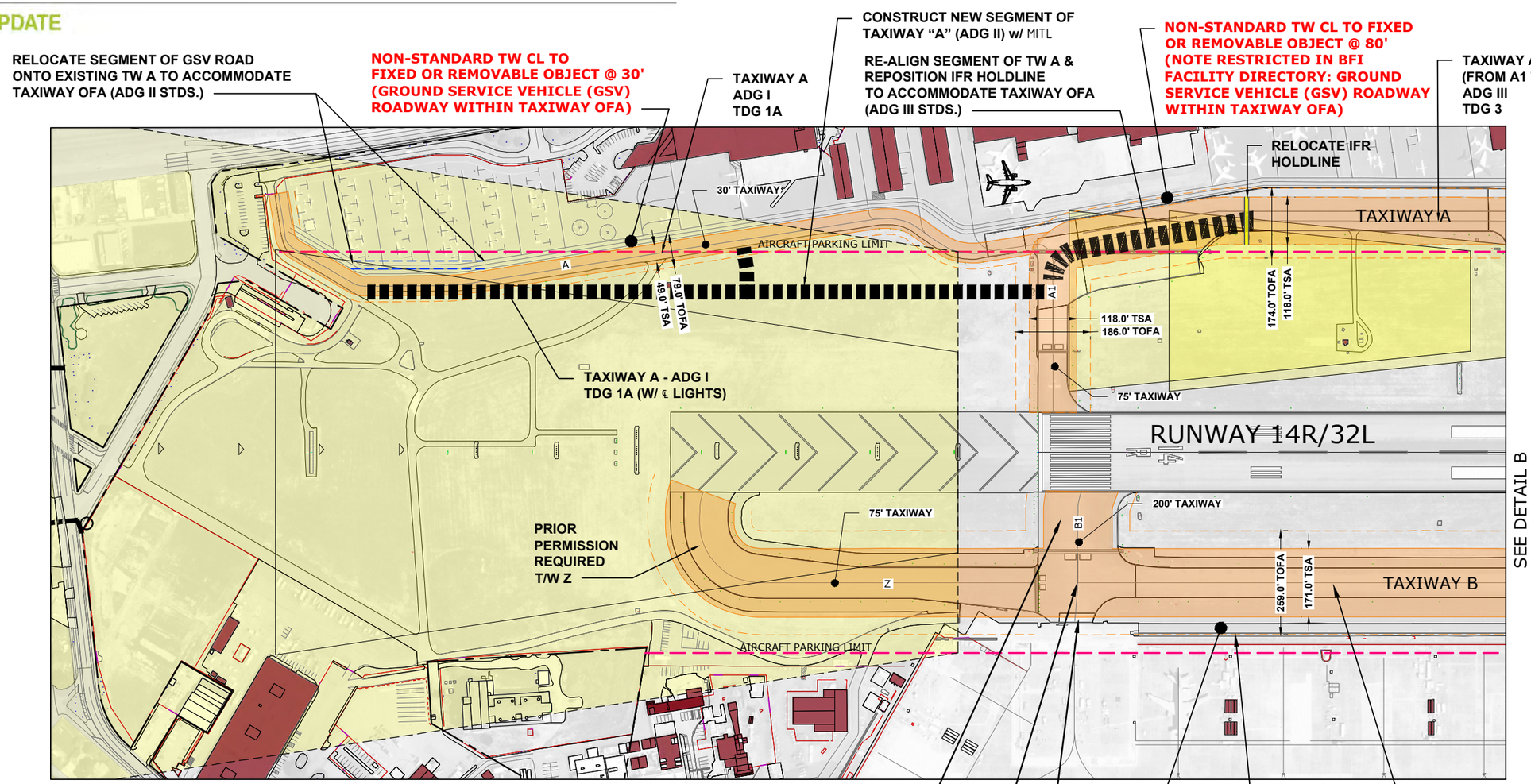
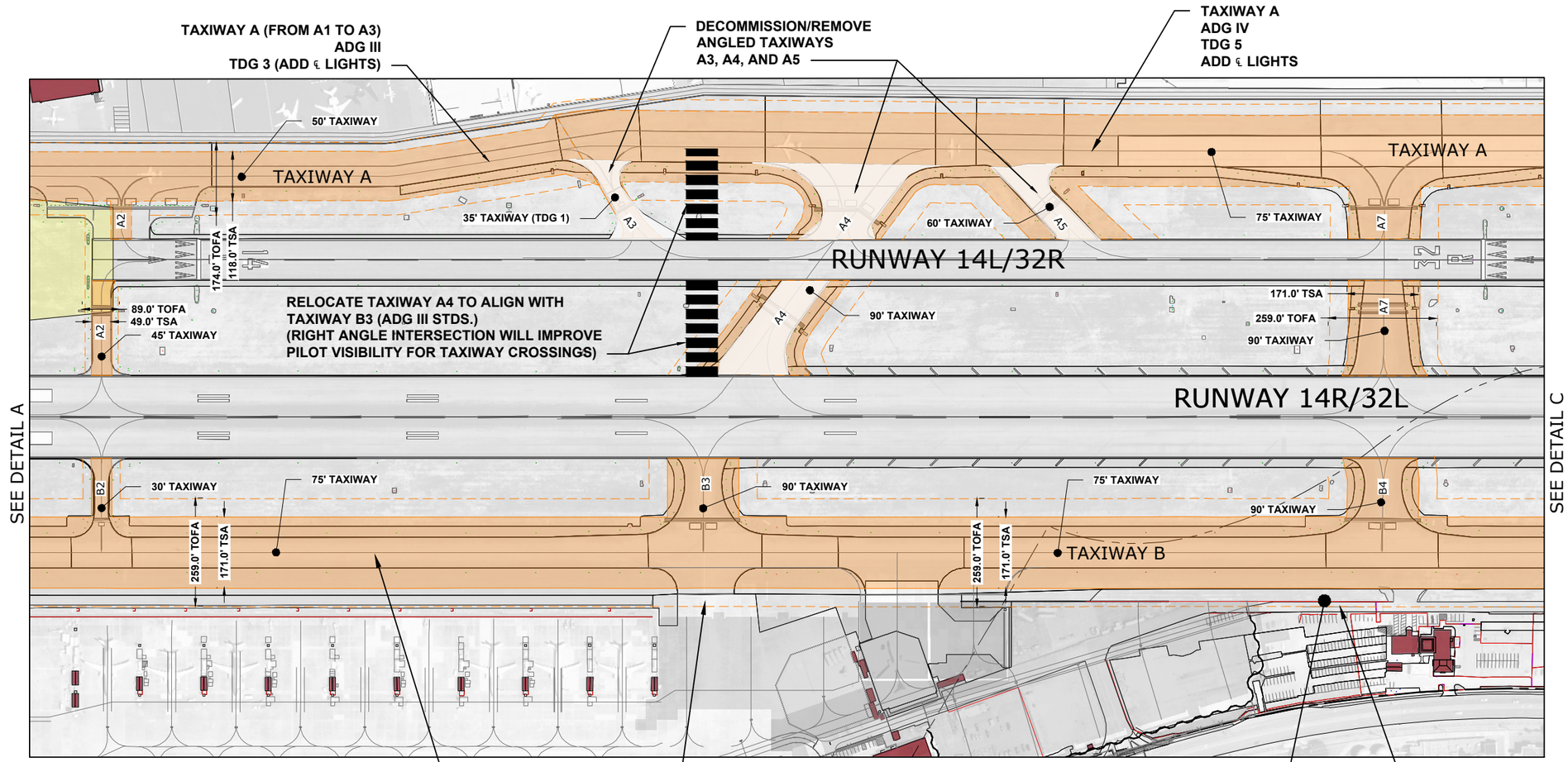
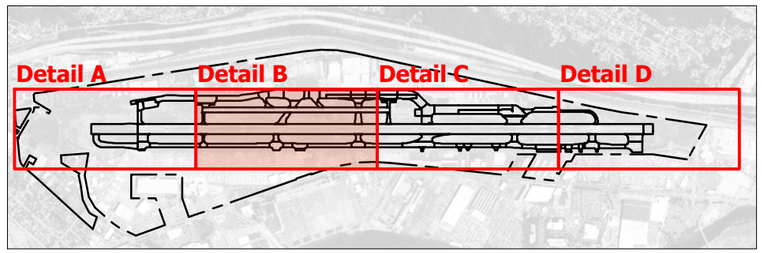


FIGURE D14 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE TWO - DETAIL A**

Mead & Hunt

King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

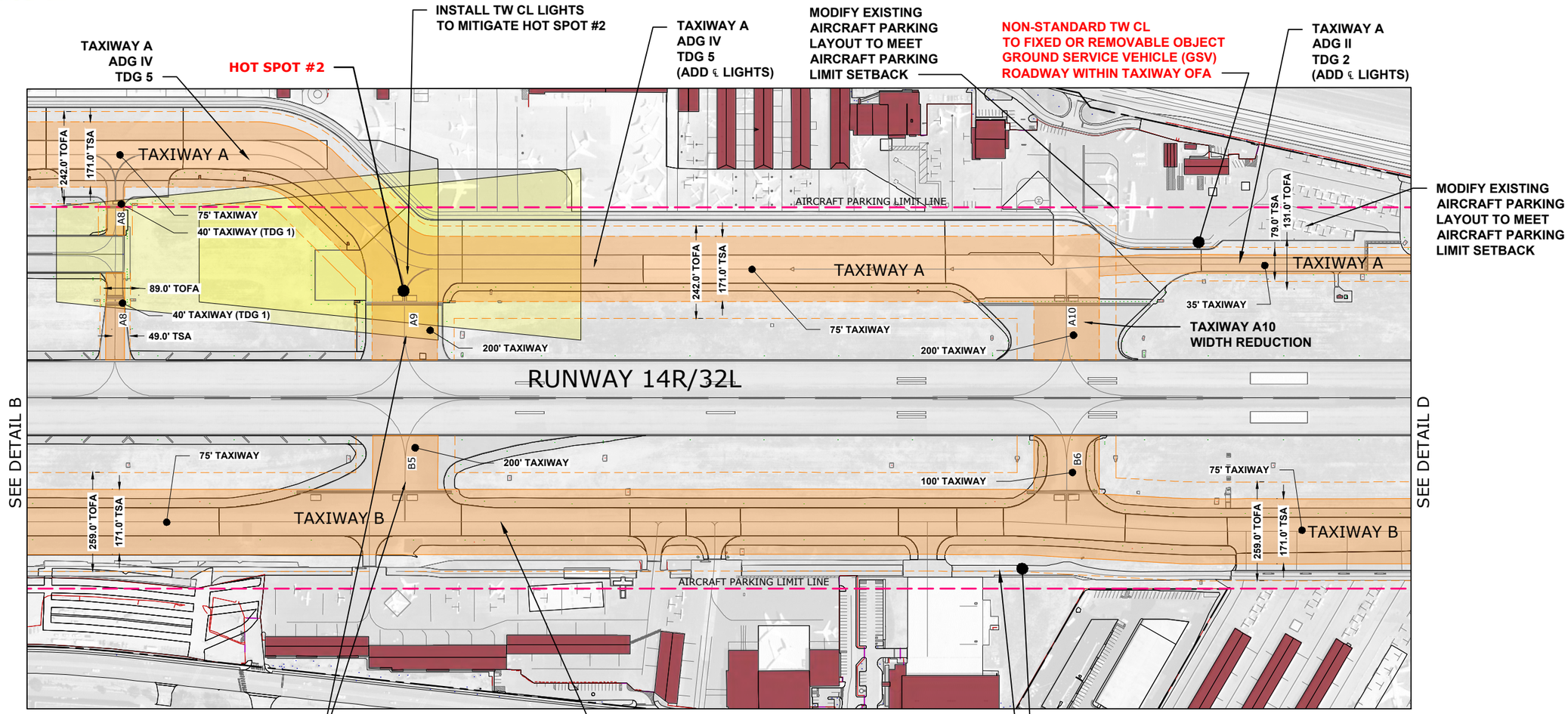
0 300 600

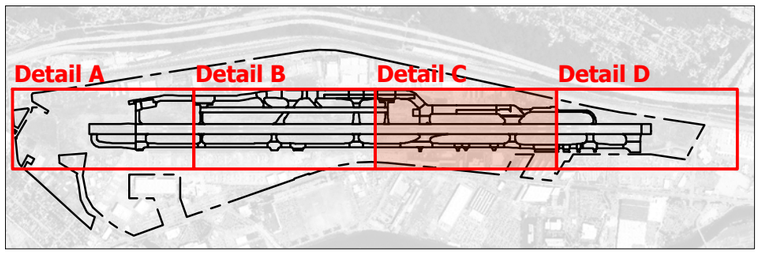
SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D15 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE TWO - DETAIL B**

Mead & Hunt

King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

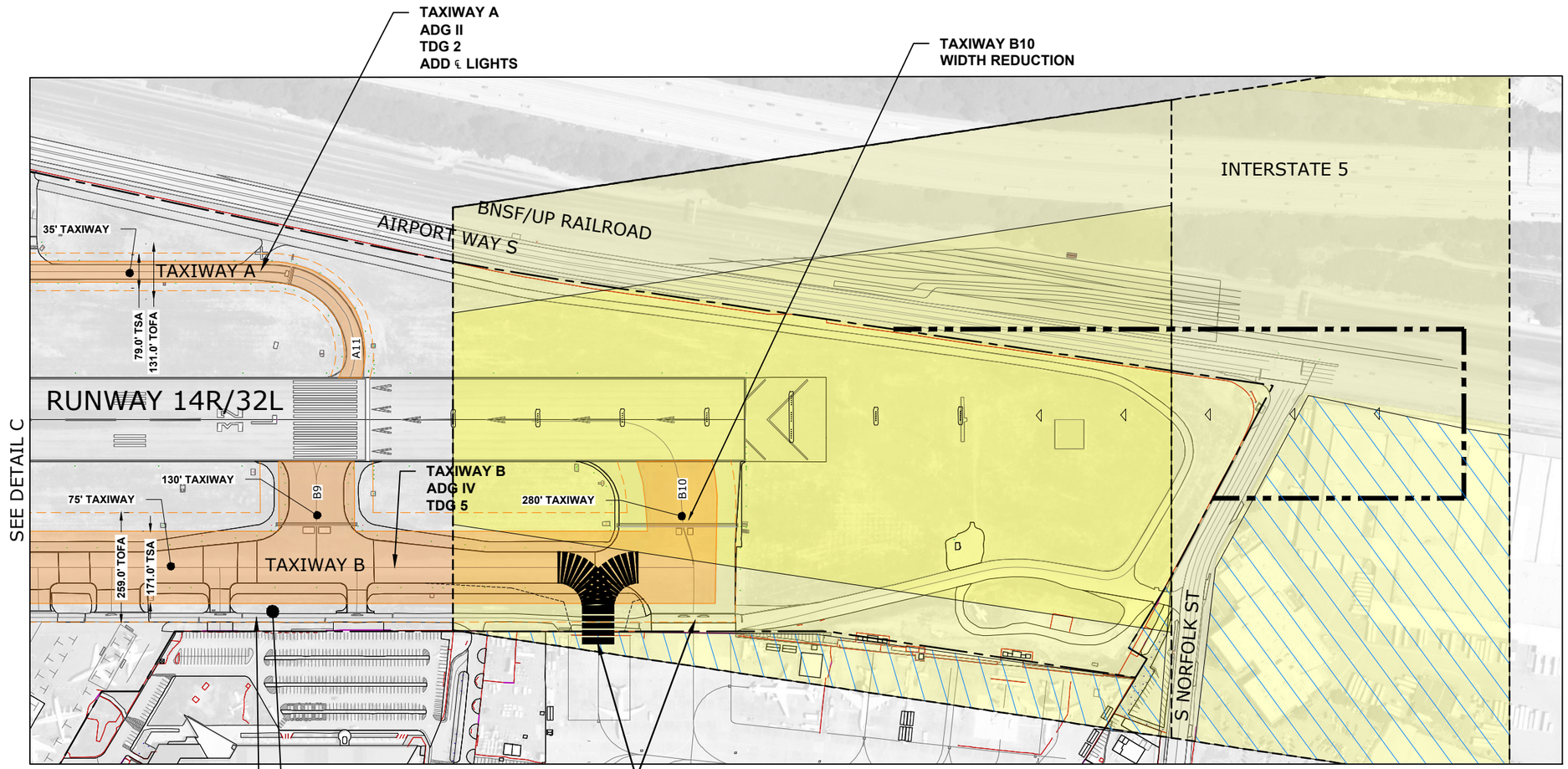
0 300 600

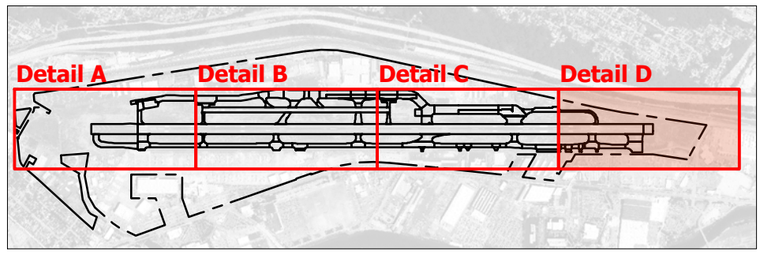
SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D16 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE TWO - DETAIL C**

Mead & Hunt

King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D17 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE TWO - DETAIL D**

Mead & Hunt

King County International Airport/ Boeing Field

Lighting and Navigational Aids. As presented on **Figure D18***,* the lower visibility minimums to Runway 14R associated with this alternative, would require a full Approach Lighting System (ALS), such as a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR), to replace the existing MALSF. For Runway 32L, an ALS is not required for the proposed lowering of the visibility minimums to ¾-mile according to *AC 150/5300-13A, Change 1*, but it is recommended. However, if the visibility minimums are lowered to ½-mile, then a full ALS, such as a MALSR would be required. In addition, the existing HIRLs, runway signage, and PAPIs would require relocation in conjunction with the runway width reduction. There would also be several modifications to existing MITLs resulting from the relocation and narrowing of connector taxiway facilities, including the addition of taxiway centerline lights to Taxiway A. As with Alternative One, the existing Glide Slope/localizer antennas at each runway end would remain in place with no modifications required.

Potential Environmental Impacts. The implementation of Alternative Two would further expand the potential environmental impacts identified for Alternative One that are associated with the larger RPZs at each end of the runway. In addition, to impacts upon the Georgetown Steam Plant, this alternative would result in impacts to Ruby Chow Park (a potential Section 4(f) property), and compatible land uses related to the residential/commercial/industrial properties located north of S. Albro Place, west of Ellis Avenue S., and east of Stanley Avenue S. Additional easement and/or property acquisition within the expanded Runway 32L RPZ associated with improved IAP visibility minimums of ¾ or ½-mile would impact the adjacent Boeing aircraft parking apron and existing industrial properties located south of S. Norfolk Street. As noted for Alternative One, the future relocation of the existing fuel farm from within the existing boundary of the Runway 14R approach RPZ to a new development site is also required and may include a Phase I EDDA and clean up/remediation due to potential contamination of the existing facility. In addition, the potential land acquisition required to implement Alternative Two may also require a Phase I EDDA prior to acquisition to identify the likely presence of any environmental contamination.

The key development components of this alternative, along with the screening criteria for their assessment is presented in **Table D8***.*

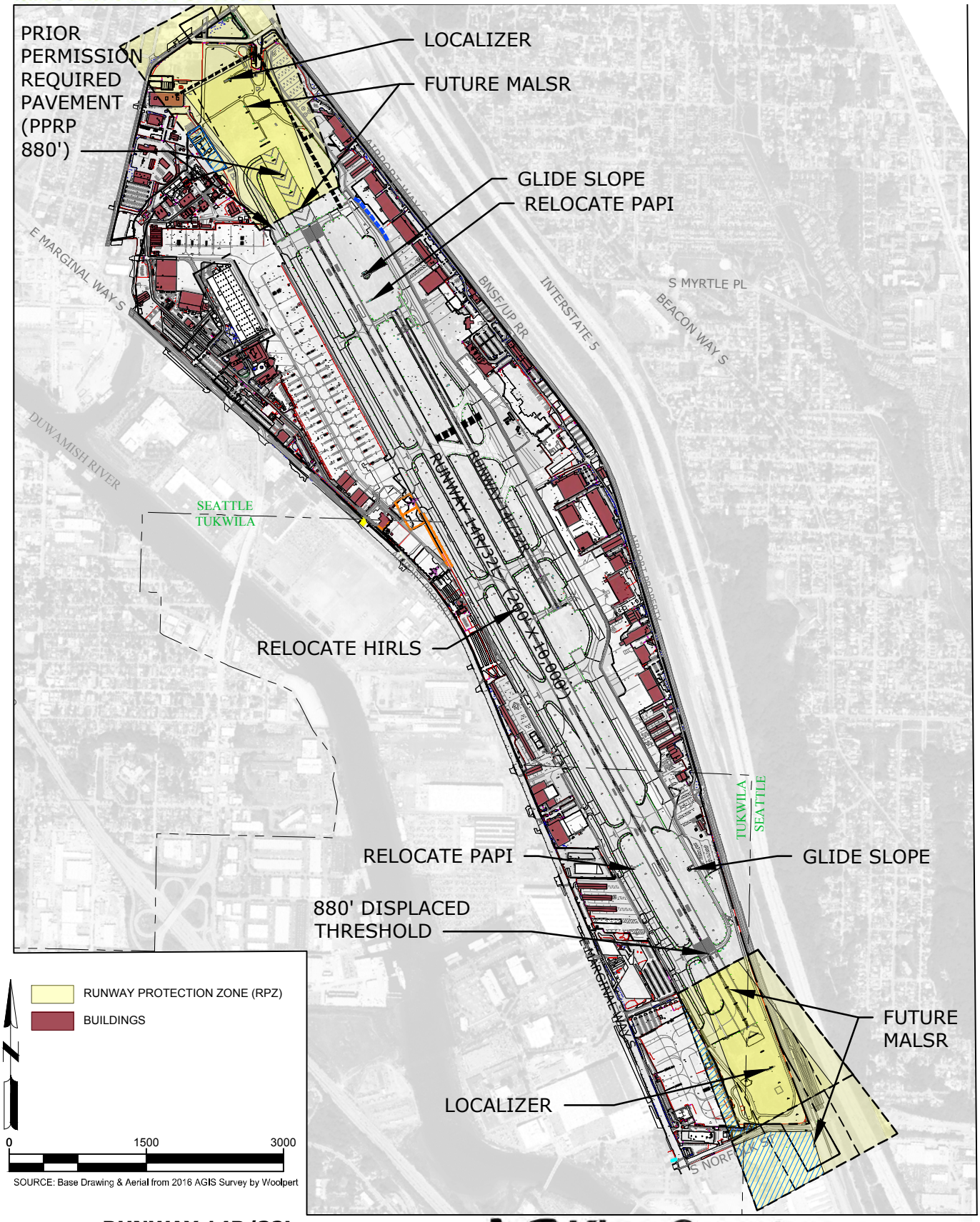


FIGURE D18 **RUNWAY 14R/32L LIGHTING & NAVIGATIONAL AIDS - ALTERNATIVE TWO**

Mead & Hunt

King County International Airport/ Boeing Field

Table D8 **RUNWAY 14R/32L SUMMARY MATRIX - ALTERNATIVE TWO**

Component/Consideration	Alternative Two	Screening Criteria
Runway Design Code (RDC)	RDC D-IV-2400 *(Significant Change-More Restrictive)*	Implement more restrictive design criteria (Existing Non-Std. Conditions to be mitigated with combination of future dev. Projects, MOS, & ATC waiver).
Runway Width	150' Reduce existing runway width by 50' *(Moderate Change)*	Reduced runway width would be 100% eligible for FAA funding/No supplemental funding sources would be required
Runway 14R Length	TORA – 9,120'[1]/10,000' (PPRP) TODA – 9,120'[1]/10,000' (PPRP) ASDA – 9,120'[1]/10,000' (PPRP) LDA – 9,120'/9,120' (PPRP) *(Moderate Change-Reduces published TORA & TODA 880')*	Reduced TORA & TODA runway lengths could be mitigated with use of PPRP runway and still satisfy operational requirements of current and projected aircraft fleet.
Runway 32L Length	TORA – 10,000' TODA – 10,000' ASDA – 10,000' LDA – 9,120' *(No Change)*	Existing runway declared distances satisfy operational requirements of current and projected aircraft fleet.
Instrument Approach Procedure Visibility Minimums	RW 14R – ½ mile vis. mins. RW 32L – ¾ mile vis. mins. *(Moderate Change-Lowers Visibility Minimums @ each runway end)*	The potential RW 14R IAP ½ mile vis. mins. would offer an additional 43.2 hrs. of annual IFR capability over the ¾ mile vis. mins.
Runway Protection Zones	RW 14R – 1,000' x 1,750' x 2,500' RW 32L – 1,000' x 1,510' x 1,700' vs. 1,000' x 1,750' x 2,500' *(Significant Change-Larger RPZs & repositions RW 14R departure RPZ)*	RW 14R RPZ – ½ mile vis. mins. RW 32L RPZ – ¾ vs. ½ mile vis. mins.
Incompatible Land Uses within Runway Protection Zones	RW 14R – 21.03 acres RW 32L – 15.09/49.7 acres *(Significant Change-Increase)*	RW 14R Uncontrolled RPZ – Steam Plant, Roadway R.O.W., Private property, & expanded light lane) RW 32L Uncontrolled RPZ – Boeing property, Roadway R.O.W. & Prologis Property.
RPZ Easement/Property Acquisition	RW 14R RPZ Easement – 1.9 acres RW 14R RPZ Property – 9.2 acres RW 32L RPZ Property/Ease. – 4.6/12.9 acres *(Significant Change-Increase)*	RW 14R RPZ – Steam Plant Property & private property RW 32L RPZ – Boeing & Prologis property.
Taxiway System	Realigns & relocates segment of Taxiway A @ Taxiway A1, Installs Taxiway A centerline lights, realigns Taxiway A4 with Taxiway B3, includes width reduction of Taxiways B5, B10, & A10, and constructs access taxiway from Taxiway A *(Moderate Change)*	Standardizes taxiway design with 90° intersections, eliminates unnecessary taxiway connectors, reduces wide expanses of pavement at taxiway connectors, and mitigates Hot Spot #2.

Table D8 **RUNWAY 14R/32L SUMMARY MATRIX - ALTERNATIVE TWO (CONTINUED)**

Component/Consideration	Alternative Two	Screening Criteria
Instrumentation/Lighting	Maintain glide slope & localizer antennas. Relocate HIRLs, MITLs, Signage, and PAPIs Upgrade RW 14R MALSF to MALSR *(Significant Change)*	Facility relocations & upgrades are dictated by runway width reduction & RW 14R IAP improvements.
Environmental Issues	Larger RW 14R RPZ – (Encroachment on Steam Plant property, Ruby Chow Park, Roadway R.O.W., & Georgetown neighborhood) Larger RW 32L RPZ – (Encroachment on Boeing & Prologis property) Existing Fuel Farm – (Location within RW 14R RPZ) *(Significant Change)*	Would require EA or Environmental Impact Statement (EIS) with Section 4(f) issues, Section 106 Consultation, & potential property acquisition Phase I EDDA. Fuel farm relocation with potential Phase I EDDA and clean up/remediation.

Note: [1] Existing PPRP provides aircraft operators with a TORA, TODA, & ASDA of 10,000-feet on as-needed basis.

Runway 14R/32L - Alternative Two Advantages.

- Reduces the Runway 14R existing declared distances for TORA & TODA by 880 feet, but effectively maintains the runway's existing operational capabilities (retaining a minimum 10,000-foot ASDA runway length in each direction with operator access to the existing 880 feet of PPRP runway).
- The Runway 14R declared distances reduction of TORA & TODA permits the repositioning of the existing departure RPZ to reduce departure RPZ easement acquisition costs and mitigate existing non-compatible land uses.
- Runway width reduction to 150 feet educes long-term pavement maintenance cost for King County.
- Runway width reduction reduces impervious pavement surface area and would minimize storm water runoff drainage volumes.
- Provides opportunity to increase IFR access capability to the Airport by 43.2 hours annually if the existing Runway 14R ILS can receive environmental clearance for the ½-mile visibility minimums and complete the RPZ property and easement acquisition requirements.

Runway 14R/32L - Alternative Two Disadvantages.

- Runway width reduction would require relocation of all runway edge lights, signage, and PAPIs.
- The published TORA and TODA declared distances for Runway 14R would be reduced from 10,000 feet to 9,120 feet.
- Implementation of future ½-mile visibility minimums for the Runway 14R IAPs would require additional planning in consideration of the FAA Memorandum *Interim Guidance on Land Uses within* a Runway Protection Zone, as well as the preparation of an Environmental Assessment with Section 4(f) issues & Section 106 Consultation.
- Implementation of future ¾- or ½-mile visibility minimums for the Runway 32L IAPs would require additional planning in consideration of the FAA Memorandum *Interim Guidance on Land Uses within a Runway Protection Zone*, as well as the preparation of an Environmental Assessment.
- Requires both easement and property acquisition within future Runway 14R approach RPZ.
- Requires easement and potential property acquisition within future Runway 32L approach RPZ.

Runway 14R/32L - Alternative Three

Alternative Three would modify the runway's existing design standards from RDC D-IV-4000 to RDC D-IV-5000 by raising the Instrument Flight Visibility Category from ¾-mile to 1-mile. In addition, this alternative reduces the Runway 14R/32L width to 150 feet to meet existing FAA design standards. It converts the existing Runway 14R PPRP to full-time runway use pavement and updates the markings of the existing Runway 14R threshold as a "displaced threshold". It also updates the runway's published declared distances, repositions the Runway 14R departure RPZ, raises the existing Runway 14R IAP visibility minimums from ¾ to 1-mile, and retains the existing Runway 32L IAP visibility minimums of greater than 1-mile. **Figure D19** depicts the overall airport planning considerations for this alternative. As with the previous two alternatives, several of the runway's existing non-standard conditions that were presented in **Table D1** have been identified for potential resolution with a future request for modification of standards and update of the existing ATC Operational Waiver.

Figures D20 and **D21**, respectively, detail the close-in planning considerations associated with each runway end for Alternative Three.

Runway Width. As with Alternative Two, this alternative reduces the existing runway width from 200 to 150 feet to comply with FAA design standards and ensure the future reconstruction costs of the runway would be 100 percent eligible for Federal AIP funding.

Runway Length. This alternative converts the existing Runway 14R PPRP to full-use runway and remarks the existing Runway 14R threshold as a "displaced". The modifications result in the following runway lengths for each runway end using declared distances, as presented in **Table D9**.

Table D9 **RUNWAY 14R/32L DECLARED DISTANCES - ALTERNATIVE THREE**

Facility	TORA	TODA	ASDA	LDA
Runway 14R	10,000'	10,000'	10,000'	9,120'[1]
Runway 32L	10,000'	10,000'	10,000'	9,120'[1]

SOURCE: *2007 Airport Layout Plan & Mead & Hunt, Inc.*

Note: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available — TODA: Takeoff Distance Available
ASDA: Accelerate Stop Distance Available — LDA: Landing Distance Available

[1] The reduced LDA length is dictated by the displaced landing threshold.

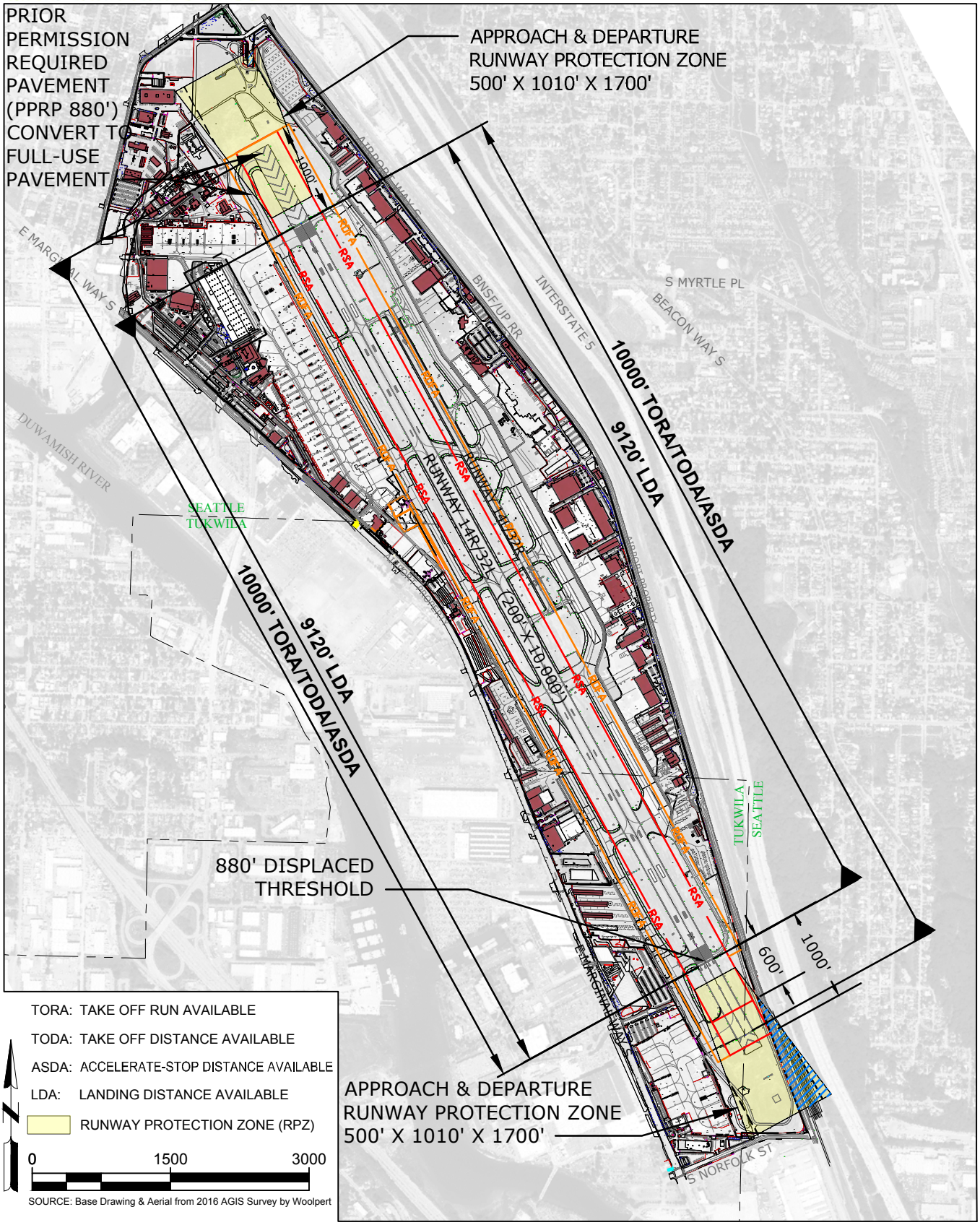


FIGURE D19 **RUNWAY 14R/32L DESIGN STANDARDS & DECLARED DISTANCES - ALTERNATIVE THREE**

Mead & Hunt

King County International Airport/ Boeing Field

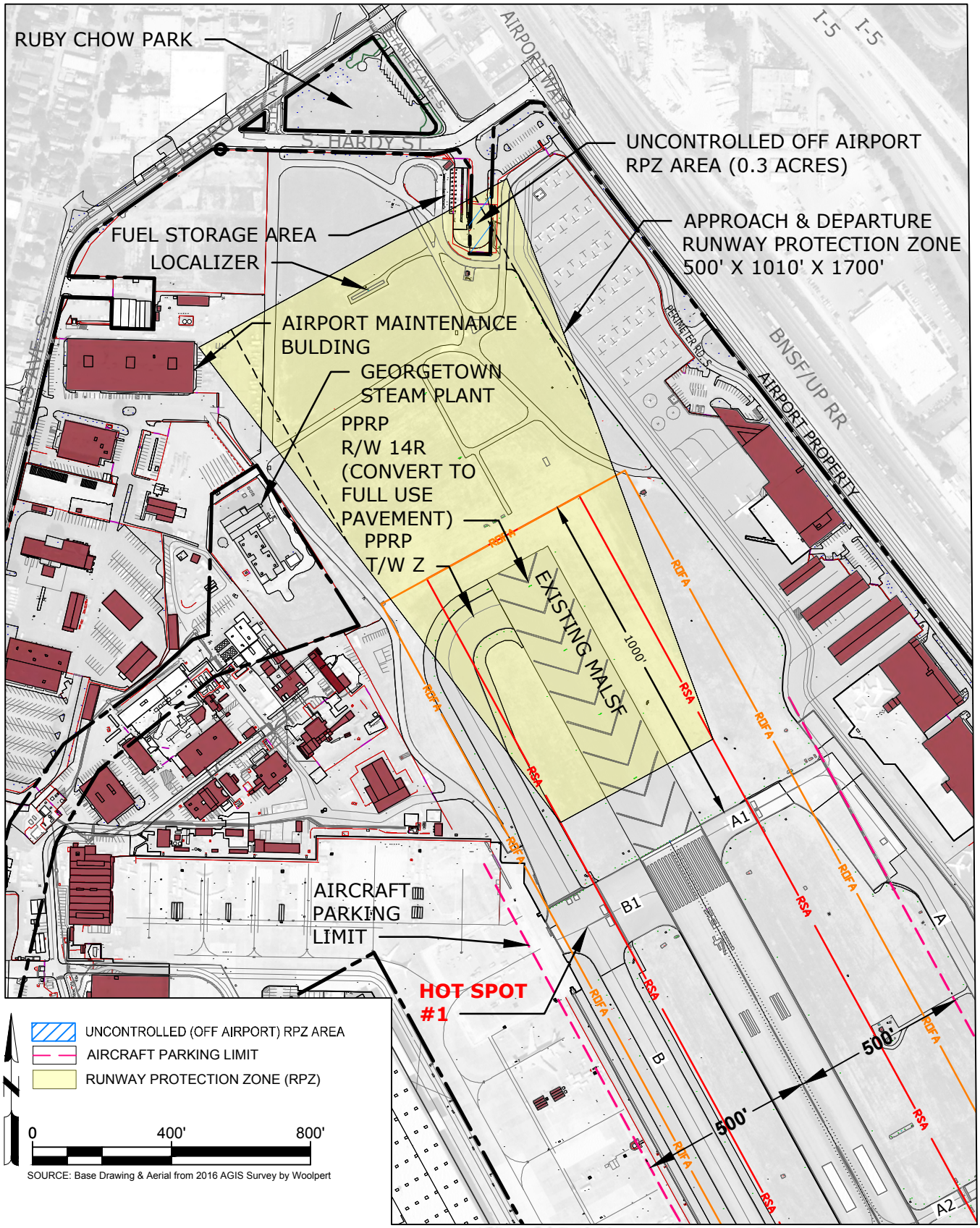
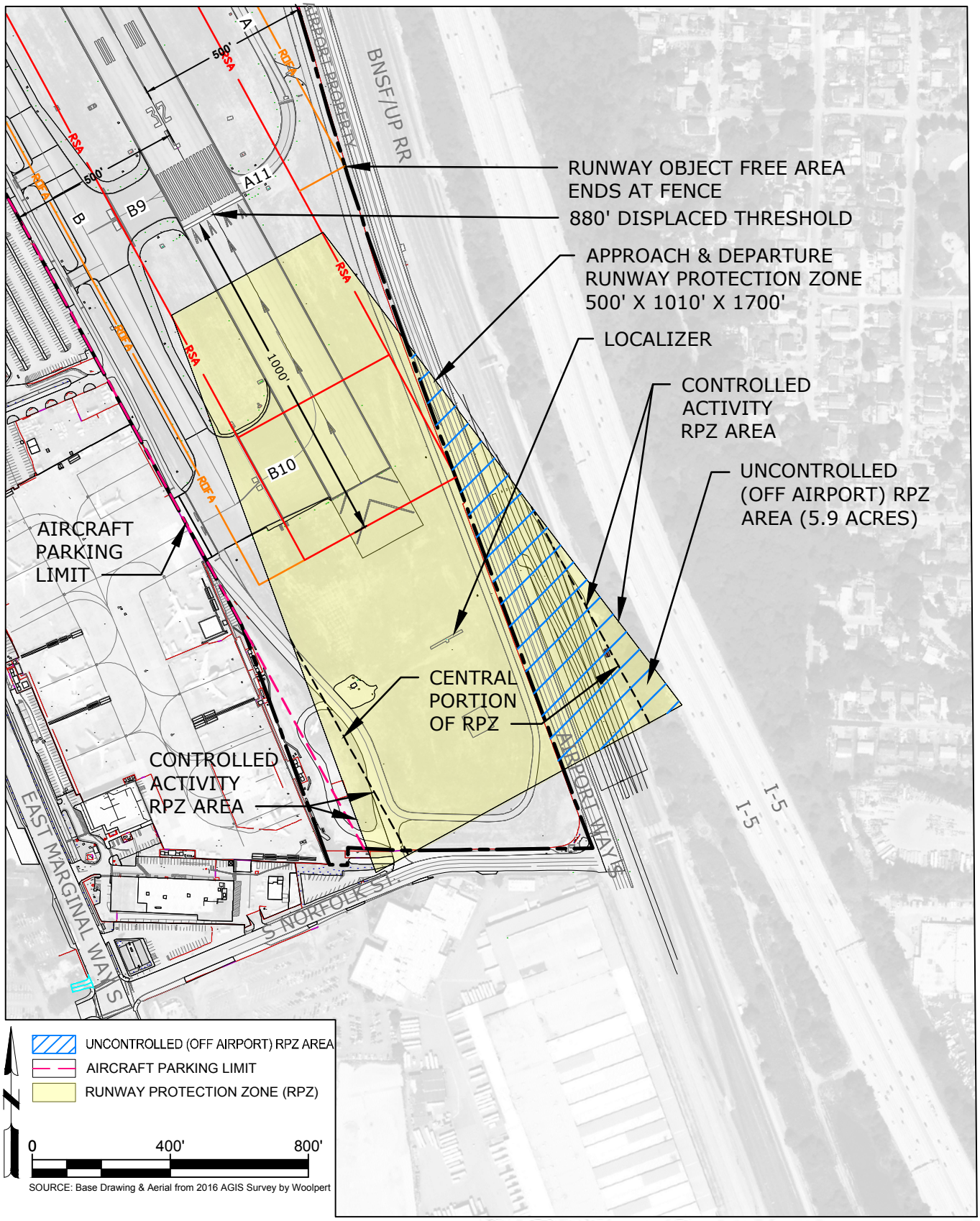


FIGURE D20 **RUNWAY 14R INSTRUMENT APPROACH PROCEDURE/ RUNWAY PROTECTION ZONE DETAIL - ALTERNATIVE THREE**

Mead & Hunt

King County International Airport/ Boeing Field



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D21 **RUNWAY 32L INSTRUMENT APPROACH PROCEDURE/ RUNWAY PROTECTION ZONE DETAIL - ALTERNATIVE THREE**

Mead & Hunt

King County International Airport/ Boeing Field

Instrument Approach Procedures. Based upon the existing IAP information presented in Alternative One, this alternative proposes raising the existing Runway 14R IAP visibility minimums from ¾-mile back to 1 mile (consistent with the existing ALP). This change would reduce the annual IFR access capability of the runway by as much as 8.8 hours. In addition, this alternative would maintain greater than 1-mile visibility minimums for the existing Runway 32L IAP.

Approach and Departure Runway Protection Zones. At the north end of the runway, the increased Runway 14R IAP visibility minimums from ¾-mile to 1 mile would reduce the required Runway 14R approach RPZ dimensions from the existing 1,000' x 1,510' x 1,700' to 500' x 1,010' x 1,700', and thus remove the Georgetown Steam Plant from within the RPZ boundary. In addition, the conversion of the Runway 14R PPRP to full-time runway use pavement and updating the declared distances permits the Runway 14R departure RPZ to be repositioned at the south end of the runway to align with the Runway 32L approach RPZ. The aligned approach and departure RPZs would decrease the existing RPZ area that extends beyond the airport boundary and thus minimize future controls through either easement or fee simple acquisitions.

The remaining uncontrolled RPZ areas for Alternative Three are defined as follows:

Runway 14R

- 15th Avenue S. R.O.W. @ 0.3 acres
- Existing airport fuel storage area (facility is located on airport property, but is designated as an incompatible land use within the RPZ)

Runway 32L

- Airport Way S., BNSF/UP Railroad, and I-5 R.O.W. @ 5.9 acres

Property/RPZ Easement Acquisition. Due to the reduced size of the Runway 14R approach RPZ and the repositioning of the Runway 14R departure RPZ, this alternative reflects the least amount of uncontrolled RPZ property extending beyond the existing property boundary to be considered for future acquisition. In addition, all the existing uncontrolled RPZ property overlays existing roadway and railroad R.O.W., which would likely not be required for purchase in either fee simple or easement.

Taxiway Improvements. Maintain the existing Taxiway B design standards (i.e., TDG 5/ADG IV) and upgrade segment of Taxiway A from a wingspan restricted ADG III to an unrestricted ADG III standard.

As presented on **Figure D22** and detailed on **Figures D23** through **D26**, the recommended taxiway improvements include:

- Realign segment of Taxiway A at Taxiway A1 to accommodate unrestricted ADG III access
- Construct new segment of Taxiway A with ADG III criteria to serve converted PPRP runway
- Extend new segment of Taxiway A with ADG II criteria to serve existing northeast apron area
- Extend West Side Parallel Taxiway (Taxiway Z from Taxiway B) with ADG II design standards to serve potential North GA Development Area
- Extend West Side Parallel Taxiway (Taxiway B) with ADG-IV design standards to serve potential South Cargo/Aviation Industrial Development Area within adjacent Prologis property
- Install Taxiway A centerline lights to mitigate Hot Spot #2
- Upgrade existing angled exit taxiways with 90° exit taxiways (Realign Taxiway A4 with Taxiway B3)
- Potential Taxiway connector width reduction projects: Taxiways B5, A10, & B10

Lighting and Navigational Aids. As presented on **Figure D27**, the existing HIRL, four-light PAPI, and runway signage would require relocation in conjunction with the runway width reduction. Also, with the raised visibility minimums to the Runway 14R IAPs, the existing MALSF would no longer be required, but is recommended to be retained.

Potential Environmental Impacts. Unlike Alternatives One and Two, the reduced size of the Runway 14R approach RPZ would eliminate future environmental coordination and documentation related to the RPZ. Yet, a new Environmental Assessment would likely be required to address the conversion of the runway's existing PPRP to full-use runway. This pavement conversion could potentially increase the noise exposure to the Steam Plant, as well as other Georgetown neighborhood properties located north of BFI, resulting from the increased number of aircraft using the pavement for takeoffs (annual utilization of the PPRP has been less than 50 operations per year since 2007). In addition, the operational change associated with the PPRP conversion may also decrease the noise exposure for properties located south of the Airport. As with the previous alternatives, the future relocation of the existing fuel farm from within the existing Runway 14R approach RPZ to a separate site may require a Phase I EDDA and clean up/remediation due to potential contamination of the existing facility.

The key development components of this alternative, along with the screening criteria for their assessment is presented in **Table D10**.

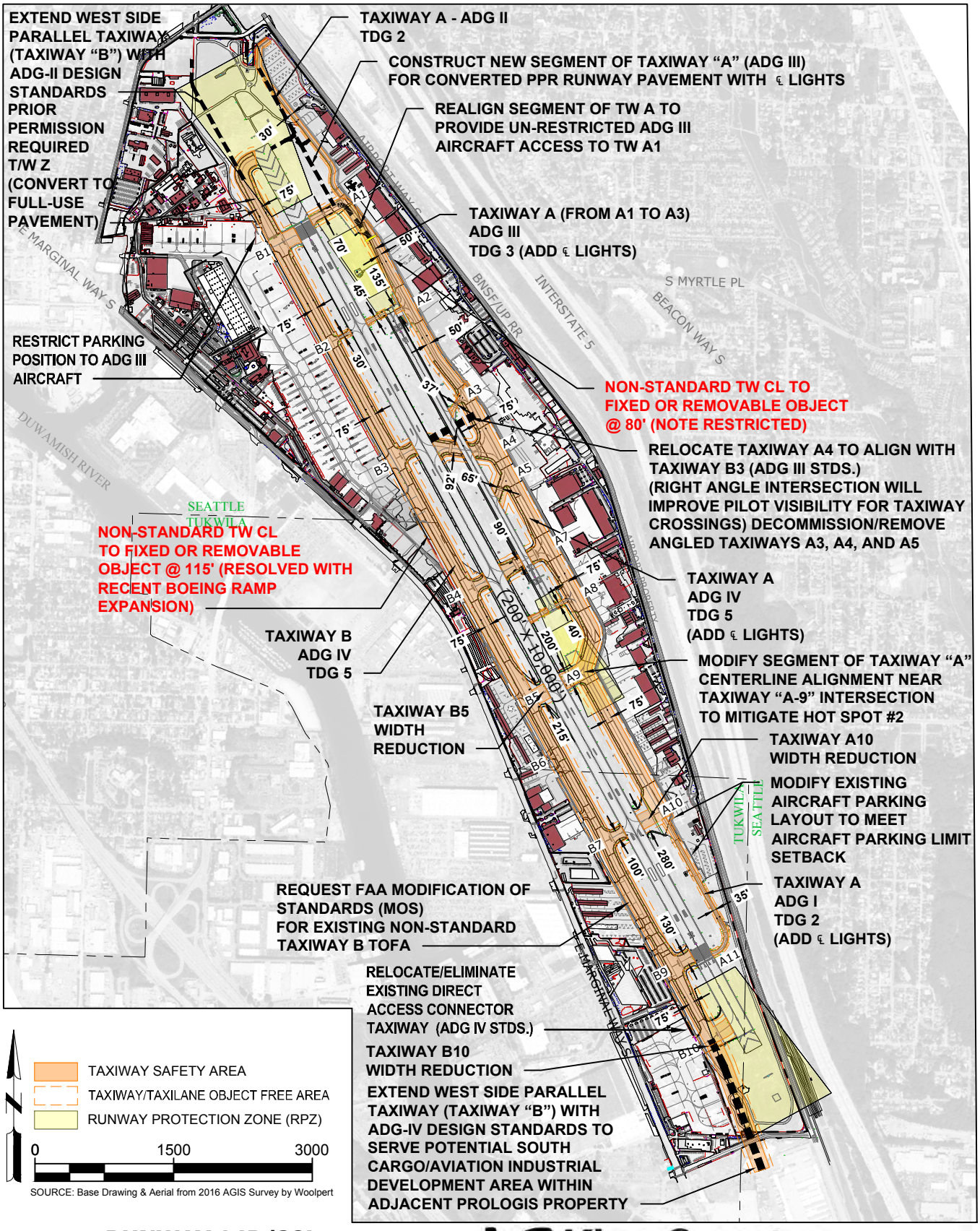


FIGURE D22 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE THREE**

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King County International Airport/ Boeing Field

CONSTRUCT NEW SEGMENT OF TAXIWAY "A" FOR CONVERTED PPR RUNWAY PAVEMENT WITH MITL (ADG II STDS.)

RELOCATE SEGMENT OF GSV ROAD TO ACCOMMODATE FUTURE TAXIWAY OFA (ADG II & III STDS.)

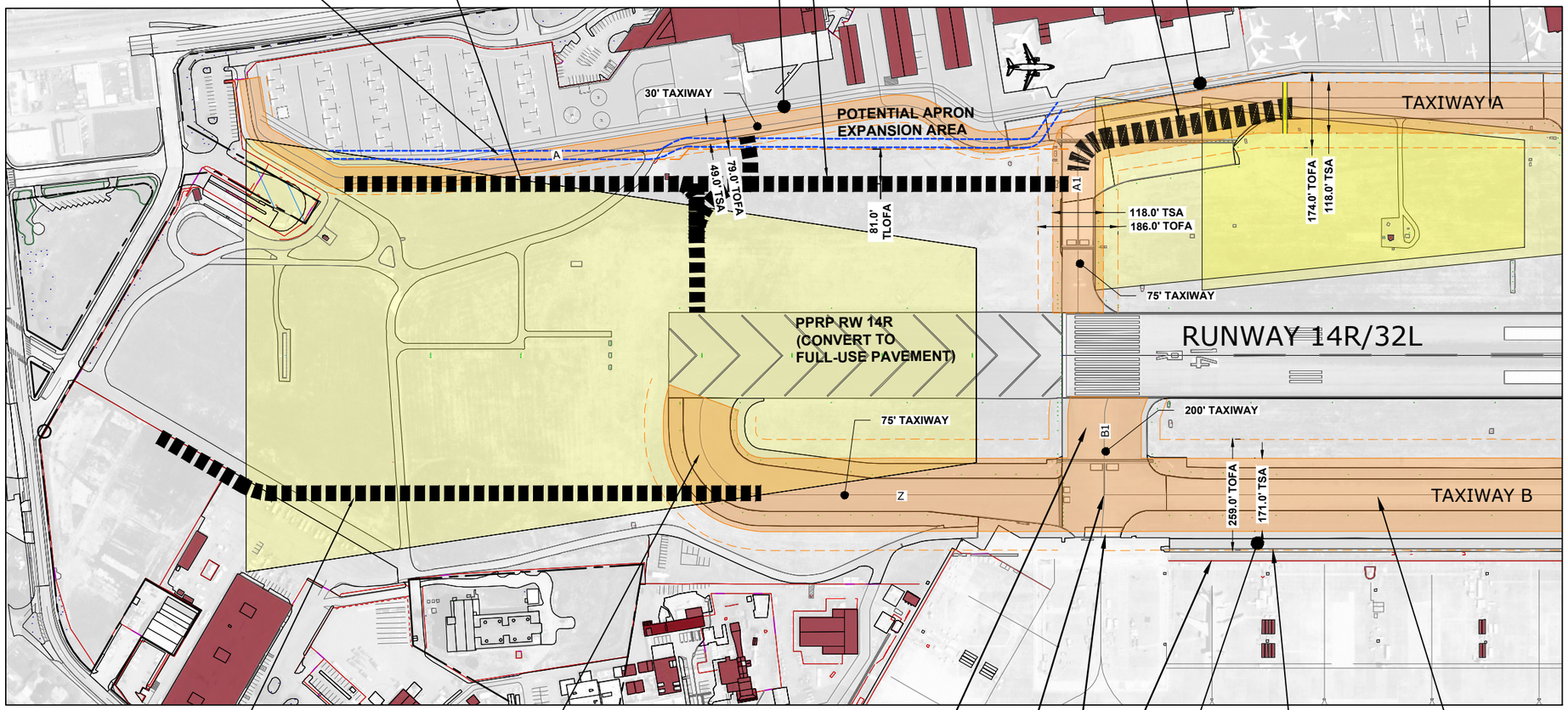
NON-STANDARD TW CL TO FIXED OR REMOVABLE OBJECT @ 30' (GROUND SERVICE VEHICLE (GSV) ROADWAY WITHIN TAXIWAY OFA)

CONSTRUCT NEW SEGMENT OF TAXIWAY "A" FOR CONVERTED PPR RUNWAY PAVEMENT WITH ℄ LIGHTS (ADG III STDS.)

RE-ALIGN SEGMENT OF TW A & REPOSITION IFR HOLDLINE TO ACCOMMODATE TAXIWAY OFA (ADG III STDS.)

NON-STANDARD TW CL TO FIXED OR REMOVABLE OBJECT @ 80' (NOTE RESTRICTED IN BFI FACILITY DIRECTORY: GROUND SERVICE VEHICLE (GSV) ROADWAY WITHIN TAXIWAY OFA)

TAXIWAY A (FROM A1 TO A3) ADG III TDG 3



EXTEND WEST SIDE PARALLEL TAXIWAY (TAXIWAY "B") WITH ADG-II DESIGN STANDARDS

PRIOR PERMISSION REQUIRED T/W Z (CONVERT TO FULL-USE PAVEMENT)

TW B1 - EXISTING WIDE EXPANSE OF PAVEMENT & DIRECT ACCESS TO RUNWAY

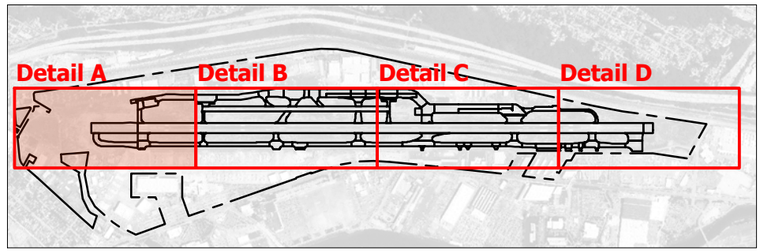
HOT SPOT #1
MITIGATE HOT SPOT #1 WITH UPDATED MARKINGS TO INCLUDE PPRP RUNWAY DESIGNATION

TAXIWAY B ADG IV TDG 5

REQUEST FAA MODIFICATION OF STANDARDS (MOS) FOR EXISTING NON-STANDARD TAXIWAY B TOFA

NON-STANDARD TW CL TO FIXED OR REMOVABLE OBJECT @ 103'-125' GROUND SERVICE VEHICLE (GSV) ROADWAY WITHIN TAXIWAY OFA

RELOCATE/ELIMINATE EXISTING DIRECT ACCESS CONNECTOR TAXIWAY (ADG IV STDS.) (WILL REQUIRE DECOMMISSIONING/CONVERSION OF ONE BOEING RAMP PARKING POSITION & MODIFICATION OF EXISTING FENCING)



Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D23 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE THREE - DETAIL A**

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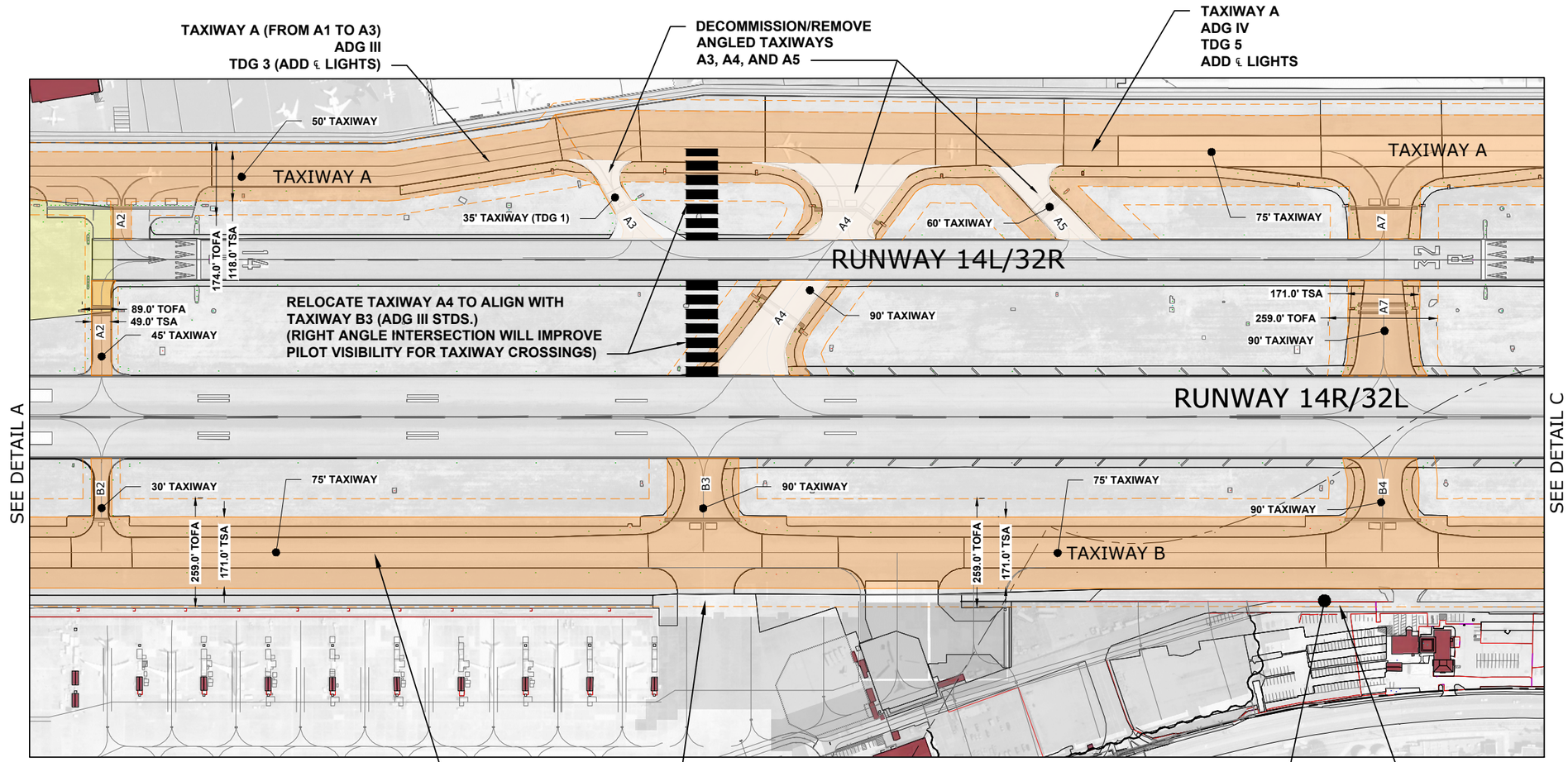
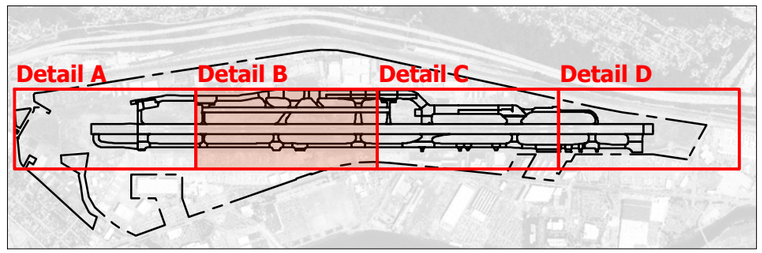




Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

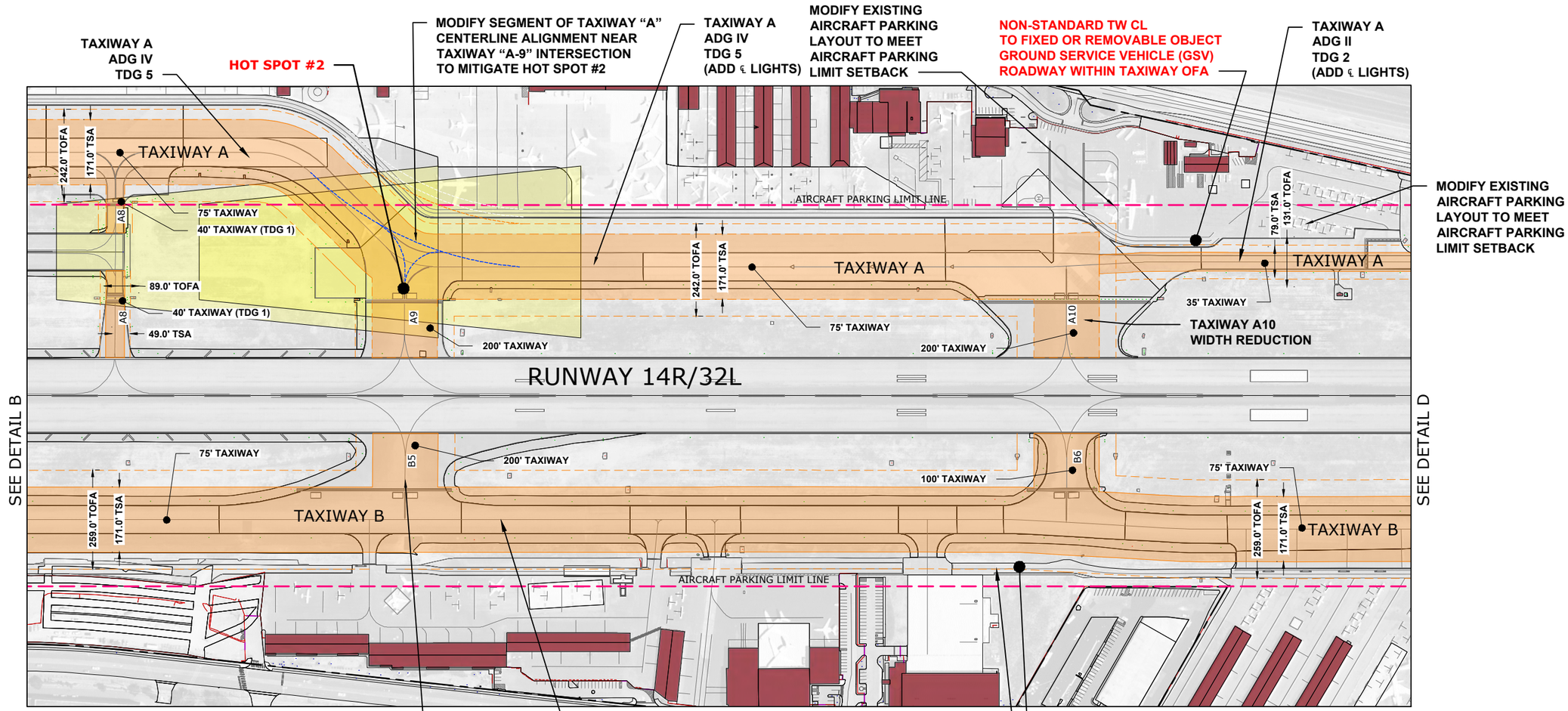
0 300 600

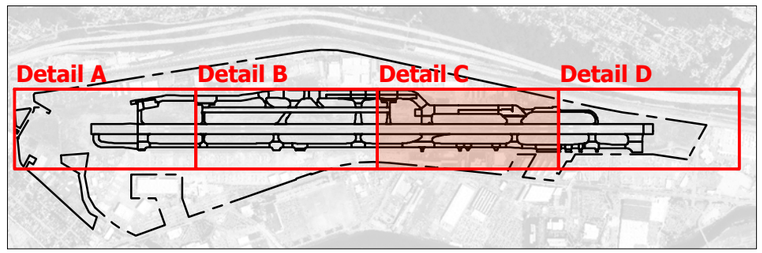
SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D24 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE THREE - DETAIL B**

Mead & Hunt

King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D25 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE THREE - DETAIL C**

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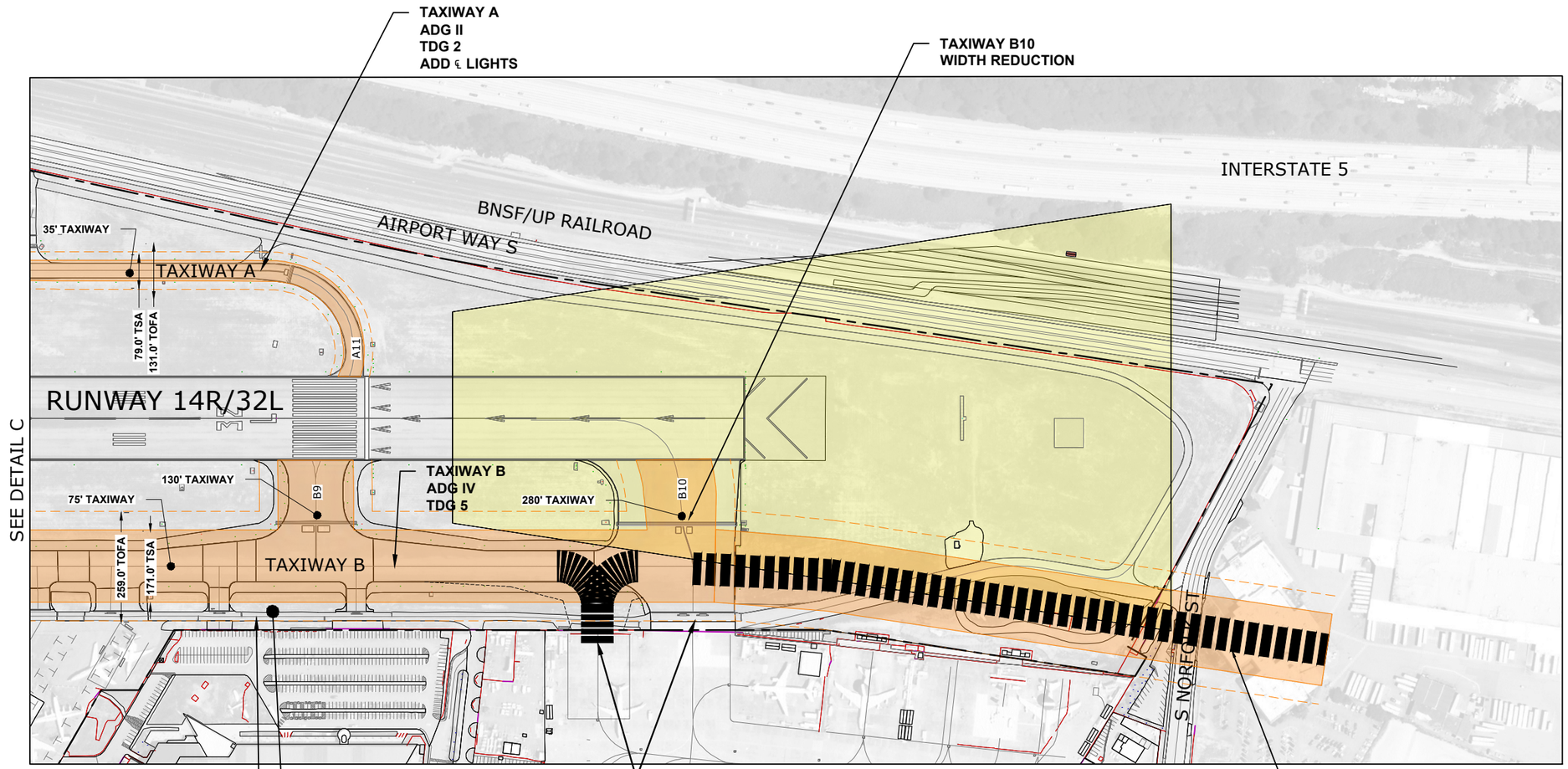
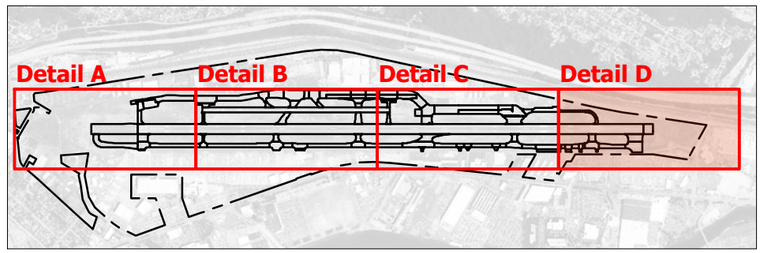
King County International Airport/ Boeing Field





Keymap

TAXIWAY SAFETY AREA
TAXIWAY/TAXILANE OBJECT FREE AREA
RUNWAY PROTECTION ZONE (RPZ)

0 300 600

SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D26 **RUNWAY 14R/32L TAXIWAY IMPROVEMENTS - ALTERNATIVE THREE - DETAIL D**

Mead & Hunt

King County International Airport/ Boeing Field

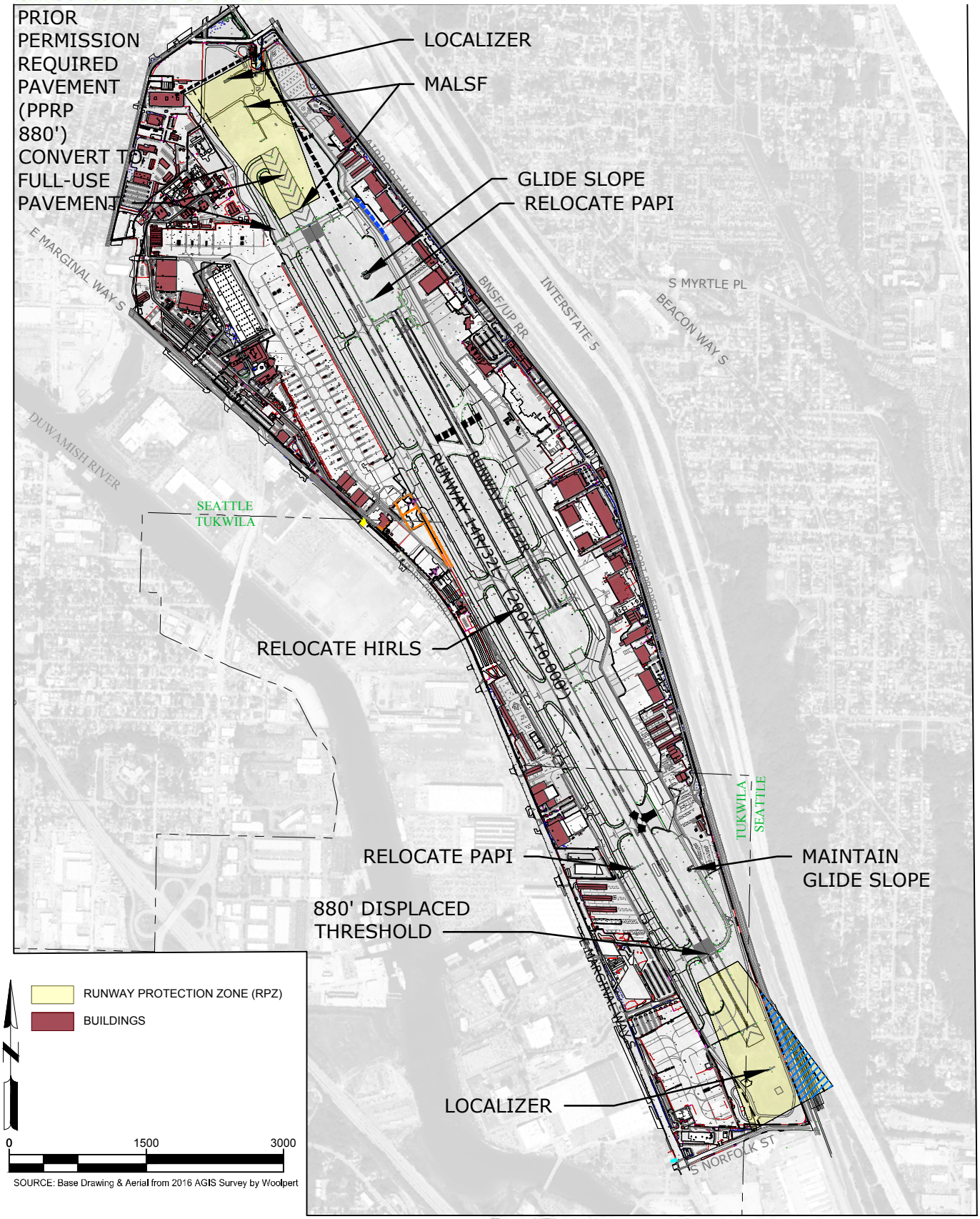


FIGURE D27 **RUNWAY 14R/32L LIGHTING & NAVIGATIONAL AIDS - ALTERNATIVE THREE**

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King County International Airport/ Boeing Field

Table D10 **RUNWAY 14R/32L SUMMARY MATRIX - ALTERNATIVE THREE**

Component/Consideration	Alternative Three	Screening Criteria
Runway Design Code (RDC)	RDC D-IV-5000 *(Minor Change-Less Restrictive)*	Implement less restrictive design criteria (Existing Non-Std. Conditions to be mitigated with combination of future development projects, MOS, & ATC waiver).
Runway Width	150' Reduce existing runway width by 50' *(Moderate Change)*	Reduced runway width would be 100% eligible for FAA funding/No supplemental funding sources would be required.
Runway 14R Length	TORA – 10,000' TODA – 10,000' ASDA – 10,000' LDA – 9,120' *(Moderate Change-Increases published ASDA by 880')*[1]	Future runway declared distances satisfy operational requirements of current and projected aircraft fleet.
Runway 32L Length	TORA – 10,000' TODA – 10,000' ASDA – 10,000' LDA – 9,120' *(No Change)*	Existing runway declared distances satisfy operational requirements of current and projected aircraft fleet.
Instrument Approach Procedure Visibility Minimums	RW 14R – 1-mile vis. mins. RW 32L – >1-mile vis. mins. *(Minor Change-Raises Visibility Minimums)*	The future RW 14R IAP 1-mile vis. mins. would potentially reduce the annual IFR capability by 8.8 hrs.
Runway Protection Zones	RW 14R – 500' x 1,010' x 1,700' RW 32L – 500' x 1,010' x 1,700' *(Significant Change-Smaller RPZ & repositions RW 14R departure RPZ)*	RW 14R RPZ – 1-mile vis. mins. RW 32L RPZ – >1-mile vis. mins.
Incompatible Land Uses within Runway Protection Zones	RW 14R – 0.3 acres RW 32L – 5.9 acres *(Significant Change-Reduction)*	RW 14R Uncontrolled RPZ – Roadway R.O.W. RW 32L Uncontrolled RPZ – Roadway R.O.W.
RPZ Easement Acquisition	RW 14R RPZ – 0 acres RW 32L RPZ – 0 acres *(Significant Change-Reduction)*	RPZ easement acquisition of existing Roadway R.O.W. is not required.
Taxiway System	Realigns & relocates segment of Taxiway A @ Taxiway A1, Installs Taxiway A centerline lights, realigns Taxiway A4 with Taxiway B3, includes width reduction of Taxiways B5, A10, & B10, constructs new segment of Taxiway A to serve new Runway 14R end, and constructs north and south extensions to Taxiway B *(Significant Change)*	Standardizes taxiway design with 90° intersections, eliminates unnecessary taxiway connectors, reduces wide expanses of pavement at taxiway connectors, mitigates Hot Spots #1 & #2, and improves airside access to north & south ends of the Airport.

Table D10 **RUNWAY 14R/32L SUMMARY MATRIX - ALTERNATIVE THREE (CONTINUED)**

Component/Consideration	Alternative Three	Screening Criteria
Instrumentation/Lighting	Maintain glide slope & localizer antennas. Relocate HIRL, Signage, and PAPIs *(Moderate Change)*	Facility relocations are dictated by runway width reduction.
Environmental Issues	RW 14R RPZ – Reduced RPZ size eliminates existing encroachment on Steam Plant property; PPRP runway conversion; Existing Fuel Farm – Location within RW 14R RPZ *(Significant Change)*	Conversion of PPRP to actual runway may require EA. Fuel Farm relocation requires potential Phase I EDDA and clean up/remediation.

Note: [1] Existing PPRP is converted to full-time use runway pavement and marked as a displaced threshold.

Runway 14R/32L - Alternative Three Advantages.

- Maintains the runway's existing operational capabilities (retaining a minimum 10,000-foot ASDA runway length in each direction.
- Runway width reduction to 150 feet educes long-term pavement maintenance cost for King County.
- The revised Runway 14R declared distances permits the repositioning of the existing departure RPZ to eliminate departure RPZ easement acquisition costs and mitigate existing incompatible land uses.
- Eliminates additional planning requirements in consideration of the FAA Memorandum *Interim Guidance on Land Uses within* a Runway Protection Zone, as well as the preparation of an EA & Section 106 Consultation related to the RPZ.
- Runway width reduction reduces impervious pavement surface area and would minimize storm water runoff drainage volumes.
- Removes the Georgetown Steam Plant from within the future Runway 14R approach RPZ.
- No easement and property acquisition would be required within future Runway 14R approach and departure RPZs.
- No easement and property acquisition would be required within the existing Runway 32L approach RPZ.
- Proposed runway declared distances satisfy operational requirements of current and projected aircraft fleet.
- Repositioned Runway 14R departure RPZ aligns with Runway 32L approach RPZ.
- Results in the least amount of land not fully controlled by King County and considered incompatible land uses within the RPZs.

Runway 14R/32L - Alternative Three Disadvantages.

- Runway width reduction would require relocation of all runway edge lights, signage, and PAPIs.
- Implementation of future ½-mile visibility minimums for the Runway 14R IAPs would potentially reduce the annual IFR capability by 8.8 hrs.
- Conversion of PPRP to full-use runway would require EA.
- Potential increase in noise impact to the Georgetown Steam Plant and other properties located north of the Airport.

Runway 14R/32L - Alternatives Summary

The matrix presented in **Table D11** summarizes and compares the advantages, disadvantages, and impacts of the three Runway 14R/32L alternatives presented in the preceding narrative.

Table D11 **RUNWAY 14R/32L ALTERNATIVES SUMMARY MATRIX**

Component/Consideration	Alternative One	Alternative Two	Alternative Three
Runway Design Code (RDC)	RDC D-IV-4000 *(No Change)*	RDC D-IV-2400 *(Significant Change-More Restrictive)*	RDC D-IV-5000 *(Minor Change-Less Restrictive)*
Runway Width	200' *(No Change)*	150' *(Moderate Change)*	150' *(Moderate Change)*
Runway 14R Length	TORA - 10,000'/10,880' (PPRP) TODA - 10,000'/10,880' (PPRP) ASDA - 9,120'[1]/10,000' (PPRP) LDA - 9,120'/9,120' (PPRP) *(No Change)*	TORA - 9,120'[1]/10,000' (PPRP) TODA - 9,120'[1]/10,000' (PPRP) ASDA - 9,120'[1]/10,000' (PPRP) LDA - 9,120'/9,120' (PPRP) *(Moderate Change Reduces Published TORA & TODA)*	TORA -10,000' TODA -10,000' ASDA -10,000' LDA -9,120' *(Moderate Change-Increases Published ASDA)*
Runway 32L Length	TORA -10,000' TODA -10,000' ASDA -10,000' LDA -9,120' *(No Change)*	TORA -10,000' TODA -10,000' ASDA -10,000' LDA -9,120' *(No Change)*	TORA -10,000' TODA -10,000' ASDA -10,000' LDA -9,120' *(No Change)*
Instrument Approach Procedure Visibility Minimums	RW 14R – ¾ statute mile RW 32L – >1 statute mile *(No Change)*	RW 14R – ½ statute mile RW 32L – ¾ statute mile or ½ statute mile *(Moderate Change-Lowers Visibility Minimums)*	RW 14R – 1 statute mile RW 32L – >1 statute mile *(Minor Change-Raises Visibility Minimums)*
Runway Protection Zones	RW 14R – 1,000' x 1,510' x 1,700' RW 32L – 500' x 1,010' x 1,700' *(No Change)*	RW 14R – 1,000' x 1,750' x 2,500' RW 32L – 1,000' x 1,510' x 1,700' or 1,000' x 1,750' x 2,500' *(Significant Change-Larger RPZs & & repositions RW 14R departure RPZ)*	RW 14R – 500' x 1,010' x 1,700' RW 32L – 500' x 1,010' x 1,700' *(Significant Change-Smaller RPZ & repositions departure RW 14R RPZ)*
Incompatible Land Uses within Runway Protection Zones	RW 14R – 2.2 acres. RW 32L – 22.5 acres. (*No Change*)	RW 14R – 21.03 acres. RW 32L – 15.1/49.7 acres. *(Significant Change-Increase)*	RW 14R – 0.3 acres. RW 32L – 5.9 acres. *(Significant Change-Reduction)*

Table D11 **RUNWAY 14R/32L ALTERNATIVES SUMMARY MATRIX (CONTINUED)**

Component/Consideration	Alternative One	Alternative Two	Alternative Three
RPZ Easement/Property Acquisition	RW 14R RPZ – 1.9 acres RW 32L RPZ – 7.4 acre *(Significant Change)*	RW 14R RPZ – 12.83 acres RWW 32L RPZ – 4.6/19.9 acres *(Significant Change-Increase)*	RW 14R RPZ – 0 acres RW 32L RPZ – 0 acres *(Significant Change-Reduction)*
Taxiway System	Realigns TW A centerline @ TW A9 intersection, realigns TW A4 with TW B3 and reduces width of TWs B5, A10, & B10 *(Moderate Change)*	Realigns & relocates segment of Taxiway A @ Taxiway A1, Installs Taxiway A centerline lights, realigns TW A4 with TW B3, includes width reduction of TWs B5, A10, & B10, and constructs access taxiway from TW A *(Moderate Change)*	Realigns & relocates segment of Taxiway A @ Taxiway A1, Installs Taxiway A centerline lights, realigns TW A4 with TW B3, includes width reduction of TWs B5, A10, & B10, constructs new segment of TW A to serve new Runway 14R end, and constructs north and south extensions to TW B *(Significant Change)*
Instrumentation/Lighting	HIRLs, PAPIs, MALSF, glide slope antennas, and localizer antennas *(Minor Change)*	Relocate HIRLs, Signage, & PAPIs Install MALSR to RW 14R. *(Significant Change)*	Relocate HIRLs, Signage, & PAPIs. *(Moderate Change)*
Environmental Issues	Possible compatible land use/NRHP Property (Georgetown Steam Plant). Possible property acquisition & Phase I EDDA. Possible fuel farm Phase I EDDA and clean up/remediation. *(Moderate Change)*	Possible compatible land use/ NRHP Property & Section 4(f) (Georgetown Steam Plant & Ruby Chow Park). Possible property acquisition Phase I EDDA. Possible fuel farm Phase I EDDA and clean up/remediation. *(Significant Change)*	Removes Georgetown Steam Plant from Runway 14R RPZ. Possible property acquisition Phase I EDDA. Possible increase in noise exposure to Georgetown Steam Plant and other north properties. Possible fuel farm Phase I EDDA and clean up/remediation. *(Significant Change)*

Note: [1] Existing PPRP provides aircraft operators with a TORA, TODA, & ASDA of 10,000-feet on as-needed basis.

Additional Runway 14R/32L Development Option- Alternative Four

Subsequent to the preparation of the Alternatives Analysis and Development Concepts chapter and the selection of the Sponsors preferred development alternative for Runway 14R/32L, the FAA determined that an existing threshold crossing height (TCH) waiver for the current Runway 14R instrument approach procedures (IAPs) could no longer be approved and would have to be resolved. Initially, efforts to increase the TCH with an adjustment to the aiming angle of the glide slope antenna proved unsuccessful. It was later determined that a 300-foot shift/extension of the Runway 14R end, with maintenance of the existing glide slope angle would achieve the required TCH clearances. Other key features of this alternative include retention of the existing Runway 14R ¾-mile IAP visibility minimums with relocation of the existing MALSF, a 300-foot extension of the runway's parallel taxiway system (Taxiways A and B) with new connectors, and the installation of a high intensity Approach Light System with Sequenced Flashing lights (ASLF-1) to Runway 32L that includes the addition of runway Centerline Lights (CL) and Touchdown Zone Lights (TDZL) at both runway ends.

Table D12 below summarizes the individual components of the alternative, which essentially results in a combination of Alternatives One and Three.

Table D12 **RUNWAY 14R/32L SUMMARY MATRIX - ALTERNATIVE FOUR**

Component/Consideration	Alternative Four	Screening Criteria
Runway Design Code (RDC)	RDC D-IV-4000 *(No Change)*	Existing Non-Std. Conditions to be mitigated with combination of future dev. projects, MOS, & ATC waiver).
Runway Width	200' *(No Change)*	FAA determined extra 50' of runway width is justified to support Boeing aircraft test flight operations and will be eligible for FAA funding.
Runway 14R Length	TORA – 10,300' TODA – 10,300' ASDA – 9,420' LDA – 9,420' *(Moderate Change-Increases published lengths for each configuration by 300 feet)*[1]	Future runway declared distances satisfy operational requirements of current and projected aircraft fleet.
Runway 32L Length	TORA – 10,300' TODA – 10,300' ASDA – 10,300' LDA – 9,420' *(Moderate Change-Increases published lengths for each configuration by 300 feet)*	Future runway declared distances satisfy operational requirements of current and projected aircraft fleet.
Instrument Approach Procedure Visibility Minimums	RW 14R – ¾-mile vis. mins. RW 32L – >1-mile vis. mins. *(No Change)*	The existing RW 14R IAP ¾ mile vis. mins. offer an additional 8.8 hrs. of annual IFR capability over the 1-mile vis. mins.
Runway Protection Zones	RW 14R – 1,000' x 1,510' x 1,700' RW 32L – 500' x 1,010' x 1,700' *(No Change)*	RW 14R RPZ – ¾-mile vis. mins. RW 32L RPZ – ≥1-mile vis. mins.
Incompatible Land Uses within Runway Protection Zones	RW 14R – 4.54 acres RW 32L – 22.35 acres *(Moderate Change-Increase)*	RW 14R Uncontrolled RPZ – Off-Airport property and Roadway R.O.W. RW 32L Uncontrolled RPZ – (Roadway R.O.W & Prologis Prop.).
RPZ Easement/Property Acquisition	RW 14R RPZ – 1.0 acre RW 32L RPZ – 7.4 acres *(Moderate Change- Increase)*	RW 14R RPZ – South of Elizabeth St. & North of S. Hardy St. RW 32L RPZ – Prologis Property

Table D12 **RUNWAY 14R/32L SUMMARY MATRIX - ALTERNATIVE FOUR (CONTINUED)**

Component/Consideration	Alternative Four	Screening Criteria
Taxiway System	Realigns north segment of Taxiway A, Installs Taxiway A centerline lights, realigns Taxiway A4 with Taxiway B3, &, constructs new segment of Taxiway A to serve new Runway 14R end, constructs north extension to Taxiway B and Installs Taxiway B centerline lights *(Significant Change)*	Standardizes taxiway design with 90° intersections, eliminates unnecessary taxiway connectors, mitigates Hot Spots #1 & #2, and improves airside access to northeast aviation development area.
Instrumentation/Lighting	Maintain glide slope & localizer antennas, HIRLs, Signage, and PAPIs. Relocate RW 14R MALSF, Install RW 32L ALSF-1, and Install RW CL & TDZ lights at each runway end. *(Moderate Change)*	Runway approach lighting system upgrades are proposed to enhance runway visibility.
Environmental Issues	Existing & future RW 14R RPZ encroachment on Steam Plant property; partial PPRP runway conversion and decommissioning. Existing Fuel Farm – Location within RW 14R RPZ *(Significant Change)*	RPZ land use compatibility and conversion of PPRP to full use runway may require EA & Section 106 consultation. Fuel Farm relocation requires potential Phase I EDDA and clean up/remediation.

Note: [1] 300-feet of existing PPRP to be converted to full-use runway pavement.

Runway 14R/32L - Alternative Four Advantages.

- Slightly enhances the runway's existing operational capabilities (providing a minimum 10,300-foot ASDA runway length for each direction.
- Maintains the 200-foot runway width, providing an extra margin of safety for final testing of Boeing aircraft and operations during crosswind conditions.
- Proposed runway declared distances satisfy operational requirements for current and projected aircraft fleet.
- Maintains the runway's existing IFR access capabilities with ¾-mile visibility minimum instrument approach procedures (IAPs).

Runway 14R/32L - Alternative Four Disadvantages.

- Partial conversion of PPRP to full-time use runway would require EA.
- Potential increase in noise impact to the Georgetown Steam Plant and other properties located north of the Airport.
- Repositioned Runway 14R approach RPZ increases the amount of land not fully controlled by King County and considered incompatible land uses within the RPZs.
- Requires property and/or easement acquisition within future Runway 14R approach and existing departure RPZs.
- Requires additional planning in consideration of the FAA Memorandum *Interim Guidance on Land Uses within* a Runway Protection Zone, as well as the preparation of an EA and Section 106 Consultation related to the Runway 14R RPZ.

- Potential increase in noise impact to the Georgetown Steam Plant and other properties located north of the Airport.

Runway 14L/32R - Alternatives One & Two

Runway 14L/32R, the Airport's secondary runway, meets all facility requirements associated with its function at BFI except for runway width, in which case the existing width of 100 feet exceeds the FAA design standard of 60 feet associated with the specified dimensional criteria of RDC B-I (Small Aircraft)-Visual for this runway. Therefore, there are two alternatives for Runway 14L/32R identified for evaluation in the following text.

Alternative One maintains the status quo of Runway 14L/32R; no changes to the current runway layout or operating conditions are proposed. **Figure D28** depicts the overall airport planning considerations for these alternatives. **Figure D29** details the close-in planning considerations associated with each runway end.

Runway Width. The existing Runway 14L/32R width of 100 feet exceeds the FAA design standard of 60 feet associated with RDC B-I (Small Aircraft) by 40 feet. The FAA will only provide AIP funds for major runway pavement reconstruction projects based on appropriate dimensional standards. Alternative One maintains the existing width of 100 feet but would transfer the future funding obligations for the reconstruction of the extra 40 feet of runway width to King County or other local funding sources exclusively. Alternative Two would reduce the runway width to 60 feet associated with RDC B-I (Small Aircraft) design standards. One additional option for consideration would be to re-designate the runway to RDC B-II (Small Aircraft) design standards, which specify a runway width of 75 feet.

Runway Length. Alternatives One and Two maintain the runway's existing published declared distances, which specify the full runway length of 3,710 feet for TORA, TODA, and ASDA for each operating direction. Also, the LDA to each runway end are reduced due to existing displaced thresholds (the Runway 14L landing threshold is displaced 250 feet, while the Runway 32R landing threshold is displaced 375 feet). However, based upon the runway length requirements presented in the previous chapter, the existing runway length of 3,710 feet generally accommodates the grouping of smaller aircraft (aircraft weighing up to 12.500 pounds) that utilize this runway for takeoffs and landings, in consideration of the reduced landing length available.

The specified runway lengths for each runway end using declared distances is presented in **Table D13**.

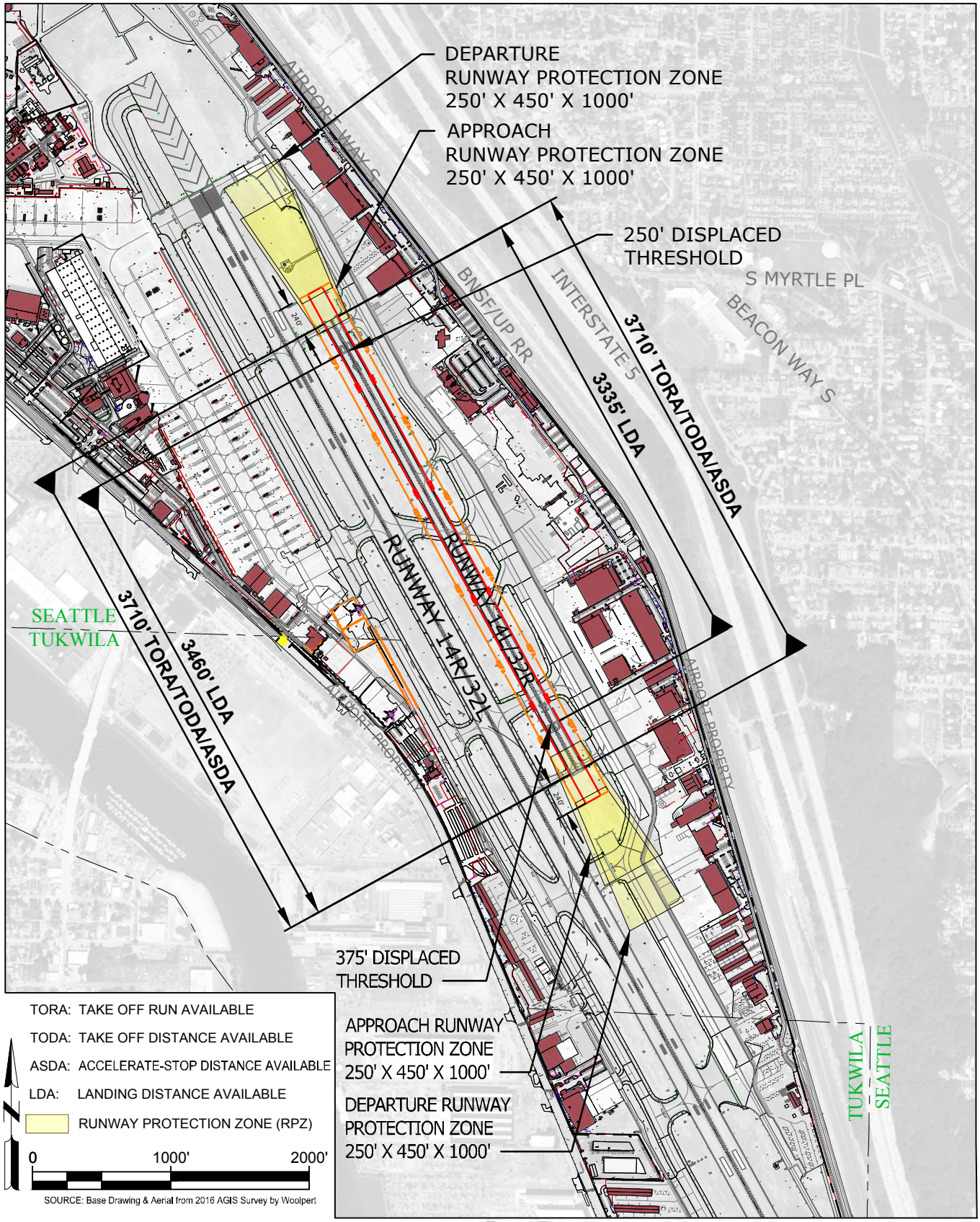

FIGURE D28 **RUNWAY 14L/32R DESIGN STANDARDS & DECLARED DISTANCES - ALTERNATIVE ONE & TWO**

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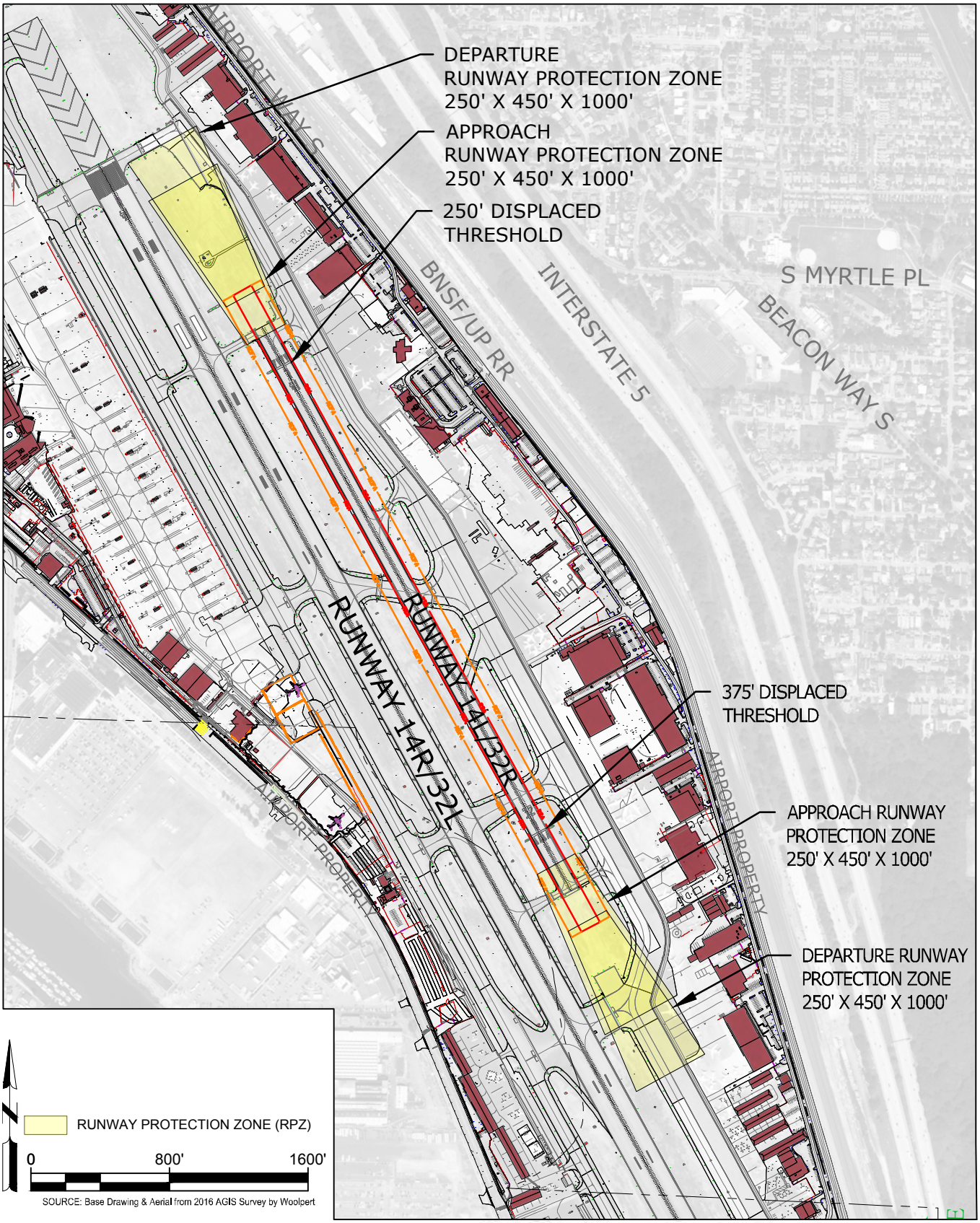

FIGURE D29 **RUNWAY 14L & 32R VISUAL APPROACHES/ RUNWAY PROTECTION ZONE DETAIL - ALTERNATIVE ONE & TWO**

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Table D13 **RUNWAY 14L/32R DECLARED DISTANCES - ALTERNATIVE ONE & TWO**

Facility	TORA	TODA	ASDA	LDA
Runway 14L[1]	3,710'	3,710'	3,710'	3,460'
Runway 32R[1]	3,710'	3,710'	3,710'	3,335'

SOURCE: *2007 Airport Layout Plan & Mead & Hunt, Inc.*
Note: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available TODA: Takeoff Distance Available
ASDA: Accelerate Stop Distance Available LDA: Landing Distance Available
[1] The reduced LDA length is dictated by the existing displaced landing threshold.

Instrument Approach Procedures. As noted previously, the primary runway at BFI (Runway 14R/32L) is equipped with five published Instrument Approach Procedures (IAPs) that offer various ceiling and visibility minimums. Runway 14L/32R is a visual approach runway and there are no plans to provide instrument approach capabilities to this facility.

Approach and Departure Runway Protection Zones. As presented in **Figure D29**, the existing Runway Protection Zones (RPZs) for Runways 14L and 32R are to be maintained. They are fully contained on existing airport property and controlled by King County.

Property/RPZ Easement Acquisition. As noted above, both the approach and departure RPZs with this alternative are contained on existing airport property. Therefore, no RPZ property or easement acquisition would be required with this alternative.

Taxiway Improvements. Maintain the existing taxiway design standards for the existing parallel taxiway facilities and associated connector taxiways:

- Taxiway A @ Taxiway Design Groups (TDG) 5, 3, 1, & 1A/Airplane Design Groups (ADG) IV, III, & I.
- Taxiway B @ TDG 5/ADG IV.

As presented on **Figure D30**, the recommended taxiway improvements include:

- Upgrade existing angled exit taxiways with 90° exit taxiways (Realign Taxiway A4 with Taxiway B3).
- Remove connector Taxiways A3 & A5.
- Upgrade taxiway lights and signs in conjunction with specified taxiway improvement projects.

Lighting and Navigational Aids. As presented on **Figure D31**, Alternative One would require some revisions to the existing Medium Intensity Runway Lights (MIRL) due to the proposed relocation and removal of some of the connector taxiway facilities. However, the existing two-light PAPI and Runway End Identifier Lights, (REILs) would remain in place with no modifications necessary. For Alternative Two, all MIRLs, signage, PAPIs, and REILs would have to be relocated due to the runway width reduction from 100 feet to either 60 or 75 feet.

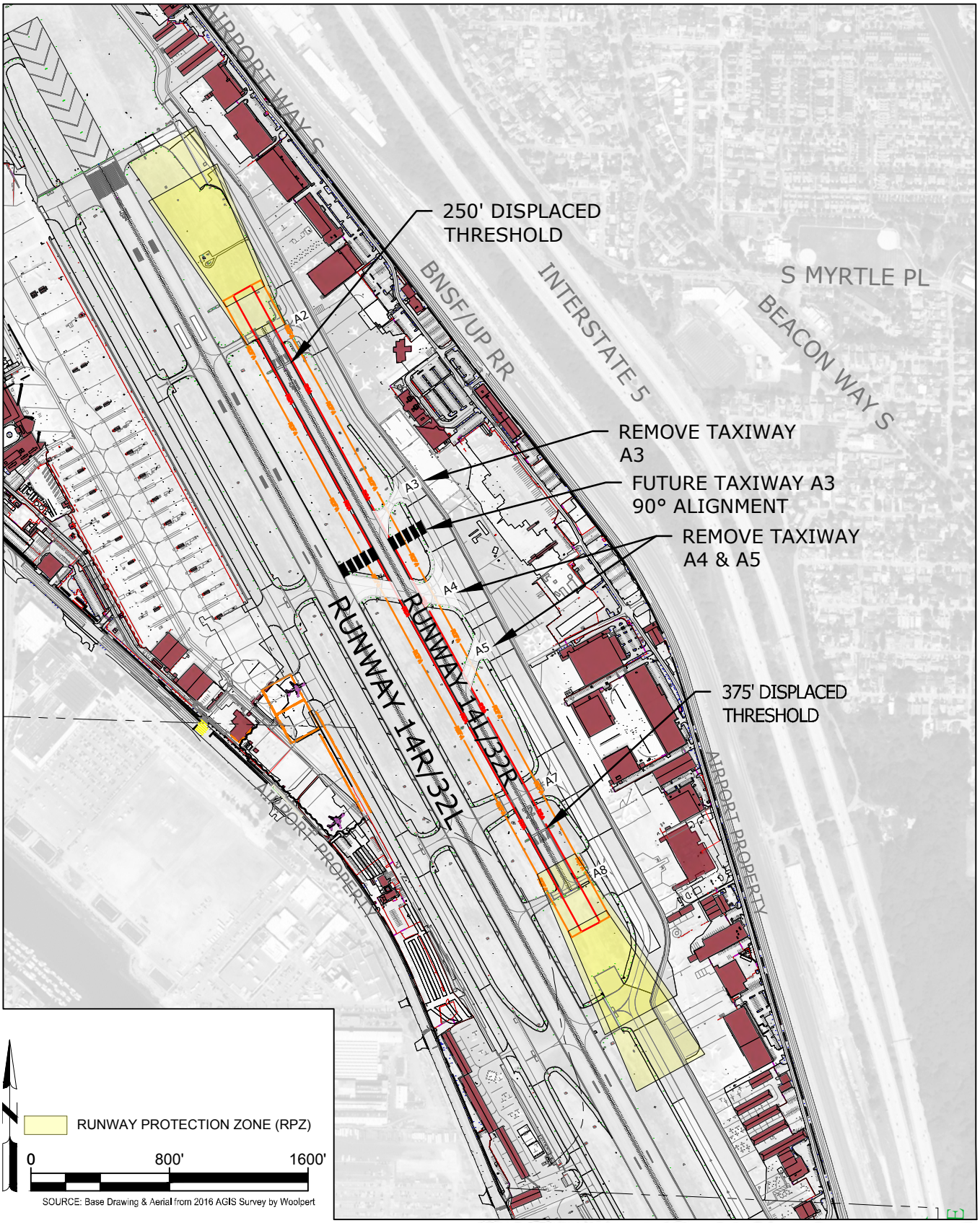

FIGURE D30 **RUNWAY 14L/32R TAXIWAY IMPROVEMENTS - ALTERNATIVES ONE & TWO**

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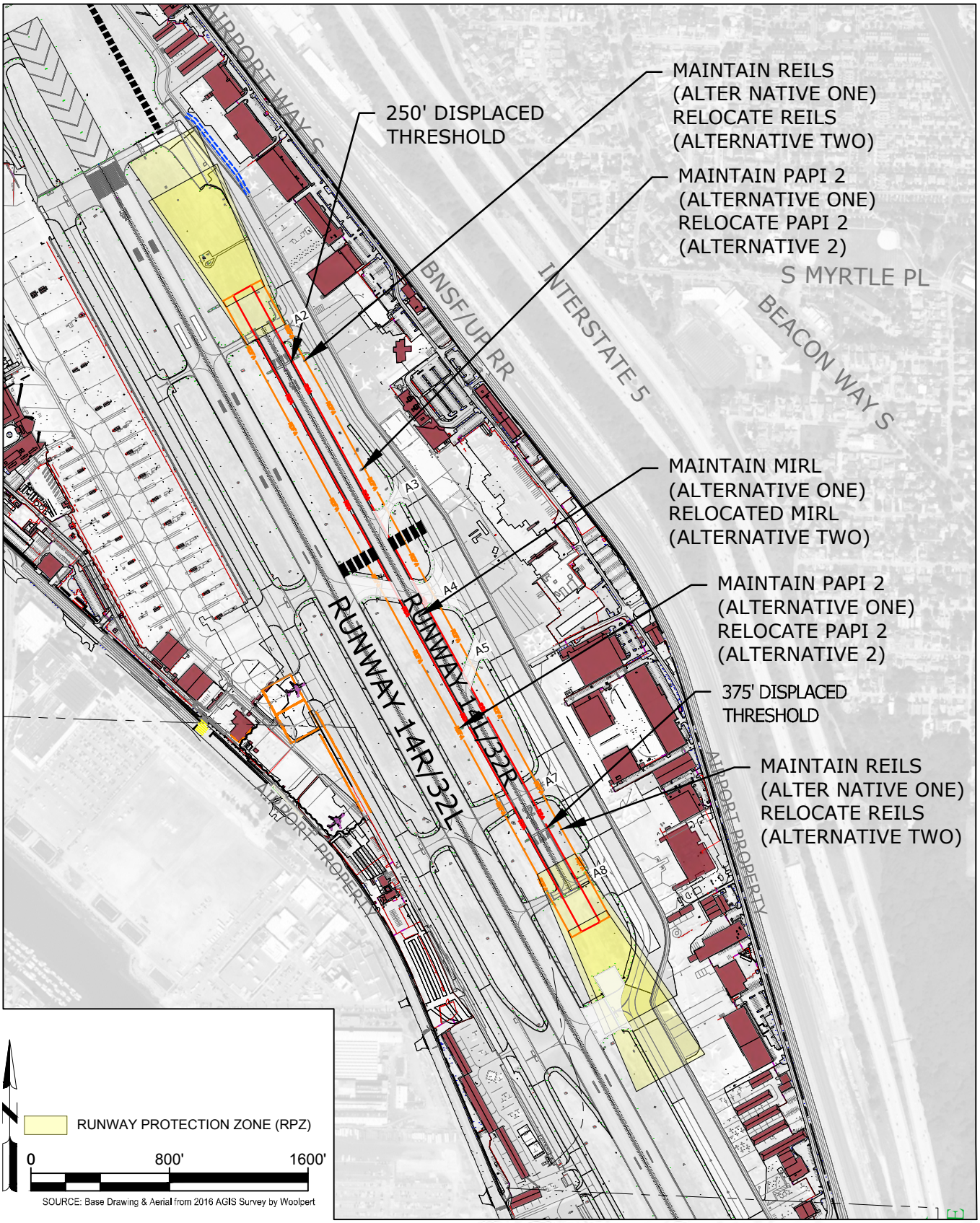

FIGURE D31 **RUNWAY 14L/32R LIGHTING & NAVAIDS - ALTERNATIVES ONE & TWO**

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Potential Environmental Impacts. Based upon the limited number of recommended development improvements associated with runway, there are no significant environmental impacts identified with the implementation of this alternative.

The key development components of this alternative, along with the screening criteria for their assessment is presented in **Table D14**.

Table D14 **RUNWAY 14L/32R ALTERNATIVES SUMMARY MATRIX**

Component/Consideration	Alternative One	Alternative Two[1]	Screening Criteria
Runway Design Code (RDC)	RDC B-I (Small Aircraft)-Visual *(No Change)*	RDC B-II (Small Aircraft)-Visual *(Minor Change)*	Sponsor's preferred *Small Aircraft* RDC designation to be confirmed.
Runway Width	100' *(No Change)*	60' vs. 75' *(Moderate Change)*	Maintain existing runway width vs. Reduce width to meet design standard.
Runway 14L Length	TORA – 3,710' TODA – 3,710' ASDA – 3,710' LDA – 3,460' *(No Change)*	Same as Alternative One. *(No Change)*	Maintain existing published Declared Distances. Displaced threshold required to achieve TSS clearances at Taxiway A1.
Runway 32R Length	TORA – 3,710' TODA – 3,710' ASDA – 3,710' LDA – 3,335' *(No Change)*	Same as Alternative One. *(No Change)*	Maintain existing published Declared Distances. Displaced threshold required to achieve TSS clearances at Taxiway A9.
Instrument Approach Procedures	RW 14L – Visual Approach RW 32R – Visual Approach *(No Change)*	Same as Alternative One. *(No Change)*	Existing visual approach to each runway end is to be maintained.
Runway Protection Zones	RW 14L – 250' x 450' x 1,000' RW 32R – 250' x 450' x 1,000' *Approach & Departure RPZs* *(No Change)*	Same as Alternative One. *(No Change)*	RW 14L RPZ – Meets Criteria RW 32R RPZ – Meets Criteria
Runway Protection Zones Incompatible Land Uses	RW 14L – None RW 32R – None *(No change)*	Same as Alternative One. *(No change)*	RW 14L RPZ – Meets Criteria RW 32R RPZ – Meets Criteria
Property/RPZ Easement Acquisition	RW 14L – None RW 32R – None *(No Change)*	Same as Alternative One. *(No Change)*	RW 14L RPZ – Meets Criteria RW 32R RPZ – Meets Criteria
Taxiway System	Realigns Taxiway A4 connector & removes Taxiway "A3" & "A5" connectors *(Moderate Change)*	Same as Alternative One. *(Moderate Change)*	Standardizes taxiway design with 90° intersections & eliminates unnecessary taxiway connectors.

Table D14 **RUNWAY 14L/32R ALTERNATIVES SUMMARY MATRIX (CONTINUED)**

Component/Consideration	Alternative One	Alternative Two[1]	Screening Criteria
Instrumentation/Lighting & Navigational Aids	Modify segment of MIRLs & Signage. Maintain PAPIs & REILs *(Minor change)*	Relocate MIRLs, Signage, PAPIs, & REILs. *(Significant Change)*	Facility relocations are dictated by runway width reduction.
Environmental Issues	No Significant Impacts *(No Change)*	Same as Alternative One. *(No Change)*	None

Note: [1] The proposed RDC designation, runway width reduction, and associated lighting & NAVAID relocations are the differences between Alternatives One & Two.

Runway 14L/32R - Alternative One & Two Advantages.

- Maintains the runway's existing operational capabilities (i.e., the existing published declared distances would remain unchanged).
- Alternative One maintains the 100-foot runway width, providing an extra margin of safety for small aircraft operations during crosswind conditions.
- The reduced runway width for Alternative Two would reduce the quantity of impervious pavement or the runway.
- The reduced runway width for Alternative Two would reduce the ongoing maintenance costs of the runway pavement.

Runway 14L/32R - Alternative One & Two Disadvantages.

- Retention of the 100-foot runway width for Alternative One increases long-term pavement maintenance costs for King County, and extra 40 feet of pavement width may not be eligible for future FAA AIP funding.
- The reduced runway width for Alternative Two would require the relocation of all MIRLs, PAPIs, REILs, & signage.

Recommended Airside Conceptual Development Plan

The proposed airside development alternatives presented in the above text for BFI provided King County Airport Staff with a variety of options for future facility maintenance and development. Following a detailed assessment of the potential impacts of each alternative, and input provided by the Airport Working Group and FAA, the draft components of the Airside Conceptual Development Plan (CDP) are identified and presented in **Tables D15**, **D16**, and **Figure D32**.

Table D15 **RUNWAY 14R/32L AIRSIDE CDP SUMMARY**

Component/Consideration	Existing	Conceptual Development Plan (CDP)
Runway Design Code (RDC)	RDC D-IV-4000	Same/Maintain
Runway Width	200'	Same/Maintain
Runway 14R Length	TORA – 10,000'/10,880' (PPRP) TODA – 10,000'/10,880' (PPRP) ASDA – 9,120'[1]/10,000' (PPRP) LDA – 9,120'/9,120' (PPRP)	Same/Maintain
Runway 32L Length	TORA – 10,000' TODA – 10,000' ASDA – 10,000' LDA – 9,120'	Same/Maintain
Instrument Approach Procedures (IAPs)	(6) IAPs – ILS, LOC, RNAV (GPS), RNAV (RNP 0.15), RNAV (RNP 0.30), ILS	Same/Maintain
IAP Visibility Minimums	RW 14R – ¾ statute mile RW 32L – >1 statute mile	Same/Maintain
Runway Protection Zones	RW 14R – 1,000' x 1,510' x 1,700' RW 32L – 500' x 1,010' x 1,700'	Same/Maintain
RPZ Property Acquisition	RW 14R RPZ – 4.54 acres RW 32L RPZ – 22.35 acres	RW 14R RPZ –Same/Maintain RW 32L RPZ – 7.4 acres (To be Acquired)
Taxiway System	Taxiway A & (11) connectors Taxiway B & (10) connectors	Taxiway Connector Upgrades
Lighting & Navigational Aids	HIRLs, PAPIs, MALSF, glide slope antennas, and localizer antennas	Install RW 32L ALSF-1 and Install CL & TDZ light to each runway end
Environmental Issues	Existing potential non-compatible land use/NRHP Property (Georgetown Steam Plant). Possible property acquisition & Phase I EDDA. Possible fuel farm Phase I EDDA and clean up/remediation.	Future ALSF-1 upgrade may require mitigation for land use compatibility. Others TBD.

SOURCE: *King County summary of selected airside development projects from airside alternative analysis.*

Table D16 **RUNWAY 14L/32R AIRSIDE CDP SUMMARY**

Component/Consideration	Existing	Conceptual Development Plan (CDP)
Runway Design Code (RDC)	RDC B-I (Small Aircraft)-Visual	Same/Maintain
Dimensions (Width)	100'	Same/Maintain
Runway 14L Length	TORA – 3,710' TODA – 3,710' ASDA – 3,710'[1] LDA – 3,460'	Same/Maintain
Runway 32R Length	TORA – 3,710' TODA – 3,710' ASDA – 3,710' LDA – 3,335'	Same/Maintain
Instrument Approach Procedures (IAPs)	RW 14L – Visual Approach RW 32R – Visual Approach	Same/Maintain
IAP Visibility Minimums	None/Visual Approaches	Same/Maintain
Runway Protection Zones	RW 14L – 250' x 450' x 1,000' RW 32R – 250' x 450' x 1,000' *Approach & Departure RPZs*	Same/Maintain
Property/RPZ Easement Acquisition	RW 14L – None RW 32R – None	Same/Maintain
Taxiway System	Taxiway A & six connectors.	Realigns Taxiway A4 & A5 connectors & removes the Taxiway A3 connector.
Instrumentation/Lighting & NAVAIDs	MIRLs, PAPIs, and REILs	Same/Maintain
Environmental Issues	No Significant Impacts.	Same/Maintain

SOURCE: *King County summary of selected airside development projects from airside alternative analysis.*

As described in previous sections, many of the projects will be implemented on a demand dictated basis; therefore, the projected phasing of the projects will continue to be updated from year to year throughout the 20-year planning period of this study. A listing of the major airside projects associated with the *Conceptual Development Plan (CDP)* are presented in the following text.

Airside Projects:

1) Design and construct new Taxiway A4 to align with Taxiway B3 with signage and edge/centerline lighting modifications in accordance with ADG IV design standards.
2) Modify alignment and reconstruct existing west side Airport Service Road (ASR), including the relocation of the Boeing Pump Station, to mitigate existing non-standard Taxiway B Object Free Area (OFA)
3) Prepare request and submittal for update of existing ATC Operational Waiver to address non-standard centerline separation distance between existing parallel runway configuration.
4) Prepare request and submittal for modification of standards to address multiple existing non-standard conditions: 1) Runway 14R/32L OFA, 2) Runway 14R/32L to Taxiway A centerline separation, and 3) Runway 14R/32L to Taxiway B centerline separation.
5) Design and construct Large Aircraft Parking Apron adjacent to Passenger Terminal Building (In Progress).

6) Design and remove existing Taxiway A3 and A4 connectors with signage and lighting modifications.
7) Design, engineer, and reconstruct Taxiway A5 to 90° connector with signage and lighting modifications, including install of in-pavement runway guard lights.
8) Design and install Taxiway A centerline lights and in-pavement runway guard lights at each connector taxiway.
9) Design and install Taxiway B centerline lights and in-pavement runway guard lights at each connector taxiway.
10) Design and implement Runway 14L/32R pavement maintenance and reconstruction projects with lighting and signage modifications/upgrades.
11) Design and implement Taxiway A pavement maintenance and reconstruction projects (Phase I, II, & III placeholder).
12) Design and implement Taxiway B pavement maintenance and reconstruction projects (Phase I, II, & III placeholder).
13) Design and implement apron pavement maintenance and reconstruction projects (Phase I, II, & III placeholder).
14) Acquire portion of existing Runway 14R Departure RPZ that extends off Airport property: 7.4 acres (fee simple).
15) Design and install Runway 32L ALSF-1. Project will also include some obstruction removal to clear future light lane boundary.

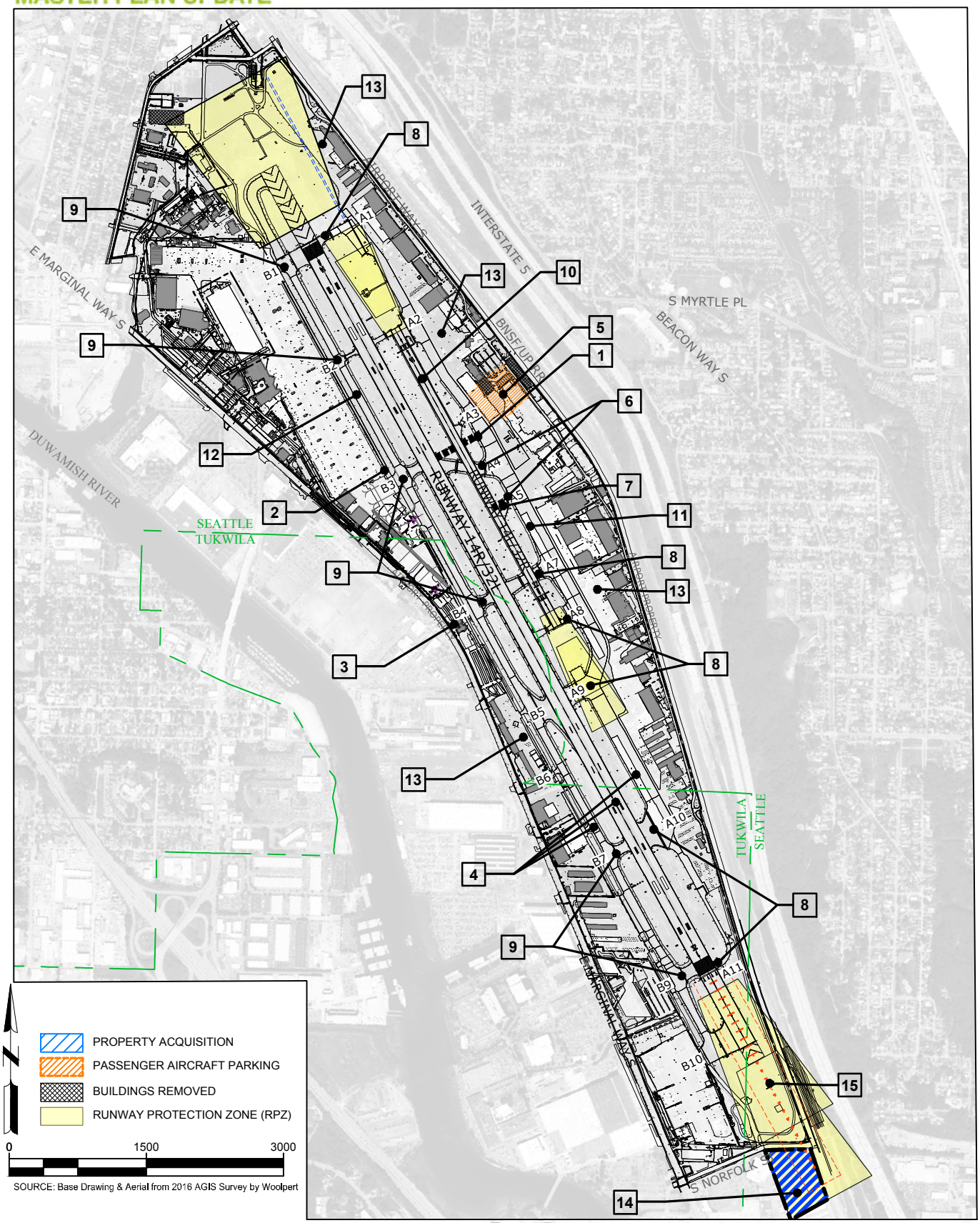

FIGURE D32 **Recommended Airside Conceptual Development Plan (CDP)**

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Landside Development Alternatives

With the framework of the Airport's ultimate airside development identified, placement of needed landside facilities can now be analyzed. The overall objectives of the landside plan are the provision of conceptual development locations for facilities that are conveniently located and accessible to the community, and that accommodate the specific requirements of Airport users.

BFI is uniquely located near both the Duwamish Industrial Corridor and the Seattle central business district, as well as the adjacent network of supporting regional transportation facilities (i.e., ground, rail, and waterway). These key locational factors combine to make BFI a prime location for Industrial Aviation facilities, air cargo operations, and the basing of corporate general aviation aircraft. However, the existing airport footprint, consisting of less than 600 acres, is extremely site-constrained (currently reserved for airfield development such as runways, taxiways, aprons, and/or safety-object setbacks), with limited property available for new or expanded landside development. Given these existing site restrictions, there are some land parcels located along the perimeter and adjacent to the Airport, and some existing airport parcels that can be evaluated for potential landside development expansion and/or redevelopment.

Landside facilities are typically grouped into two generalized categories: aeronautical and non-aeronautical uses. To designate areas for aeronautical use facilities, two factors must be considered. First, they must be located outside of the airfield operational areas (i.e., property that is protected for runways, taxiways, and approach clearance requirements, building restriction lines, RPZs, runway visibility zones, etc.). Second, development sites that support aeronautical use facilities must have physical attributes that make economic airside access possible. In contrast, development sites for non-aeronautical use facilities are best located in areas that cannot be developed for aviation uses because of physical constraints such as topography, floodplains/drainages, roadways, or because the provision of airside access would be cost prohibitive.

For the purposes of this Master Plan Update, aeronautical use facilities include the passenger terminal area, air cargo, aviation industrial/maintenance facilities, general aviation, and airport support facilities (i.e., air traffic control tower, fuel storage, aircraft rescue and firefighting facility, and airport maintenance). Non-aeronautical use facilities include commercial/office/industrial development that can co-exist with the operation of the Airport and surrounding land uses, as well as provide financial support through revenue generation to the Airport. It also includes non-terminal area roadways and utility right-of-way boundaries.

Existing Passenger Terminal Area

As noted in the previous chapters, all passenger-related activities are accommodated in the lower level of the passenger terminal building, which consist of over 15,000 square feet, is occupied by various tenants: one commuter airline operator - Kenmore Air, U.S. Customs and Immigration facilities, and a small coffee shop/deli. Based on the updated passenger enplanement forecasts, in consideration of "industry standard" terminal space planning requirements, it is projected that the existing passenger terminal area (e.g., terminal building, curb, and auto parking) can accommodate all forecast commercial aircraft operations and enplanements throughout the 20-year planning period of this Master Plan Update.

Additionally, since Kenmore Air provides commercial passenger service with aircraft that do not exceed the 12,500-pound weight classification or loadings in excess of 30), the airline and airport are not required to provide a security program that is administered by the Transportation Security Administration (TSA). The existing baseline configuration of the passenger terminal area is presented on **Figure D33**. Potential improvements to the Passenger Terminal Area that have been identified include reconfiguration of the Terminal Entrance to include two-way traffic/signalization improvements, realignment of the terminal access roadway with reduced auto parking counts, and removal of the adjacent Terminal Arrivals building to accommodate future aircraft apron expansion requirements. Variations of these alternatives are presented in the following alternatives for consideration.

Passenger Terminal Area - Alternative One

Alternative One maintains the existing passenger terminal building, access roadway configuration, and auto parking area that is internal to the looped access road. However, Othello Street is to be relocated to align with the outbound segment of the Terminal looped roadway, which will require the removal of the former King County Agencies building located adjacent to Airport Way South. The remainder of the former building area and Othello Street area would be converted to new auto parking facilities. The existing traffic light at the Othello Street/Airport Way South intersection would be relocated to the existing Orchard St. intersection to better serve the Terminal Building entrance roadway. This alternative also proposes the removal of the Terminal/South Arrivals building and adjacent auto parking facility, including modification of the existing air cargo lease area to accommodate the development of a new Terminal Area Courtyard Apron, consisting of approximately 4.7 acres. This new and expanded apron area would serve the parking of larger passenger charter aircraft and provide flex space for additional cargo aircraft parking when needed from the adjacent cargo development area located to the south. This alternative is illustrated in **Figure D34**.

Passenger Terminal Area - Alternative One Advantages.

- Improves landside vehicular access to the passenger terminal area with the relocation of Othello St. and the relocation of the existing signalized intersection from Othello St. to Orchard St.
- Converts the underutilized area of the Terminal South Arrivals Building and adjacent auto parking to needed terminal apron area.
- Converts the former King County Agencies Building to needed auto parking facilities to better serve the adjacent air cargo development area.

Passenger Terminal Area - Alternative One Disadvantages.

- Reduces the number of auto parking spaces in the Passenger Terminal Area by 36.

Passenger Terminal Area - Alternative Two

Passenger Terminal Area Alternative Two, as illustrated in **Figure D35,** also maintains the existing passenger terminal building, but further modifies the access roadway configuration and auto parking area to maximize the size of the new Terminal Area Courtyard Apron area. For this alternative, the outbound segment of the Terminal looped roadway is relocated to align with Othello Street.

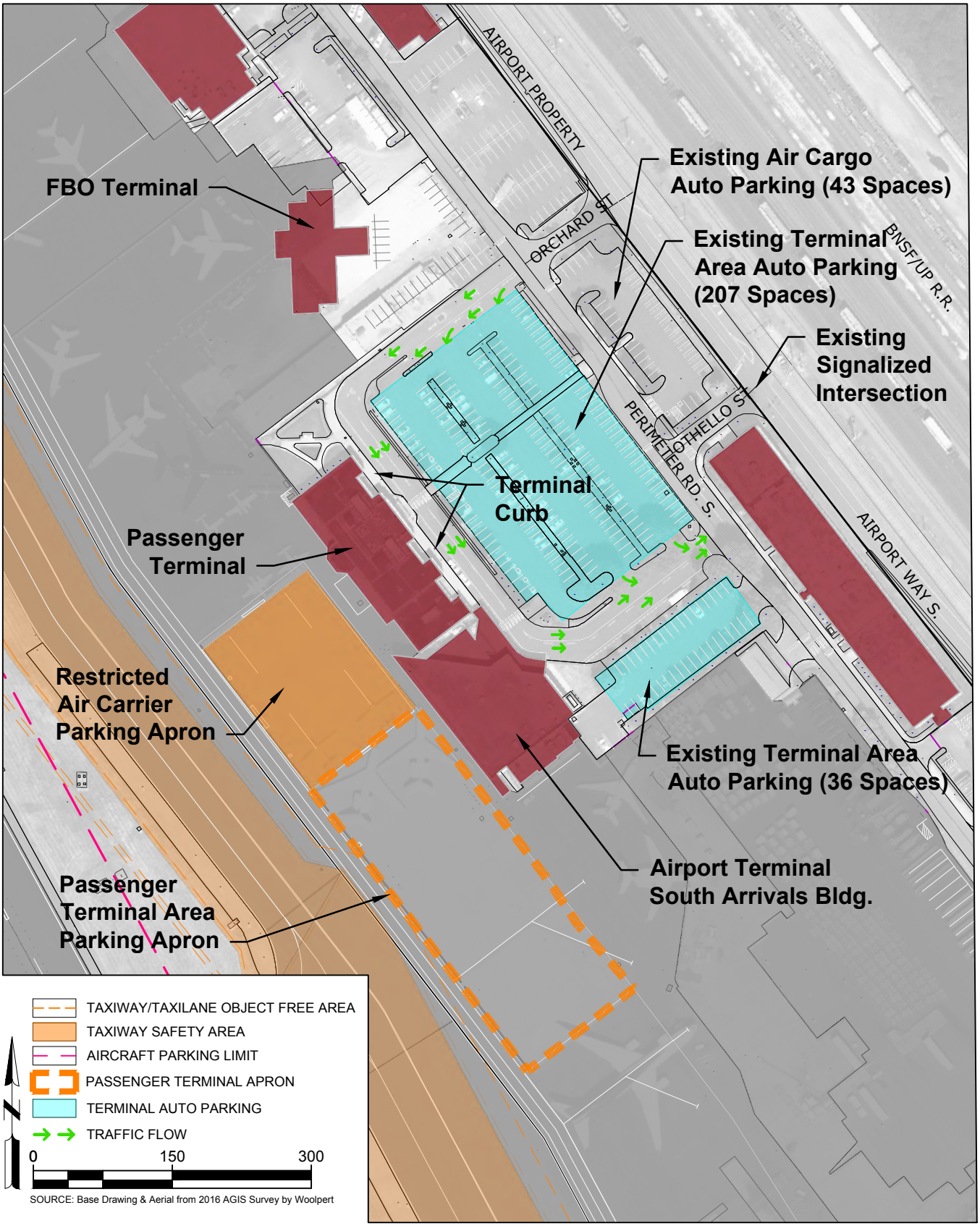

FIGURE D33 **Passenger Terminal Area - Existing Layout**

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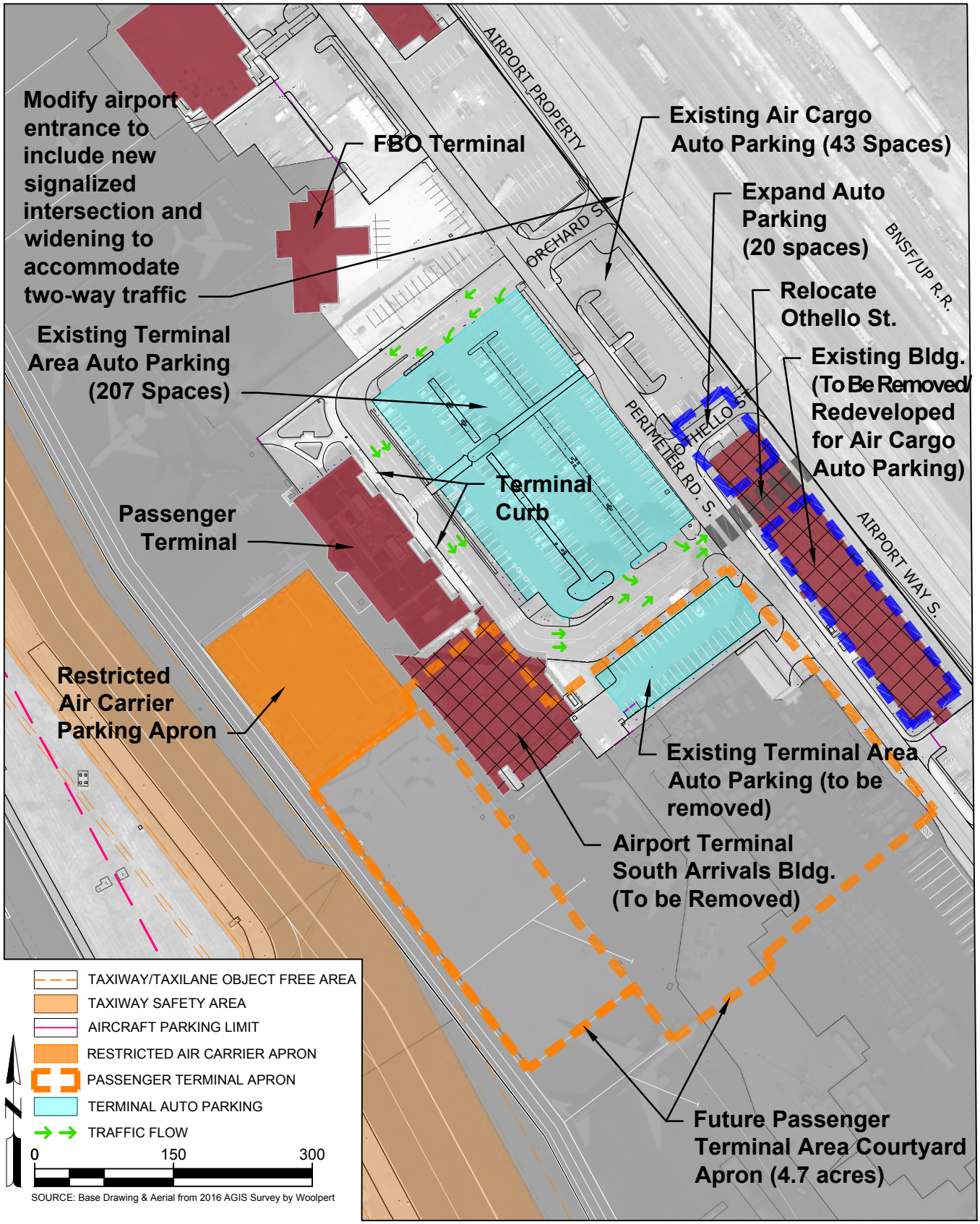

FIGURE D34 **Passenger Terminal Area - Alternative One**

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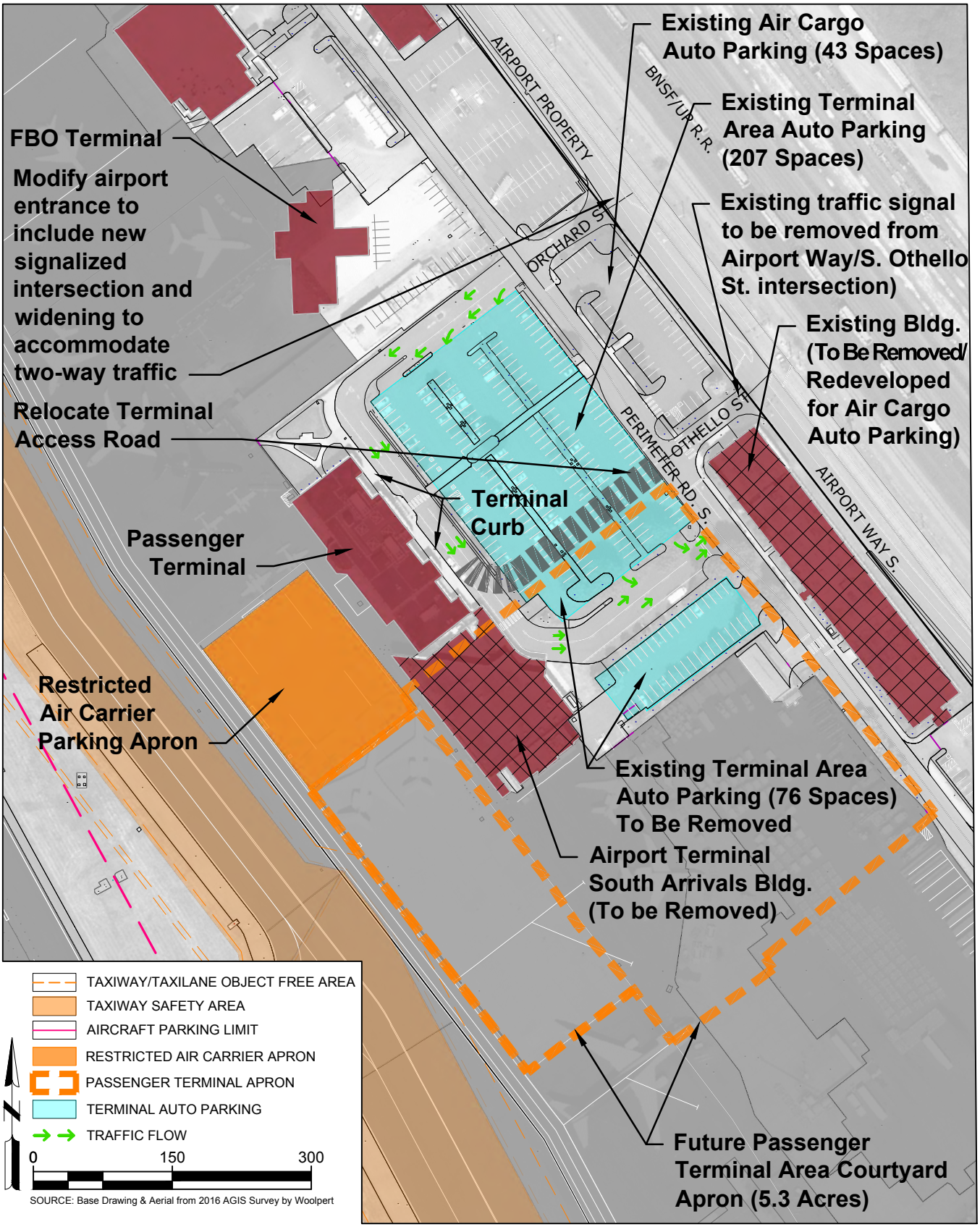

FIGURE D35 **Passenger Terminal Area - Alternative Two**

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As with Alternative One, Alternative Two proposes the removal of the Terminal/South Arrivals building and the adjacent auto parking facility to accommodate the development of a new Terminal Area Courtyard Apron (consisting of approximately 5.3 acres), which is slightly larger than the Alternative One configuration due to the partial relocation of the Terminal Roadway. This new and expanded apron area would serve the parking of larger passenger charter aircraft and provide flex space for additional cargo aircraft parking when needed from the adjacent cargo development area located to the south. This alternative would also propose the removal of the former King County Agencies building to accommodate new auto parking facilities, as well as relocate the existing traffic light at the Othello Street/Airport Way South intersection to the existing Orchard Street, as presented in Alternative One.

Passenger Terminal Area - Alternative Two Advantages.

- Improves landside vehicular access to the passenger terminal area with the relocation of the existing signalized intersection from Othello St. to Orchard St.
- Converts the underutilized area of the Terminal South Arrivals Building and adjacent auto parking to needed terminal apron area.
- Converts the former King County Agencies Building to needed auto parking facilities to better serve the adjacent air cargo development area.

Passenger Terminal Area - Alternative Two Disadvantages.

- Requires significant modification of the terminal access road and reduces the number of auto parking spaces in the Passenger Terminal Area by 94.

Passenger Terminal Area Alternatives Summary

The key development components of the two Passenger Terminal Area alternatives, along with a comparison to the existing facility, is presented in **Table D17**. Following a detailed assessment of the potential impacts of each alternative, and input provided by the Airport Working Group and FAA, Alternative Two has been selected as the recommended Passenger Terminal Area alternative in the following table and is presented in the ALP Drawing Set and contained in the **Executive Summary** chapter of this document to represent the ultimate airport configuration.

Table D17 **PASSENGER TERMINAL AREA ALTERNATIVES SUMMARY MATRIX**

Component/Consideration	Existing	Alternative One	Alternative Two[1]
Passenger Terminal Building, Terminal/South Arrivals Building, and former King County Agencies Building	---	Maintain Passenger Terminal Building, Remove Terminal/South Arrivals Building & King County Agencies Building *(Moderate Change)*	Maintain Passenger Terminal Building, Remove Terminal/South Arrivals Building & King County Agencies Building *(Moderate Change)*
Terminal Access Roadway & Auto Parking	One-way Looped Access Road, 243 Auto Parking Spaces, & Signalized Intersection @ Othello Street/Airport Way S. Intersection	Maintain Looped Access Road, Reduce Auto Parking by 36 Spaces, Relocate Othello St., & Relocate Traffic Signal to Orchard Street/Airport Way S. Intersection *(Moderate Change)*	Modify Looped Access Road, Reduce Auto Parking by 94 Spaces, & Relocate Traffic Signal to Orchard Street/Airport Way S. Intersection *(Significant Change)*
Passenger Terminal Apron	Commuter Passenger Apron @ 0.7 acres Flex Use Air Carrier Apron @ 1.3 acres	Maintain Commuter Passenger Apron @ 0.7 acres Increase Flex Use Air Carrier Apron @ 4.7 acres *(Moderate Change)*	Maintain Commuter Passenger Apron @ 0.7 acres Increase Flex Use Air Carrier Apron @ 5.3 acres *(Moderate Change)*
Environmental Issues	---	No Significant Impacts *(No Change)*	No Significant Impacts *(No Change)*

Source: *King County summary of selected landside development alternatives.*
Note: [1] Selected development alternative.

Existing Air Cargo Development Areas

The predominant air cargo facility at BFI is located on the east side of airport property, just south of the passenger terminal and Terminal/South Arrivals buildings and includes both airside and landside facilities operated by UPS that consist of about 18.0 acres. As the dominant air cargo carrier on the Airport, UPS operates as an Integrated Express carrier, moving customer goods door to door, shipment collection, air and truck shipment, and package delivery. UPS is also supported by contracted Regional Air Cargo Carriers (e.g., Ameriflight) that operate as "feeder" airlines between origin and destination (O&D) stations and/or smaller or remote markets. This existing air cargo development area is illustrated in **Figure D36**.

Air Cargo Area East - Alternative One

UPS is currently evaluating options to modify their existing development footprint at BFI and this alternative proposes a consolidation of their apron area to accommodate the designation of a new 'courtyard" ramp area that can serve as multi-use apron area for commercial passenger charters and overflow parking positions for cargo during peak-use periods. The revised air cargo area would consist of approximately 2.9 acres of airside development for aircraft parking and approximately 13.0 acres of landside development area for cargo processing, storage, and auto parking.

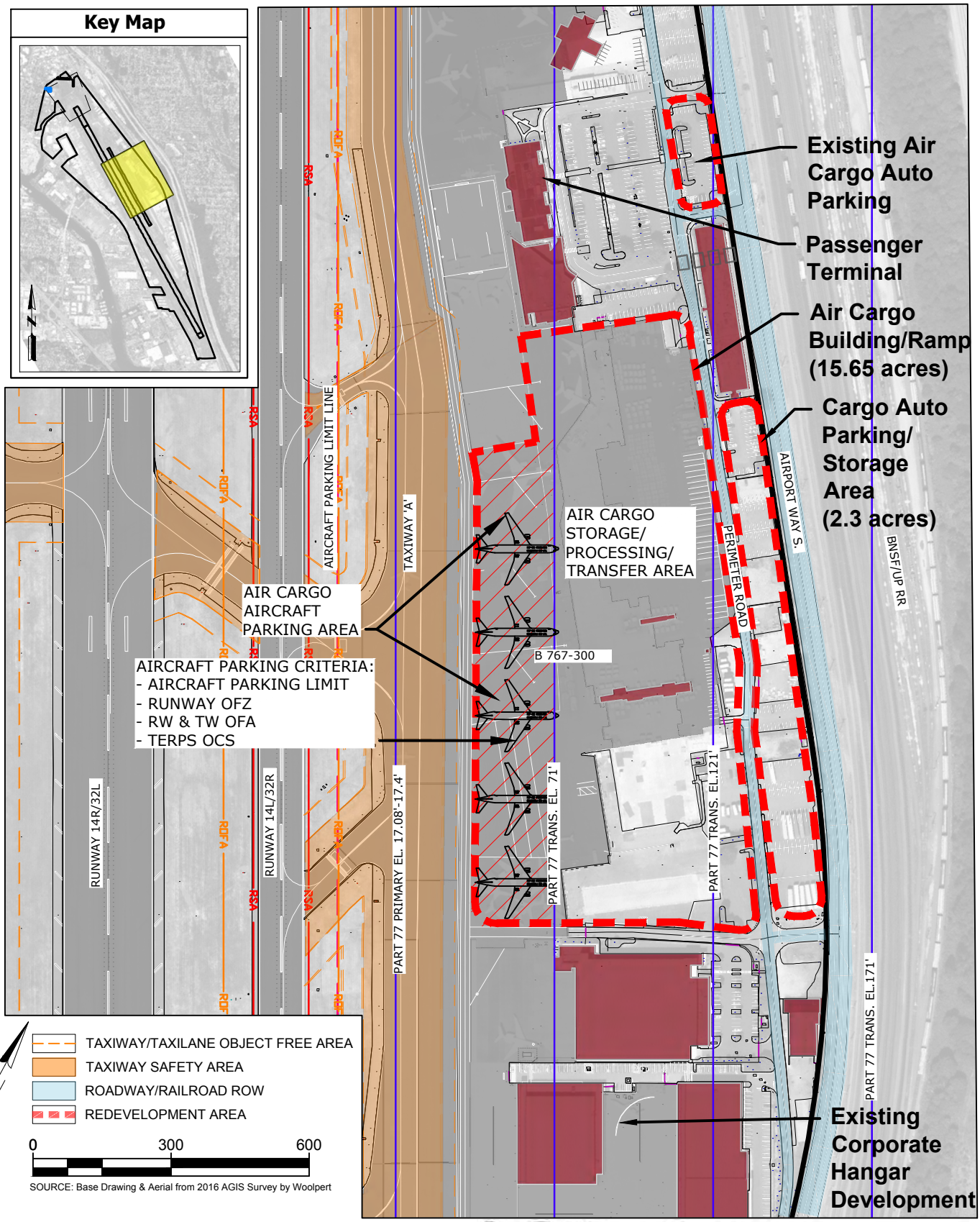

FIGURE D36 **Air Cargo Area East - Existing Layout**

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This alternative also proposes the closure of a segment of Perimeter Road South to public access, installs a new traffic signal at the intersection of Airport Way S. and Portland Street, and the removal of the former King County Agencies building to accommodate new cargo-related auto parking facilities. This alternative is illustrated in **Figure D37**.

Air Cargo Area East - Alternative One Advantages.

- Boundary of existing air cargo area can be modified to better accommodate both the requirements of the cargo operator and the projected apron requirements of the passenger terminal area
- The functionality of the air cargo landside facilities would be improved with the proposed expanded auto parking facilities, segment closure of Perimeter Road South to public access, and installation of a new traffic signal at the intersection of Airport Way S. and Portland Street

Air Cargo Area East - Alternative One Disadvantages.

- Segment closure of Perimeter Road South would eliminate full length public access to the east side of the Airport via the existing internal roadway

Air Cargo Area East Alternatives Summary

The key development components of this alternative, along with a comparison to the existing Air Cargo Development Area is presented in **Table D18**.

Table D18 **AIR CARGO AREA EAST ALTERNATIVES SUMMARY MATRIX**

Component/Consideration	Existing	Alternative One[1]
Air Cargo Area (Airside)	6 acres	5.6 acres *(Minor Change)*
Air Cargo Area (Landside)	12.3 acres	10.4 acres *(Moderate Change)*
Air Cargo Access Roadway/Auto Parking & Storage	Public-Use perimeter road separates auto parking area and provides vehicular access to Airport Way via Portland St. & S. Othello St., with signalized Intersection.	Closes segment of perimeter road to public access, expands auto parking, and installs traffic signal at Portland St./Airport Way intersection. *(Significant Change)*
Property Acquisition/Facility Relocation	None	Existing development area footprint would be modified to accommodate expansion of Passenger Terminal Area Apron. *(Minor Change)*
Environmental Issues	None	No significant impacts. *(No Change)*

SOURCE: *King County summary of selected landside development alternatives.*
Note: [1] Selected development alternative.

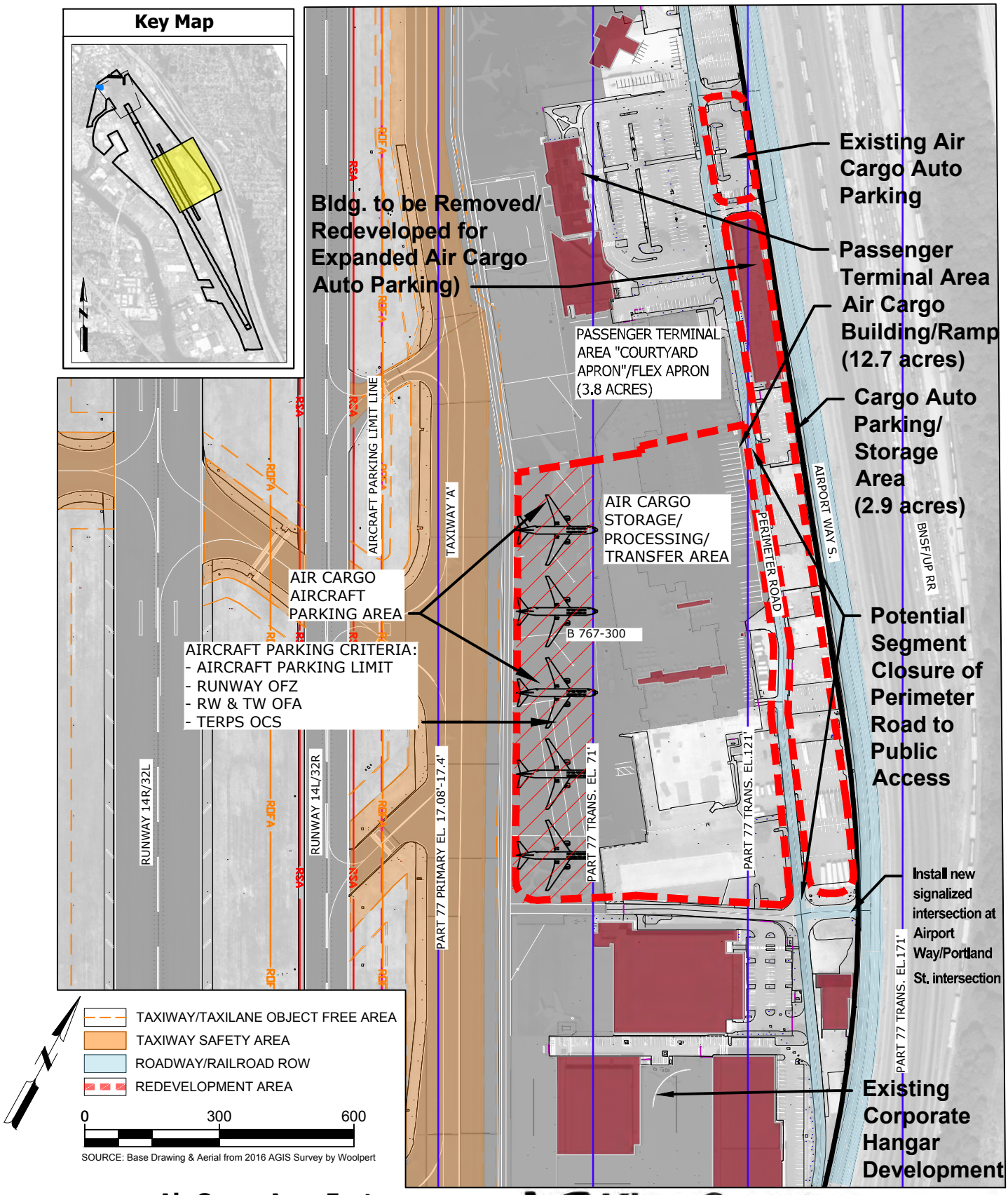

FIGURE D37 **Air Cargo Area East - Alternative One**

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Potential Air Cargo Area Southwest - Alternative One

The potential Air Cargo Area Southwest option proposes to redevelop the existing Southwest T-hangar area, in conjunction with the future acquisition of the adjacent Woods Meadows property (i.e., approximately 3.6 acres) to accommodate a future "west side" air cargo facility. This alternative would provide just over 10.0 acres to accommodate both air cargo airside and landside facilities consisting of cargo building/processing areas, auto parking, and aircraft parking for as many as five Boeing 767-300 size aircraft adjacent to Taxiway B. This alternative is illustrated in **Figure D38.**

Potential Air Cargo Area Southwest - Alternative One Advantages.

- Potential development area, with the acquisition of the adjacent Woods Meadows property, is of sufficient size to accommodate an additional air cargo development area at the Airport, within the existing airport boundary.

Potential Air Cargo Area Southwest - Alternative One Disadvantages.

- Redevelopment of the area to accommodate air cargo facilities would require relocation of existing general aviation T-hangars and aircraft tiedown facilities.
- A new general aviation development area would need to be identified on airport property to accommodate the potential relocation of existing general aviation aircraft storage facilities (i.e., hangar storage for 32 aircraft and 35 aircraft tiedowns).

Potential Air Cargo Area Southwest Alternatives Summary

The key development components of this alternative, along with a comparison to the existing landside aviation facilities in this area is presented in **Table D19**.

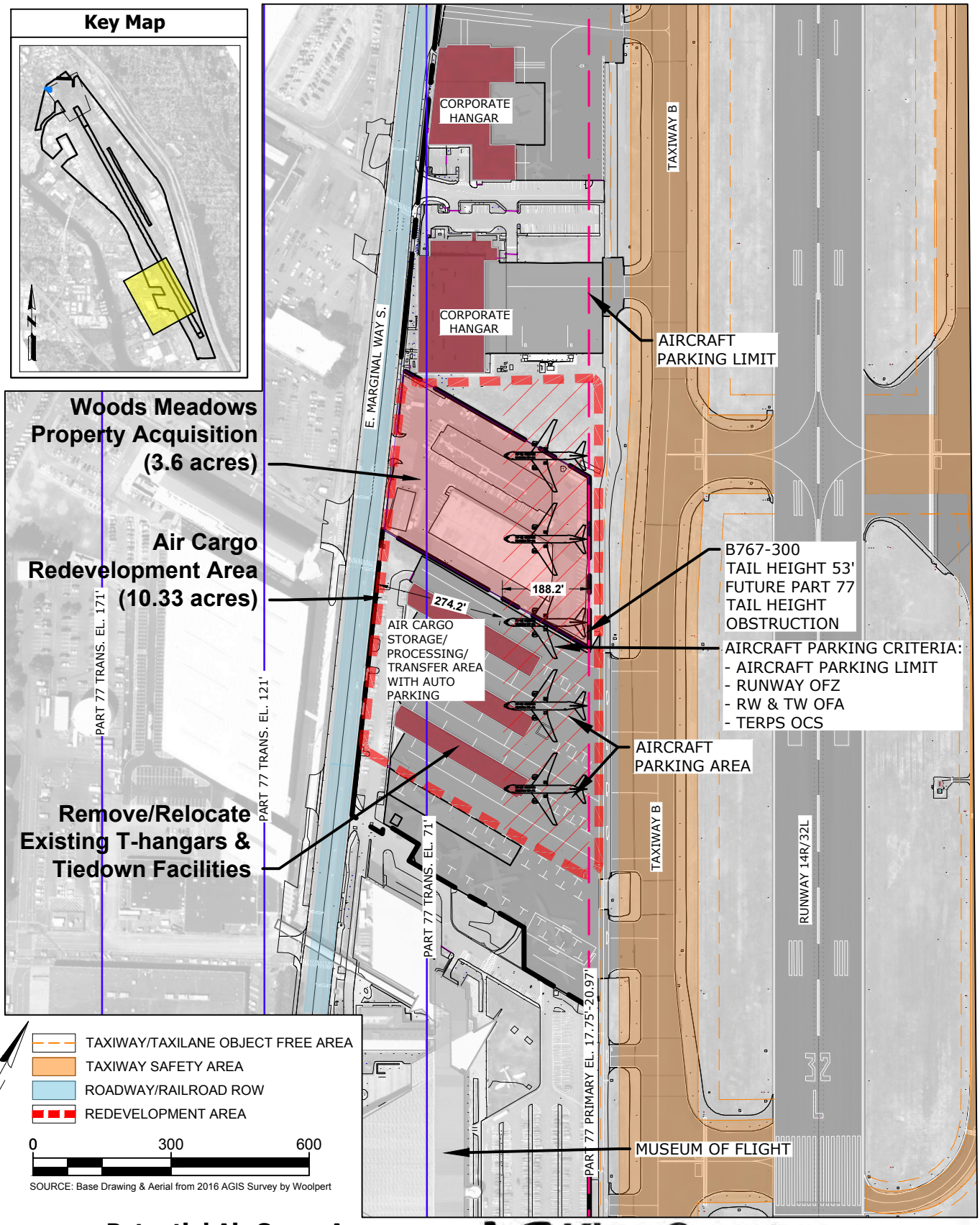

FIGURE D38 **Potential Air Cargo Area Southwest - Alternative One**

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King County International Airport/ Boeing Field

Table D19 **POTENTIAL AIR CARGO AREA SOUTHWEST ALTERNATIVE SUMMARY MATRIX**

Component/Consideration	Existing	Alternative One[1]
Air Cargo Area (Airside)	None/Existing GA T-hangar & Tiedown Storage Area would require relocation.	5.8 acres *(Significant Change)*
Air Cargo Area (Landside)	None/Existing GA T-hangar & Tiedown Storage Area would require relocation.	4.5 acres *(Significant Change)*
Air Cargo Access Roadway/Auto Parking & Storage	Existing direct vehicular access to East Marginal Way, with existing auto parking located along western boundary of the development area.	Maintain existing vehicular access to East Marginal Way & modify existing auto parking. *(Minor Change)*
Property Acquisition/Facility Relocation	None	Acquire Woods Meadows Property (3.7 acres) & relocate existing GA T-hangar & tiedown storage area. *(Significant Change)*
Environmental Issues	None	No Significant Impacts. *(No Change)*

SOURCE: *King County summary of selected landside development alternatives.*
Note: [1] Selected development alternative.

Potential Air Cargo Area South – Alternatives One & Two

The potential Air Cargo Area South option proposes that King County either establish a "through-the-fence" access agreement or purchase property to accommodate development of a new south side air cargo facility located south of Norfolk Street, on property recently acquired by Prologis (the former Sabey property). It is recognized that Prologis has preliminary development plans for the overall 62-acre site that includes mixed-use warehouse and/or manufacturing facilities with office/retail support and a large automobile parking structure. The exact amount of property that could be designated to accommodate a potential air cargo development facility has not been defined, but there is sufficient area to accommodate as many as five Boeing 767-300 size aircraft parking spaces within the northwest quadrant of the site.

Airfield access could be provided by an extension of Taxiway B to the south and would require the closure of a segment of S. Norfolk Street. This alternative is illustrated in **Figure D39** and a variation of the alternative, which is illustrated in **Figure D40,** would substitute the potential extension of Taxiway B with a realigned segment of the west side airport perimeter roadway. A new signalized intersection on S. Norfolk Street with controlled access to Airport property would also be required for cargo to be trailered via ground vehicles between the off-airport cargo processing site and the Airport's potential Southwest Air Cargo Development Area, described previously.

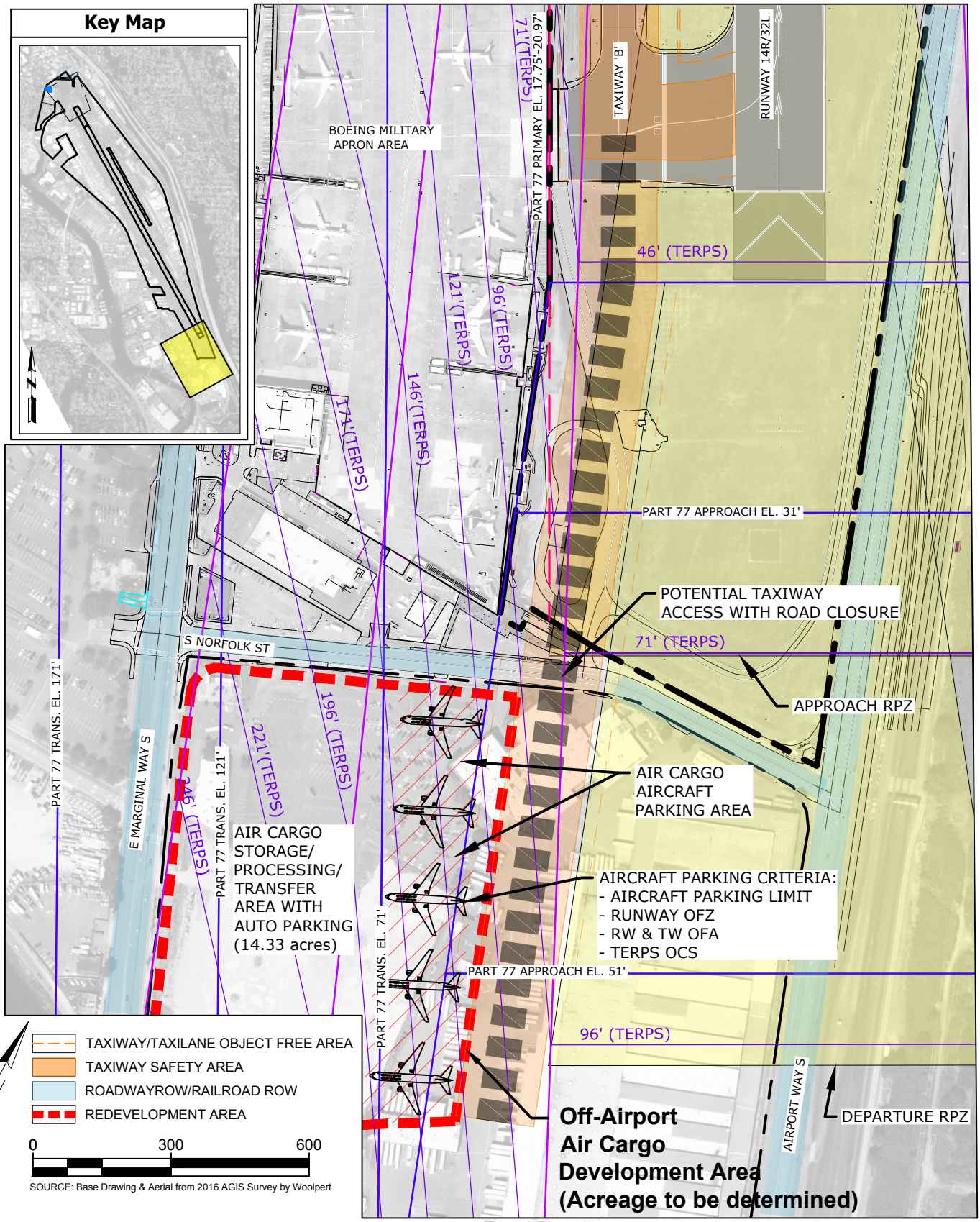

FIGURE D39 **Potential Air Cargo Area South Alternative One**

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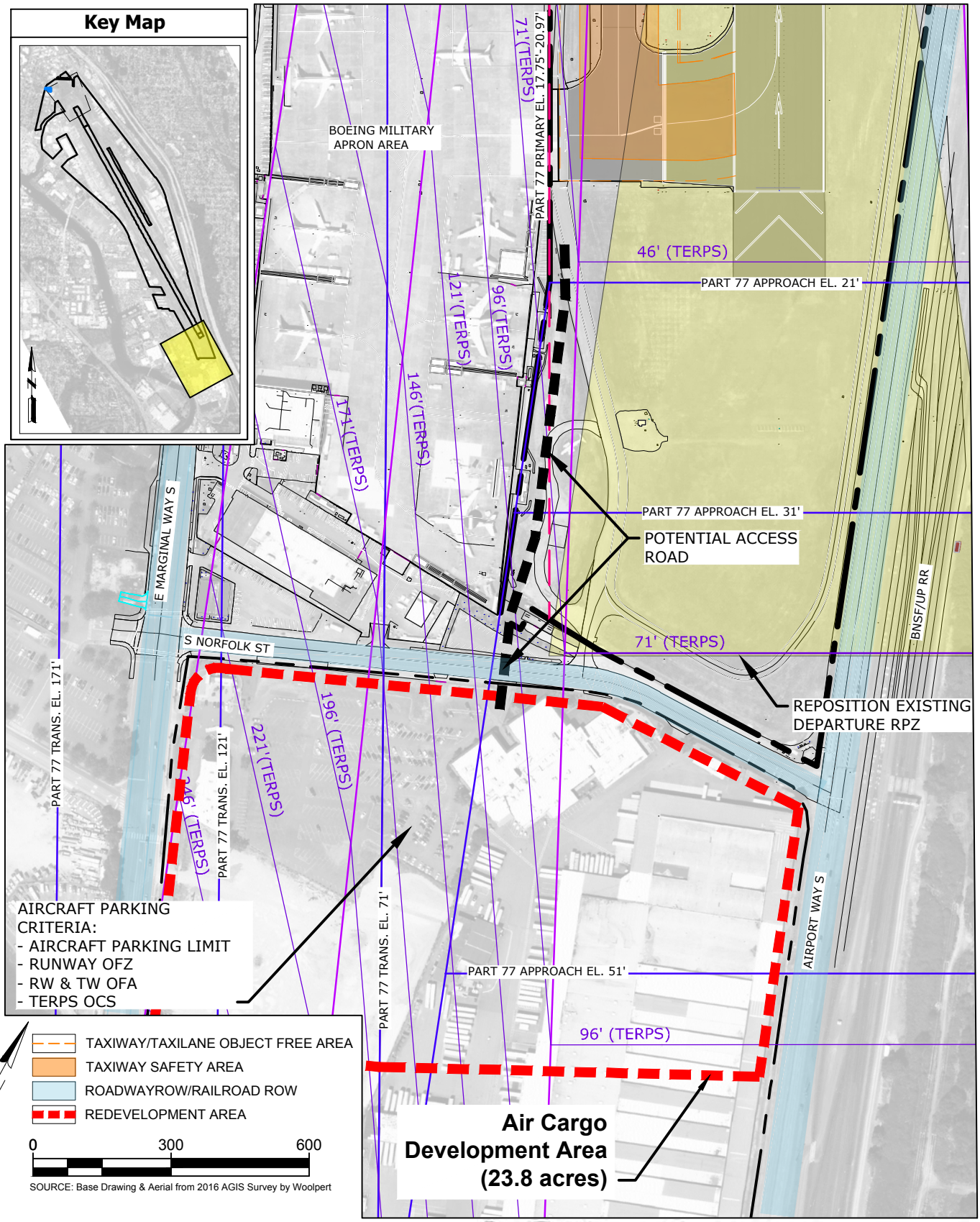
King County International Airport/ Boeing Field



SOURCE: Base Drawing & Aerial from 2016 AGIS Survey by Woolpert

FIGURE D40 **Potential Air Cargo Area South Alternative Two**

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King County International Airport/ Boeing Field

Potential Air Cargo Area South - Alternative One & Two Advantages.

- Identifies long-term development options to accommodate additional demand for air cargo facilities at BFI.
- Establishment of a "through-the-fence" access agreement (via taxiway or roadway) that is supported by the FAA could significantly reduce the project development costs to King County.

Potential Air Cargo Area South - Alternative One & Two Disadvantages.

- FAA approval of "through-the-fence" access agreements can be challenging due to existing Airport Sponsor grant assurance compliance requirements.
- Potential property acquisition costs of existing Prologis property would be significant.
- Extension of Taxiway B to provide airside access (as identified in Alternative One) would likely require the closure of a segment of S. Norfolk Street.

Potential Air Cargo Area South Alternatives Summary

The key development components of the two alternatives, are presented in **Table D20**.

Table D20 **POTENTIAL AIR CARGO AREA SOUTH ALTERNATIVES SUMMARY MATRIX**

Component/Consideration	Existing	Alternative One	Alternative Two
Air Cargo Area (Airside)	None/Proposed 62-acre Prologis development site has no existing taxiway access to Airport.	Airport airside access to be provided by extension of Taxiway B. *(Significant Change)*	No Airport airside access to be provided. *(No Change)*
Air Cargo Area (Landside)	None/Proposed 62-acre Prologis development site has no existing roadway access to Airport.	No Airport landside access to be provided. *(No Change)*	Airport landside access to be provided by realigned segment of the west side airport perimeter roadway & signalized intersection @ S. Norfolk Street. *(Significant Change)*
Air Cargo Access Roadway/Auto Parking & Storage	Proposed 62-acre Prologis development site has existing vehicular access to East Marginal Way, S. Norfolk Street, and Airport Way S., with existing auto parking facilities.	Vehicular access from East Marginal Way would be modified and segment of S. Norfolk Street would be closed, including reconfiguration of existing auto parking, to serve future Air Cargo development area *(Significant Change)*	Vehicular access from East Marginal Way and S. Norfolk Street would be modified, including existing auto parking, to serve future Air Cargo development area. *(Moderate Change)*
Property Acquisition/Facility Relocation	Current Prologis re-development site consists of 62-acres.	Establish "through-the-fence" access agreement or acquire +/- 15 acres to develop air cargo facility *(Significant Change)*	Similar to Alternative One. *(Significant Change)*
Environmental Issues	Aircraft noise and land use compatibility.	Changes in aircraft noise and land use compatibility impacts TBD.	Changes in aircraft noise and land use compatibility impacts TBD.

SOURCE: *King County summary of selected landside development alternatives.*

Air Cargo Area Alternatives Summary

The key development components of the various Air Cargo Area alternatives (the existing East Area and potential Southwest and South Areas), were presented in the summary matrix **Tables D18, D19,** and **D20**. Following a detailed assessment of the potential impacts of each alternative, and input provided by the Airport Working Group and FAA, the Alternative One development was selected for the existing East Area and the proposed Southwest Area, with their layouts presented in the ALP Drawing Set contained in the **Executive Summary** chapter of this document. At present there are no plans to recommend development the off-airport South Area for future Air Cargo facilities.

Existing Aviation Industrial/Maintenance Development Areas

Aviation Industrial/Maintenance facilities typically require large acreage sites for initial development, which should also consider future expansion capability. Most often, these sites must provide runway/taxiway access, as well as include convenient landside access and adequate automobile parking areas. Due to the existing site constraints and limited remaining development area within the current airport boundary, the existing Aviation Industrial/Maintenance facilities at BFI are located on properties both on and off the Airport. A description of these existing facilities, along with alternatives to accommodate future expansion is presented in the following text.

On-Airport Aviation Industrial/Maintenance Development Areas

The existing on-airport aviation industrial/maintenance areas at BFI are currently represented by Boeing facilities (i.e., the Boeing 737 Flight Test Facility and Delivery Center). Their existing leasehold consists of 106 acres located in the northwest quadrant of the Airport (represented by combination of apron aircraft parking positions, hangars, and office facilities). Boeing recently completed the expansion of existing aircraft parking positions adjacent to Taxiway B3, within their existing airport leasehold boundary, in response to projected monthly production rate increases of their Boeing 737 aircraft.

The existing layout of the on-airport aviation industrial maintenance areas, as well as potential expansion areas for consideration, are presented on **Figure D41**. These potential facility expansion areas that are contained within the existing airport boundary include the current WANG property leasehold, which expires in 2023 (i.e., 7.6 acres located within the northwest corner of the Airport), and just under 3 acres of currently vacant/unleased property located south of the ATCT facility that could potentially accommodate two additional B-737 aircraft parking positions.

On-Airport Aviation Industrial/Maintenance Development Area Advantages.

- As a major leaseholder of Airport property, the existing on-airport aviation industrial maintenance facilities operated by Boeing are a significant revenue generator for BFI and an economic engine for both the local and regional economy.

On-Airport Aviation Industrial/Maintenance Development Area Disadvantages.

- There is limited remaining property available on the Airport to accommodate future expansion of existing on-airport aviation industrial maintenance facilities.
- The existing industrial property in the vicinity of the Airport is of high value, with limited availability for future acquisition (e.g., the 62-acre tract of property located directly south of the Airport was purchased by Prologis in late 2016 for $136 million).

On-Airport Aviation Industrial/Maintenance Development Area Alternatives Summary

The key development components of the existing facilities, along with potential expansion areas are presented in **Table D21**.

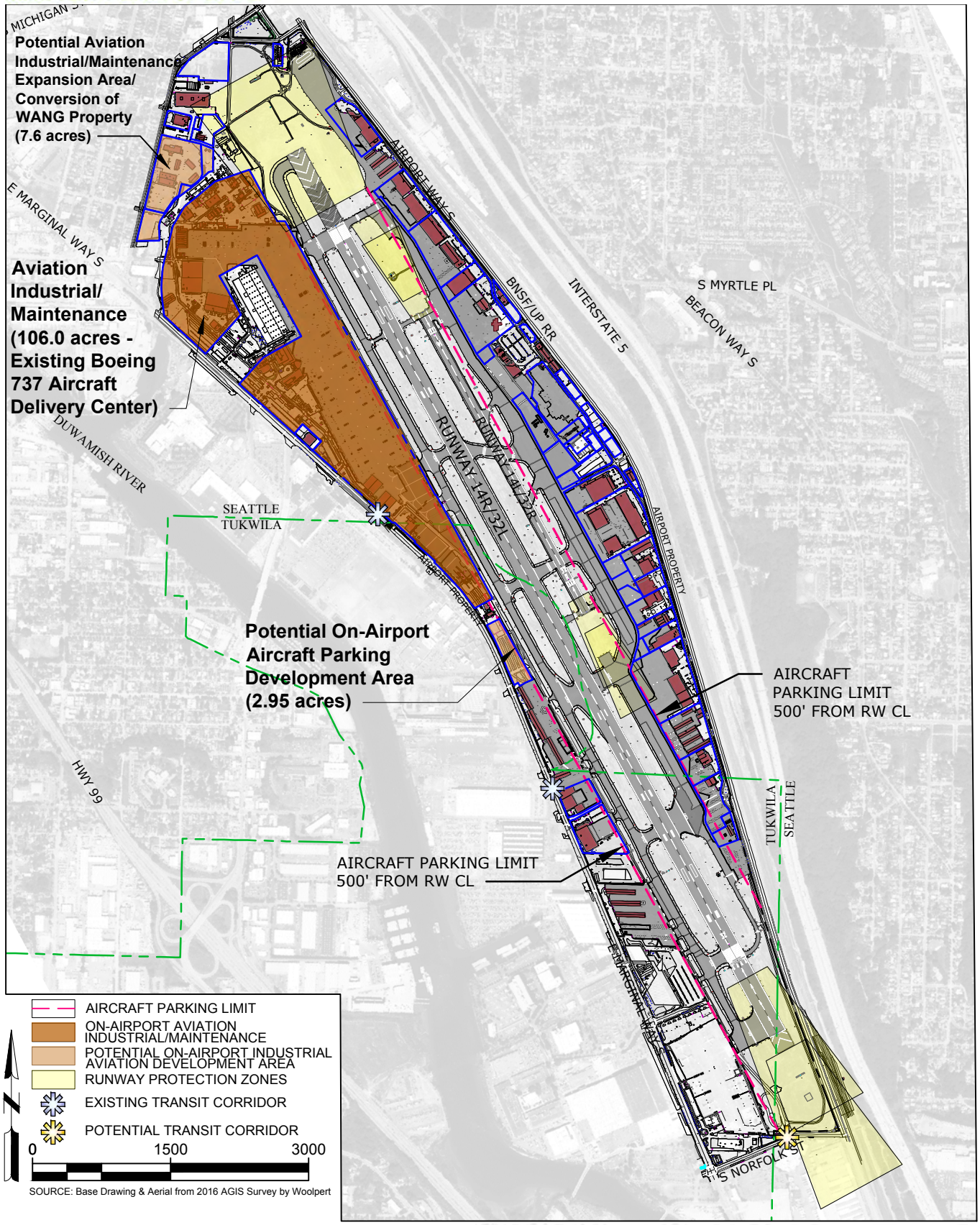

FIGURE D41 **Existing & Potential On-Airport Aviation Industrial/ Maintenance Development Areas**

Mead & Hunt

King County International Airport/ Boeing Field

Table D21 **EXISTING/POTENTIAL ON-AIRPORT AVIATION INDUSTRIAL/MAINTENANCE DEVELOPMENT AREAS SUMMARY MATRIX**

Component/Consideration	Existing	Potential Expansion North	Potential Expansion South[1]
Aviation Industrial Area (Airside)	Aircraft Parking Apron & Taxilane @ +/-70 acres.	None *(No Change)*	2.9 acres (Vacant Leasehold south of ATCT) *(Minor Change)*
Aviation Industrial Area (Landside)	Hangars, Office/Support Facilities, Access Roadways & Auto Parking @ +/-36 acres.	7.6 acres (Existing WANG Leasehold) *(Moderate Change)*	None *(No Change)*
Aviation Industrial Access Roadway/Auto Parking & Storage	Vehicular access provided by East Marginal Way, with internal roadways & auto parking located along western boundary of the development.	Vehicular access provided by Ellis Avenue South, with auto parking requirements TBD. *(Minor Change)*	Vehicular access provided by East Marginal Way via 86th St. South, with auto parking requirements TBD. *(Minor Change)*
Property Acquisition/Facility Relocation	None	No property acquisition required/Existing facilities would be reconfigured. *(Moderate Change)*	No property acquisition or facility relocation required/Infrastructure upgrades would be required. *(Moderate Change)*
Environmental Issues	None	No Significant Impacts anticipated. *(No Change)*	No Significant Impacts anticipated. *(No Change)*

SOURCE: *King County summary of selected landside development alternatives.*
Note: [1] Selected development alternative.

Off-Airport Aviation Industrial/Maintenance Development Areas

The existing off-airport aviation industrial maintenance areas adjacent to BFI that are also currently represented by Boeing include support facilities related to the Boeing 737 Flight Test Facility and Delivery Center and the Boeing Military Flight Center and Test Facility). Four of these existing off-airport development areas are supported by "through-the-fence" access agreements with the Airport, with two of these requiring taxiway transit corridors across East Marginal Way South that permit the movement of aircraft to and from Boeing property/facilities located west of the Airport. The existing location/layout of these development areas, as well as potential expansion areas for consideration, are presented on **Figure D42**. Additional improvements to the existing taxiway transit corridors for consideration include roadway infrastructure/signalization improvements at the East Marginal Way South intersection locations to improve aircraft accessibility.

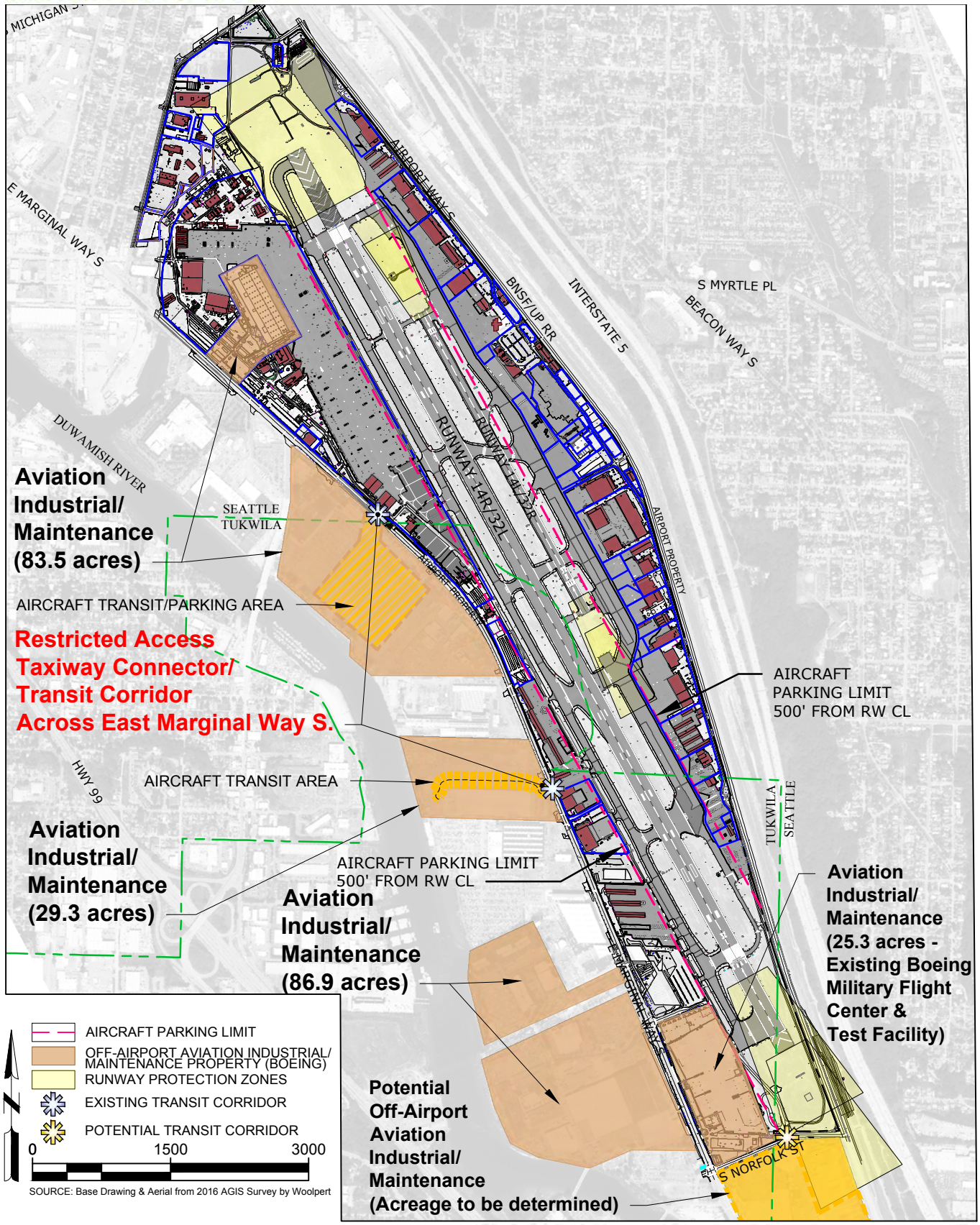

FIGURE D42 **Existing & Potential Off-Airport Aviation Industrial/ Maintenance Development Areas**

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King County International Airport/ Boeing Field

Off-Airport Aviation Industrial/Maintenance Development Area Advantages.

- King County can generate revenue for the Airport from properly negotiated/FAA approved "through-the-fence" airport access agreements without the significant costs of land acquisition (if available) adjacent to the Airport. As a major leaseholder of Airport property, the existing on-airport aviation industrial maintenance facilities operated by Boeing are a major revenue generator for BFI and an economic engine for both the local and regional economy.

Off-Airport Aviation Industrial/Maintenance Development Area Disadvantages.

- The approval of "through-the-fence" airport access agreements by the FAA can be difficult due to the Airport Sponsor's compliance requirements with existing Airport Improvement Program (AIP) Grant Assurances.

Off-Airport Aviation Industrial/Maintenance Development Area Alternatives Summary

The key development components of the existing facilities, along with potential expansion areas in this area are presented in **Table D22**.

Table D22 **EXISTING/POTENTIAL OFF-AIRPORT AVIATION INDUSTRIAL/MAINTENANCE DEVELOPMENT AREAS SUMMARY MATRIX**

Component/Consideration	Existing	Potential Expansion South
Aviation Industrial Area (Airside)	Aircraft parking apron and taxilane: B-737 Deliv. Cntr. @ 16 acres Mil. Flight Center @ 25.3 acres	Aircraft parking apron and taxilane/acreage TBD. *(Significant Change)*
Aviation Industrial Area (Landside)	B-737 Deliv. Cntr. Hangar, Office/Support Facilities, access roadways and auto parking @ +/- 184 acres.	Support facilities, access roadways and auto parking TBD. *(Moderate Change)*
Aviation Industrial Access Roadway/Auto Parking & Storage	Vehicular access provided by East Marginal Way South, with internal roadways & auto parking.	Vehicular access provided by East Marginal Way South, with auto parking requirements TBD. *(Minor Change)*
Property Acquisition/Facility Relocation	None	No property acquisition with Through-the-Fence Agreement/ Facility relocation & Infrastructure upgrades would likely be required *(Moderate Change)*
Environmental Issues	None	Changes in aircraft noise and land use compatibility impacts TBD.

SOURCE: *King County summary of selected landside development alternatives.*

Aviation Industrial/Maintenance Area Alternatives Summary

The key development components of the various Aviation Industrial/Maintenance Area alternatives (both On-Airport and Off-Airport Areas), were presented in the summary matrix **Tables D21** and **D22**. Following a detailed assessment of the potential impacts of each alternative, and input provided by the Airport Working Group and FAA, the Expansion Area South was selected for the On-Airport facilities and is presented in the ALP Drawing Set contained in the **Executive Summary** chapter of this document. At present there are no plans to identify potential off-airport development of any additional Aviation Industrial/Maintenance facilities.

General Aviation Development Areas

General aviation is typically categorized as all activity that is not related to commercial passenger operations, large transport air cargo operations, or military operations. It includes private aviation related to pleasure flying, training, business transportation and storage; commercial aviation related to Fixed Base Operators (FBOs), aircraft maintenance, flight training, aircraft charter/rental, and aircraft storage; corporate aviation related to employee transportation and aircraft storage; and, industrial activity related to aircraft manufacturing and refurbishment. Thus, general aviation is a very diverse category considering various aircraft sizes, aircraft technology/sophistication, the mission of the organization operating the aircraft, and both airside and landside access requirements.

All the diverse considerations mentioned above will impact the appropriateness of a given location for a specific general aviation use. However, as in many cases, a variety of general aviation facilities can be accommodated on any given site. The recommendations in this Master Plan Update attempt to identify the best types of general aviation facilities for a specific developable site. Ultimately, King County must evaluate each development proposal and make land use determinations based on the proposed site usage efficiencies (i.e., striving to maximize the utilization of the available property in the most efficient and effective manner), and best business practices.

The majority of existing general aviation aircraft storage facilities at BFI are located on the east side of the Airport and provided with direct access to the east side partial parallel taxiway system (i.e., Taxiway A). However, additional general aviation property is located within the southwest quadrant of the Airport and is provided with direct access to the west side parallel taxiway system (i.e., Taxiway B). Based aircraft at BFI are stored in a variety of large commercial hangars (i.e., Fixed Base Operator and charter hangar storage facilities), large private corporate hangars, and smaller aircraft T-hangars or tiedown apron, with limited remaining undeveloped or redevelopment property available to accommodate new general aviation facilities.

In recent years, there have been a number of commercial and corporate general aviation redevelopment projects completed on the east side of the Airport. These include new FBO redevelopments by Signature Flight Support and Modern Aviation, including the expansion of the Kenmore Aero Services leasehold and the redevelopment of a previous air cargo facility to accommodate a new large corporate hangar facility. As noted in the Potential Air Cargo Area Southwest section of this chapter, the T-hangar facilities and apron tiedowns located just north of the Museum of Flight facility have been identified for potential removal/relocation to accommodate a future air cargo redevelopment area (there are currently 32 T-hangar units and 35 aircraft tiedowns in this area). The future displacement of based aircraft from these T-hangars

were to be relocated to a new general aviation aircraft hangar development area located at the north end of airfield.

However, the retention of the existing ¾-mile IAP visibility minimums, and the corresponding RPZ, eliminated the option of developing a new north general aviation aircraft storage area at BFI. In addition, the retention of the existing ¾-mile IAP visibility minimums will require the decommissioning of the existing northeast tiedown apron area (there are currently 52 aircraft tiedowns in this area).

Airport Staff recognizes the potential impact these reductions to the aircraft storage facilities could have on the existing based aircraft owners located in these areas. However, given the limited availability of existing airport property to construct new general aviation aircraft storage facilities (i.e., both hangars and tiedown apron), Airport Staff will continue to explore future options for the relocation of these based aircraft at BFI.

Airport Support Facilities

Support facilities provide those services and functions that are necessary for an airport to operate safely and efficiently but are not part of the runway/taxiway system and are not related to the passenger terminal building, air cargo facilities, aircraft storage, or aircraft maintenance. In 2016, BFI completed reconstruction the existing ARFF facility in its present location, at mid-field on the west side of the Airport, adjacent to the ATCT. As presented in the previous chapter, based on the anticipated level of passenger service, the existing ARFF facilities and equipment provided at the Airport are projected to be sufficient throughout the timeframe of this Master Plan Update.

Additionally, King County has selected proposed relocation sites for the Airport's existing ATCT and fuel storage facility, and the MP Update also includes a project to design a proposed Snow Removal Equipment (SRE) building within the northwest development area of the Airport. A brief description of these proposed facilities, along with illustrations of their recommended layout is presented below.

Airport Maintenance Facility Development Area

The Airport's existing maintenance facility development area is located at the northwest corner of the airfield (northwest of the Steam Plant and southwest of the Runway 14R localizer antenna). Existing vehicular access is provided via South Warsaw Street, which extends east from Ellis Avenue South. Due to the RPZ development restrictions, future plans for the site include renovation of the existing FAA Flight Service Station for Airport Offices, including relocation of the Airport's Maintenance Building and construction of a Snow Removal Equipment (SRE) Building to a new Airport Maintenance Development Area located west of the Steam Plant. In addition, construction of a new access road is planned to serve the existing Steam Plant facility. The proposed layout for the redevelopment of this area is illustrated in **Figure D43**.

Fuel Storage Facility

As presented in the airside alternatives, BFI's existing fuel storage facility is partially located within the existing Runway 14R RPZ, which is considered an incompatible land use within RPZs. Additionally, based upon the generalized planning standard of a two-week storage capacity, the fuel storage and distribution rate analysis presented in the previous chapter indicates that BFI's existing Jet A fuel storage facility is potentially

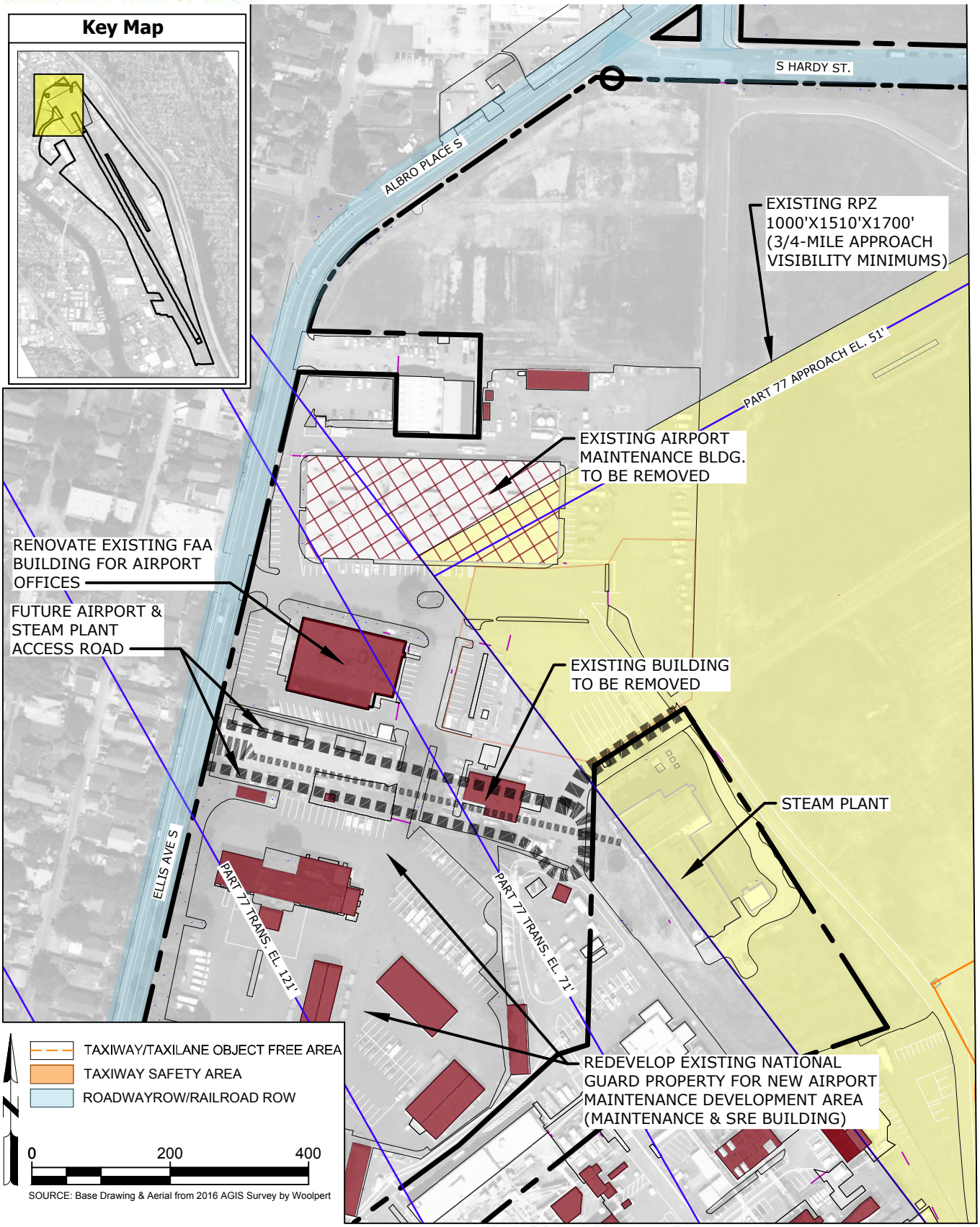

FIGURE D43 **Proposed Airport Maintenance Redevelopment Area**

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King County International Airport/ Boeing Field

undersized. A potential redevelopment site for the fuel storage facility has been identified west of East Marginal Way South, on the former Jorgensen Forge property that is to be acquired for Airport facility expansion (see **Figure D44** for site location). Prior to the relocation of the existing fuel farm/development of the new facility, a comprehensive environmental documentation and evaluation will have to be conducted. In addition, the future fuel storage facility will likely require a development footprint of approximately two acres.

Airport Traffic Control Tower (ATCT)

The Airport's existing ATCT is located at midfield, on the west side of the Airport, adjacent to the ARFF facility. Based upon the *ATCT Line of Sight Shadow Study* prepared for BFI in 2006, it was determined that all areas of the airfield within the Airport Operations Area (AOA) defined "visibility zone" maintain a clear line of sight for the ATCT controllers. However, the age and condition of the ATCT facilities indicate that a facility upgrade might be necessary during the timeframe of this Master Plan Update. Given the existing site constraints of airport property, Airport Staff have identified a potential new development site, also located west of East Marginal Way South, on the former Jorgensen Forge property (see **Figure D44**). King County would have the option to construct a new ATCT at the new location with conventional facilities or evaluate an upgrade/replacement of existing ATC facilities with new remote/virtual Air Traffic Control (ATC) technology.

The remote/virtual ATC technology utilizes a tower mounted system of cameras and equipment that broadcast 360 degrees of live airfield images to a remotely located/manned simulated ATCT cab workstation. This technology has been installed at several locations outside the United States, and a current test site evaluation is being conducted at Leesburg Executive Airport, which is a designated reliever airport for Washington-Dulles International Airport. Additionally, the FAA has installed a Remote Tower System that will be tested and certified at Northern Colorado Regional Airport located in Fort Collins/Loveland, Colorado. This ATC technology will be the first in the world to integrate both video and track-based surveillance (radar) to provide a comprehensive view of the airport surface and surrounding Class D airspace to controllers working in a remote facility. It is recommended King County closely monitor this emerging technology to determine if these or other potential cost saving methods of providing ATC services should be pursued in lieu of replacing the existing ATCT facility with conventional infrastructure.

Recommended Landside Conceptual Development Plan

The proposed landside development alternatives presented in the above text for BFI provided King County Airport Staff with a variety of options for future facility maintenance and development. Following a detailed assessment of the potential impacts of each alternative, and input provided by the Airport Working Group and FAA, the draft components of the Landside CDP are identified and presented in the following project list and illustration (see **Figure D44**).

As described in previous sections, many of the projects will be implemented on a demand dictated basis; therefore, the projected phasing of the projects will continue to be updated from year to year throughout the planning period of this study. A listing of the major landside projects associated with the *Conceptual Development Plan* are presented in the following text.

Landside Projects:

1) Design and construct Passenger Terminal Area roadway and parking modifications, including removal of the South Arrivals Building related to new large Aircraft Parking Apron. (In Progress)
2) Design and construct Modern Aviation redevelopment improvements. (In Progress)
3) Design and construct Kenmore Aero redevelopment improvements. (In Progress)
4) Design and construct UPS redevelopment improvements. (In Progress)
5) Acquire Jorgensen Forge property: 20.58 acres (fee simple).
6) Continue to evaluate new Fuel Storage Facility.
7) Construct Steam Plant Access Road.
8) Design and construct Perimeter Intrusion Detection System.
9) Design Snow Removal Equipment (SRE) building.
10) Demo Existing Southwest GA Development Area and Woods Meadows buildings to accommodate a new Aviation Development Area.
11) Modify existing National Guard leasehold property to accommodate relocation of existing Airport Maintenance Facilities and Airport Administrative Offices.
12) Acquire Woods Meadows property: 3.6 acres (fee simple).
13) Renovate existing FAA Flight Service Building for Airport Admin. use.
14) Design and construct Phase 3 stormwater system rehabilitation.
15) Design and construct Phase 4 stormwater system rehabilitation.
16) Prepare ATCT Siting Study for relocation of existing ATCT.

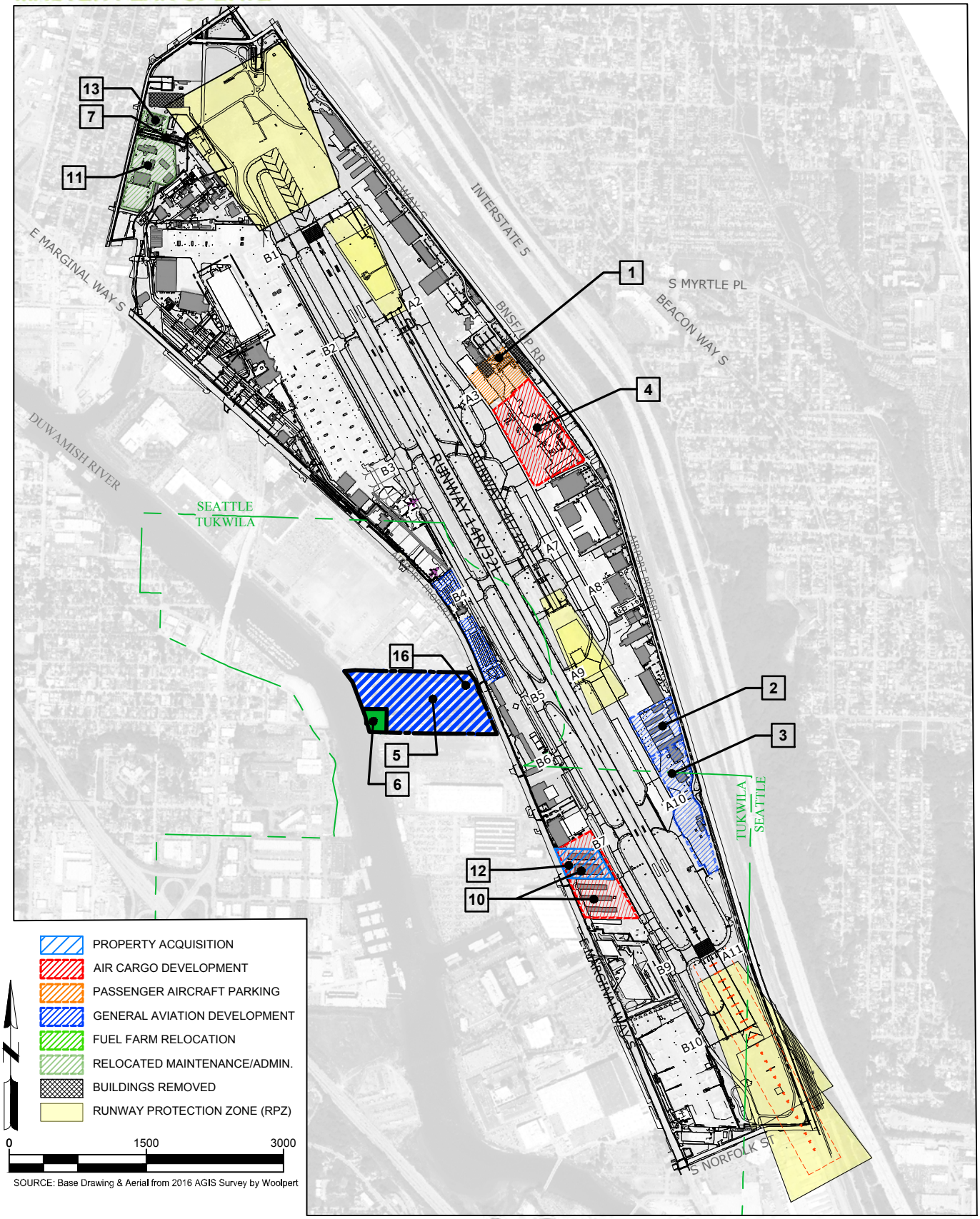

FIGURE D44 **Recommended Landside Conceptual Development Plan (CDP)**

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King County International Airport/ Boeing Field

Appendix One

2015 BFI ACAIS Report

MASTER PLAN UPDATE

King County International Airport/ Boeing Field

Mead & Hunt

FAA - Office Of Airports

Report Date: 05/19/2017

SOURCE: CY 2015 FAA

ENPLANEMENTS BY INDIVIDUAL CARRIERS FOR CALENDAR YEAR 2015

Boeing Field/King County International (BFI) SEA

Randall Berg 7277 Perimeter Road South, Seattle, WA 98108-3812 BFI

SCHEDULE TYPE	ENPLANEMENTS		
CARRIER NAME (CARRIER CODE)	SCHEDULED	NONSCHEDULED	TOTAL
ATCO - Nonscheduled/On-Demand Air Carriers, filing FAA Form 1800-31.			
Aero Jet Services LLC (J7EA)	0	29	29
Aurora Aviation Inc (GLRA)	0	36	36
Crow Executive Air, Inc. (DRUA)	0	15	15
KaiserAir, Inc. (COZA)	0	6	6
Priester Aviation LLC (PRIA)	0	4	4
Rite Bros Aviation, Inc. (RTEA)	0	296	296
Skybird Aviation, Inc. (AAWA)	0	16	16
ATCO Total:	0	402	402
CAC - Commuters or Small Certificated Air Carriers, filing T-100.			
Empire Airlines, Inc. (EM)	0	0	0
Kenmore Air Harbor, Inc. (KAH)	8,201	240	8,441
CAC Total:	8,201	240	8,441
CRAC - Large Certificated Air Carriers, filing T-100.			
Air Transport International Limited Liability Co (8C)	0	0	0
Alaska Airlines, Inc. (AS)	0	840	840
Allegiant Air LLC (G4)	0	50	50
American Airlines, Inc. (AA)	0	537	537
Ameristar Air Cargo, Inc. (AMQ)	0	0	0
Atlas Air, Inc. (5Y)	0	123	123
Avjet Corporation (0WQ)	0	64	64
Caribbean Sun Airlines, Inc. D/B/A World Atlantic Airlines	0	106	106
Delta Air Lines, Inc. (DL)	0	219	219
Falcon Air Express (FCQ)	0	1,310	1,310
Federal Express Corp (FX)	0	0	0
Hawaiian Airlines, Inc. (HA)	0	129	129
Kaiserair, Inc. (1EQ)	0	58	58
Kalitta Air LLC (KAQ)	0	0	0
Kalitta Charters (KLQ)	0	0	0
Lynden Air Cargo LLC (L2)	0	0	0
Northern Air Cargo, Inc. (NC)	0	0	0
Sierra Pacific Airlines, Inc. (SI)	0	2,562	2,562
Sun Country Airlines (SY)	0	123	123
Swift Air, Llc (09Q)	0	3,100	3,100
TATONDUK OUTFITTERS LIMITED D/B/A EVERTS AIR	0	0	0
US Airways, Inc. (US)	0	127	127
United Air Lines, Inc. (UA)	0	180	180
United Parcel Service Co (5X)	0	0	0
Varig Logistica S/A (ABX)	0	0	0
Vision Airlines (0JQ)	0	75	75

FAA - Office Of Airports

Report Date: 05/19/2017

SOURCE: CY 2015 FAA

ENPLANEMENTS BY INDIVIDUAL CARRIERS FOR CALENDAR YEAR 2015

Boeing Field/King County International (BFI) SEA

Randall Berg 7277 Perimeter Road South, Seattle, WA 98108-3812 BFI

SCHEDULE TYPE	ENPLANEMENTS		
CARRIER NAME (CARRIER CODE)	SCHEDULED	NONSCHEDULED	TOTAL
CRAC - Large Certificated Air Carriers, filing T-100.			
CRAC Total:	0	9,603	9,603
FFC - Foreign Air Carriers, filing T-100(f).			
Air Canada (AC)	0	50	50
Air Georgian (ZX#)	0	9	9
Chartright Air Inc. (13Q)	0	2	2
Global Jet Luxembourg, Sa (SVW)	0	2	2
Jazz Aviation Lp (QK#)	76	0	76
London Air Services Limited (14Q)	0	267	267
Prince Edward Air Ltd (PEQ)	0	0	0
TAG Aviation (0RQ)	0	3	3
Vistajet Limited (VJT)	0	10	10
Westjet (WS)	80	0	80
FFC Total:	156	343	499
Site Total:	**8,357**	**10,588**	**18,945**

Appendix Two

FAA Forecast Approval Letter

MASTER PLAN UPDATE

King County International Airport/ Boeing Field

Mead & Hunt

U.S. Department
of Transportation
**Federal Aviation
Administration**

Northwest Mountain Region
Seattle Airports District Office
2200 S. 216th Street
Des Moines, WA 98198

April 10, 2018

Mr. Michael Colmant, A.A.E
Interim Airport Director
King County International Airport/Boeing Field
7277 Perimeter Road South
Seattle, WA 98108

King County International Airport/Boeing Field (BFI)
Aviation Forecast Approval

Dear Mike:

The Federal Aviation Administration (FAA), Seattle Airports District Office has reviewed the aviation forecast for the King County International Airport/Boeing Field (BFI) Master Plan Update, submitted April 5, 2018. The FAA approves these forecasts for airport planning purposes, including for Airport Layout Plan (ALP) development. The FAA approval is based on the following:

1. The difference between the FAA Terminal Area Forecast (TAF) and BFI's forecast for passenger enplanements is not within the 10% and 15% allowances for the 5- and 10-year planning horizons for reasons contained within the forecast. We concur with these reasons and believe the differences have been resolved.
2. The difference between the TAF and BFI's forecasts for commercial operations, total operations, and based aircraft are within the 10% and 15% allowances for the 5- and 10-year planning horizons.
3. The forecast is based on reasonable planning assumptions, current data and appropriate forecasting methodologies.

Based on the approved forecast, the FAA also approves the existing and future critical aircraft typified by the Boeing 767 (RDC D-IV).

The approval of the forecast and critical aircraft does not automatically constitute a commitment on the part of the Unites States to participate in any development recommended in the master plan or shown on the ALP. All future development will need to be justified by current activity levels at the time of proposed implementation. Further, the approved forecasts may be subject to additional analysis or the FAA may request a sensitivity analysis if this data is to be used for environmental or Part 150 noise planning purposes.

If you have any questions about this forecast approval, please call me at (206) 231-4135.

Sincerely,

Jennifer I. Kandel
Planner, FAA Seattle Airports District Office

Appendix Three

FAA ATC Waiver for Runway Centerline Separation

BFI

MASTER PLAN UPDATE

King County International Airport/ Boeing Field

Mead & Hunt

Modification of Standards Alternative Analysis

February 2006

King County International Airport/ Boeing Field

SEATTLE, WASHINGTON

Barnard Dunkelberg & Company
Cherry Street Building
1616 East 15th Street
Tulsa, Oklahoma 74120
Phone Number. 918 585 8844
FAX Number. 918 585 8857

Reid Middleton
Everett, Washington

U.S. Department of Transportation
Federal Aviation Administration

Memorandum

Faxed to Pam 8/20/02

Subject: **INFORMATION:** Waiver to FAA Order 7110.65, Paragraph 3-8-3, for BFI ATCT; Your Memo Dated 7/1/02

Date: AUG 20 2002

From: Program Director for Air Traffic Planning and Procedures, ATP-1

Reply to Attn. of:

To: Manager, Air Traffic Division, ANM-500

Your above-referenced request for a waiver to Federal Aviation Administration (FAA) Order 7110.65, Air Traffic Control, Paragraph 3-8-3, Simultaneous Same Direction Operation, is approved.

This waiver authorizes Boeing Field (BFI) Airport Traffic Control Tower (ATCT) personnel to conduct simultaneous same direction operations to Runways 13R/13L and 31R/31L between Categories I and II aircraft with reduced runway centerline distance minima of 375 feet instead of 500 feet.

Attached waiver 02-T-08 has been assigned and is effective August 19, 2002, and is valid for 2 years. A request for renewal of this waiver should be made at least 120 days prior to the expiration date of August 18, 2004.

If you have any questions, please have a member of your staff contact Angela Nelson, ATP-120.1, at (202) 493-4129.

Michael A. Cirillo

Attachment

Waiver: 02-T-08
Date: August 19, 2002
update 8/6/04

FEDERAL AVIATION ADMINISTARATION
AIR TRAFFIC DIRECTIVES
WAIVER/AUTHORIZATION

ISSUED TO:

Manager, Air Traffic Division, ANM-500, for Boeing Field (BFI) Airport Traffic Control Tower (ATCT).

AFFECTED DIRECTIVES:

Federal Aviation Administration (FAA) Order 7110.65, Air Traffic Control, Paragraph 3-8-3, Simultaneous Same Direction Operations.

OPERATIONS AUTHORIZED:

This waiver authorizes BFI ATCT personnel to conduct simultaneous same direction operations to Runways 13R/13L and 31R/31L between Categories I and II aircraft with reduced runway centerline distance minima of 375 feet instead of 500 feet.

SPECIAL PROVISIONS, CONDITIONS, AND LIMITATIONS:

a. This operation shall only be conducted between sunrise and sunset.

b. The special procedures shall be appropriately advertised in a Letter to Airmen and in the Notice to Airmen publication.

c. This waiver is issued on the basis that the published special procedures for the period of the waiver provide an equivalent level of safety.

This waiver is effective August 19, 2002, and is valid for 2 years. Any request for renewal of this waiver should be made at least 120 days prior to the expiration date of August 18, 2004.

Michael A. Cirillo
Program Director for Air Traffic
Planning and Procedures

[redacted]

U.S. Department of Transportation

Dave Kohn
530 Manager

FEDERAL AVIATION ADMINISTRATION
NORTHWEST MOUNTAIN REGION
AIR TRAFFIC DIVISION

ANM-530 FAX SHEET
OPERATIONS BRANCH

1601 LIND AVE SW
RENTON, WA 98055-4056

OFFICE: (425) 227-2530
FAX: (425) 227-1534

FACILITY: SEA ADO ATTN: CAYLA

FROM: GREG MOORE ANM-530.5 EXT: 2539

DATE: 7/11/02

RE: BFI

PAGES: 4 (EXCLUDING COVER)

CC:

COMMENTS: CAYLA, SORRY FOR NOT RESPONDING EARLIER - WAS OUT FOR HAMSTRING TEAR. APPROPRIATE PARS. ARE 3-8-3, 3-9-6 & 3-9-7. THE LOA/LOE REQUEST IS FOR ~~3-8-3~~ 3-8-3V & TBL 3-8-1 SPECIFICALLY THE SDF. I HAVE REQUESTED PAM TO SEND THE LOA REGARDING TAXI MOVEMENT AREA LIMITATIONS. THE BRIEFING SHEET MAY NOT BE READILY AVAILABLE AS THEY ARE PREPARING IT FOR BRIEFING THE NEXT MONTH.

Thanks

Section 8. Spacing and Sequencing

3-8-1. SEQUENCE/SPACING APPLICATION

Establish the sequence of arriving and departing aircraft by requiring them to adjust flight or ground operation, as necessary, to achieve proper spacing.

PHRASEOLOGY-
CLEARED FOR TAKEOFF.

CLEARED FOR TAKEOFF OR HOLD SHORT/HOLD IN POSITION/TAXI OFF THE RUNWAY (traffic).

EXTEND DOWNWIND.

MAKE SHORT APPROACH.

NUMBER (landing sequence number).

FOLLOW (description and location of traffic).

or if traffic is utilizing another runway,

TRAFFIC (description and location) LANDING RUNWAY (number of runway being used).

CIRCLE THE AIRPORT.

MAKE LEFT/RIGHT THREE-SIXTY/TWO SEVENTY.

GO AROUND.

CLEARED TO LAND.

CLEARED:

TOUCH-AND-GO,
or

STOP-AND-GO,
or

LOW APPROACH.

CLEARED FOR THE OPTION,

or

OPTION APPROVED,

or

UNABLE OPTION, (alternate instructions).

or

UNABLE (type of option), OTHER OPTIONS APPROVED.

NOTE-
1. The "Cleared for the Option" procedure will permit an instructor pilot/flight examiner/pilot the option to make a touch-and-go, low approach, missed approach, stop-and-go, or full stop landing. This procedure will only be used at those locations with an operational control tower and will be subject to ATC approval.

2. For proper helicopter spacing, speed adjustments may be more practical than course changes.

3. Read back of hold short instructions apply when hold instructions are issued to a pilot in lieu of a takeoff clearance.

REFERENCE-
FAAO 7110.65, Tied and Ground Movement Operations, Para 3-7-2.

3-8-2. TOUCH-AND-GO OR STOP-AND-GO OR LOW APPROACH

Consider an aircraft cleared for touch-and-go, stop-and-go, or low approach as an arriving aircraft until it touches down (for touch-and-go), or makes a complete stop (for stop-and-go), or crosses the landing threshold (for low approach), and thereafter as a departing aircraft.

REFERENCE-
FAAO 7110.65, Vehicles/Equipment/Personnel on Runways, Para 3-1-5.
FAAO 7110.65, Wake Turbulence Separation for Intersection Departures, Para 3-9-7.

3-8-3. SIMULTANEOUS SAME DIRECTION OPERATION

Authorize simultaneous, same direction operations on parallel runways, on parallel landing strips, or on a runway and a parallel landing strip only when the following conditions are met:

a. Operations are conducted in VFR conditions unless visual separation is applied.

b. Two-way radio communication is maintained with the aircraft involved and pertinent traffic information is issued.

c. The distance between the runways or landing strips is in accordance with the minima in TBL 3-8-1 (use the greater minimum if two categories are involved).

TBL 3-8-1

Same Direction Distance Minima

Aircraft category	Minimum distance (feet) between parallel	
	Runway centerlines	Edges of adjacent strips or runway and strip
Lightweight, single-engine, propeller driven	300	200
Twin-engine, propeller driven	500	400
All others	700	600

3-8-4. SIMULTANEOUS OPPOSITE DIRECTION OPERATION

Authorize simultaneous opposite direction operations on parallel runways, on parallel landing strips, or on a runway and a parallel landing strip only when the following conditions are met:

a. Operations are conducted in VFR conditions.

b. Two-way radio communication is maintained with the aircraft involved and pertinent traffic information is issued.

PHRASEOLOGY-
TRAFFIC (description) ARRIVING/DEPARTING/LOW APPROACH, OPPOSITE DIRECTION ON PARALLEL RUNWAY/LANDING STRIP.

c. The distance between the runways or landing strips is in accordance with the minima in TBL 3-8-2.

TBL 3-8-2

Opposite Direction Distance Minima

Type of Operation	Minimum distance (feet) between parallel	
	Runway centerlines	Edges of adjacent strips or runway and strip
Between sunrise and sunset	1,400	1,400
Between sunset and sunrise	2,800	Not authorized

1. HOLD SHORT OF RUNWAY, *or*
2. HOLD IN POSITION.

b. USAF/USN. When issuing additional instructions or information to an aircraft holding in takeoff position, include instructions to continue holding or taxi off the runway, unless it is cleared for takeoff.

PHRASEOLOGY-
CONTINUE HOLDING,

or

TAXI OFF THE RUNWAY.

REFERENCE-
FAAO 7110.65, Altitude Restricted Low Approach, Para 3-10-10.

3-9-5. ANTICIPATING SEPARATION

Takeoff clearance needs not be withheld until prescribed separation exists if there is a reasonable assurance it will exist when the aircraft starts takeoff roll.

3-9-6. SAME RUNWAY SEPARATION

Separate a departing aircraft from a preceding departing or arriving aircraft using the same runway by ensuring that it does not begin takeoff roll until:

a. The other aircraft has departed and crossed the runway end or turned to avert any conflict. If you can determine distances by reference to suitable landmarks, the other aircraft needs only be airborne if the following minimum distance exists between aircraft: (See FIG 3-9-1 and FIG 3-9-2.)

1. When only Category I aircraft are involved- *3,000 feet.*

2. When a Category I aircraft is preceded by a Category II aircraft- *3,000 feet.*

3. When either the succeeding or both are Category II aircraft- *4,500 feet.*

4. When either is a Category III aircraft- *6,000 feet.*

5. When the succeeding aircraft is a helicopter, visual separation may be applied in lieu of using distance minima.

FIG 3-9-1

Same Runway Separation
[View 1]

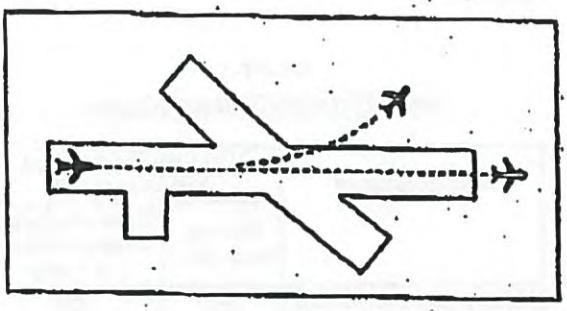
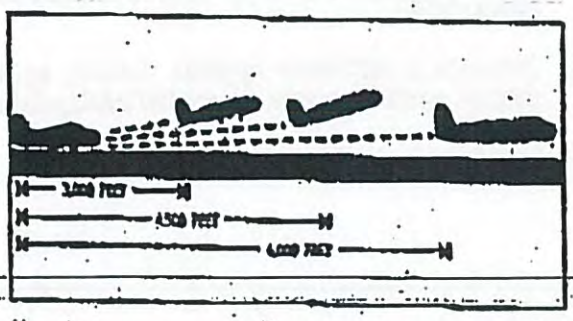


FIG 3-9-2

Same Runway Separation
[View 2]



NOTE-
Aircraft same runway separation (SRS) categories are specified in Appendices A, B, and C and based upon the following definitions:

CATEGORY I- small aircraft weighing 12,500 lbs. or less, with a single propeller driven engine, and all helicopters.

CATEGORY II- small aircraft weighing 12,500 lbs. or less, with propeller driven twin-engines.

CATEGORY III- all other aircraft.

REFERENCE-
FAAO 7110.65, Wake Turbulence Separation for Intersection Departures, Para 3-9-7.

3-9-7. WAKE TURBULENCE SEPARATION FOR INTERSECTION DEPARTURES

a. Apply the following wake turbulence criteria for intersection departures:

1. Separate a small aircraft taking off from an intersection on the same runway (same or opposite direction takeoff) or a parallel runway separated by less than 2,500 feet with runway thresholds offset by 500 feet or more behind a preceding departing large aircraft by ensuring that the small aircraft does not start takeoff roll until at least 3 minutes after the large aircraft has taken off.

2. Separate any aircraft taking off from an intersection on the same runway (same or opposite direction takeoff), parallel runways separated by less than 2,500 feet, and parallel runways separated by less than 2,500 feet with runway thresholds offset by 500 feet or more, by ensuring that the aircraft does not start takeoff roll until at least 3 minutes after a heavy aircraft/B757 has taken off.

NOTE-
Parallel runways separated by less than 2,500 feet with runway thresholds offset by less than 500 feet shall apply para 3-9-6, Same Runway Separation, subpara f.

3. Separate a small aircraft weighing 12,500 lbs. or less taking off from an intersection on the same runway (same or opposite direction takeoff) behind a preceding small aircraft weighing more than 12,500 lbs. by ensuring the following small aircraft does not start takeoff roll until at least 3 minutes after the preceding aircraft has taken off.

4. Inform an aircraft when it is necessary to hold in order to provide the required 3-minute interval.

PHRASEOLOGY-
HOLD FOR WAKE TURBULENCE.

NOTE-
Aircraft conducting touch-and-go and stop-and-go operations are considered to be departing from an intersection.

REFERENCE-
FAAO 7110.65, Touch-and-Go or Stop-and-Go or Low Approach, Para 3-8-2.

b. The 3-minute interval is not required when:

1. A pilot has initiated a request to deviate from that interval unless the preceding departing aircraft is a heavy aircraft/B757.

NOTE-
A request for takeoff does not initiate a waiver request; the request for takeoff must be accomplished by a request to deviate from the 3-minute interval.

2. USA NOT APPLICABLE. The intersection is 500 feet or less from the departure point of the preceding aircraft and both aircraft are taking off in the same direction.

3. Successive touch-and-go and stop-and-go operations are conducted with a small aircraft following another small aircraft weighing more than 12,500 lbs. or a large aircraft in the pattern, or a small aircraft weighing more than 12,500 lbs. or a large aircraft departing the same runway, provided the pilot of the small aircraft is maintaining visual separation/spacing behind the preceding large aircraft. Issue a wake turbulence cautionary advisory and the position of the large aircraft.

EXAMPLE-
"Caution wake turbulence, DC-9 on base leg."

4. Successive touch-and-go and stop-and-go operations are conducted with any aircraft following a heavy aircraft/B757 in the pattern, or heavy aircraft/B757 departing the same runway, provided the pilot of the aircraft is maintaining visual separation/spacing behind the preceding heavy aircraft/B757. Issue a wake turbulence cautionary advisory and the position of the heavy aircraft/B757.

EXAMPLE-
"Caution wake turbulence, heavy Lockheed C5A departing runway two three."

5. If action is initiated to reduce the separation between successive touch-and-go or stop-and-go operations, apply 3 minutes separation.

c. When applying the provision of subpara b:

1. Issue a wake turbulence advisory before clearing the aircraft for takeoff.

2. Do not clear the intersection departure for an immediate takeoff.

3. Issue a clearance to permit the trailing aircraft to deviate from course enough to avoid the flight path of the preceding large departure when applying subpara b1 or b2.

Section 9. Departure Procedures and Separation

3-9-1. DEPARTURE INFORMATION

Provide current departure information, as appropriate, to departing aircraft.

a. Departure information contained in the ATIS broadcast may be omitted if the pilot states the appropriate ATIS code.

b. Issue departure information by including the following:

1. Runway in use. (May be omitted if pilot states "have the numbers.")

2. Surface wind from direct readout dial, LLWAS, or automated weather observing system information display. (May be omitted if pilot states "have the numbers.")

3. Altimeter setting. (May be omitted if pilot states "have the numbers.")

REFERENCE-
FAAO 7110.65, Current Settings, Para 2-7-1.

c. Time, when requested.

d. Issue the official ceiling and visibility, when available, to a departing aircraft before takeoff as follows:

1. To a VFR aircraft when weather is below VFR conditions.

2. To an IFR aircraft when weather is below VFR conditions or highest takeoff minima, whichever is greater.

NOTE-
Standard takeoff minimums are published in 14 CFR Section 91.175(f). Takeoff minima other than standard are prescribed for specific airports/runways and published in a tabular form supplement to the FAA instrument approach procedures charts and appropriate FAA Forms 8260.

e. Taxi information, as necessary. You need not issue taxi route information unless the pilot specifically requests it.

f. *USAF NOT APPLICABLE.* An advisory to "check density altitude" when appropriate.

REFERENCE-
FAAO 7210.3, Broadcast Density Altitude Advisory, Para 2-10-6.

g. Issue braking action for the runway in use as received from pilots or the airport management when Braking Action Advisories are in effect.

REFERENCE-
FAAO 7110.65, Altimeter Setting Issuance Below Lowest Usable FL, Para 2-7-2.
FAAO 7110.65, Low Level Wind Shear Advisories, Para 3-1-8.
FAAO 7110.65, Braking Action Advisories, Para 3-3-5.
P/CG Term- Braking Action Advisories.

3-9-2. DEPARTURE DELAY INFORMATION

USA/USAF/USN NOT APPLICABLE

When gate-hold procedures are in effect, issue the following departure delay information as appropriate:

REFERENCE-
FAAO 7210.3, Gate Hold Procedures, Para 10-4-3.

a. Advise departing aircraft the time at which the pilot can expect to receive engine startup advisory.

PHRASEOLOGY-
GATE HOLD PROCEDURES ARE IN EFFECT. ALL AIRCRAFT CONTACT (position) ON (frequency) FOR ENGINE START TIME. EXPECT ENGINE START/TAXI (time).

b. Advise departing aircraft when to start engines and/or to advise when ready to taxi.

PHRASEOLOGY-
START ENGINES, ADVISE WHEN READY TO TAXI,

or

ADVISE WHEN READY TO TAXI.

c. If the pilot requests to hold in a delay absorbing area, the request shall be approved if space and traffic conditions permit.

d. Advise all aircraft on GC/FD frequency upon termination of gate hold procedures.

PHRASEOLOGY-
GATE HOLD PROCEDURES NO LONGER IN EFFECT.

3-9-3. DEPARTURE CONTROL INSTRUCTIONS

Inform departing IFR, SVFR, VFR aircraft receiving radar service, and TRSA VFR aircraft of the following:

a. Before takeoff.

1. Issue the appropriate departure control frequency and beacon code. The departure control

frequency may be omitted if a DP has been or will be assigned and the departure control frequency is published on the DP.

PHRASEOLOGY-
DEPARTURE FREQUENCY WILL BE (frequency), SQUAWK (code).

2. Inform all departing IFR military turboprop/ turbojet aircraft (except transport and cargo types) to change to departure control frequency. If the local controller has departure frequency override, transmit urgent instructions on this frequency. If the override capability does not exist, transmit urgent instructions on the emergency frequency.

PHRASEOLOGY-
CHANGE TO DEPARTURE.

3. *USAF.* USAF control towers are authorized to inform all departing IFR military transport/cargo type aircraft operating in formation flight to change to departure control frequency before takeoff.

b. After takeoff.

1. When the aircraft is about $^1/_2$ mile beyond the runway end, instruct civil aircraft, and military transport, and cargo types to contact departure control, provided further communication with you is not required.

2. Do not request departing military turboprop/ turbojet aircraft (except transport and cargo types) to make radio frequency or radar beacon changes before the aircraft reaches 2,500 feet above the surface.

REFERENCE-
FAAO 7110.65, Visual Separation, Para 7-2-1.

3-9-4. TAXI INTO POSITION AND HOLD (TIPH)

a. The intent of TIPH is to position aircraft for an imminent departure. Authorize an aircraft to taxi into position and hold, except as restricted in subpara f, when takeoff clearance cannot be issued because of traffic. Issue traffic information to any aircraft so authorized. Traffic information may be omitted when the traffic is another aircraft which has landed on or is taking off the same runway and is clearly visible to the holding aircraft. Do not use conditional phrases such as "behind landing traffic" or "after the departing aircraft."

b. *USN NOT APPLICABLE.* First state the runway number followed by the taxi into position clearance when more than one runway is active.

PHRASEOLOGY-
RUNWAY (number), TAXI INTO POSITION AND HOLD.

Or, when only one runway is active:

TAXI INTO POSITION AND HOLD.

c. When an aircraft is authorized to taxi into takeoff position to hold, inform it of the closest traffic that is cleared to land, touch-and-go, stop-and-go, or unrestricted low approach on the same runway.

EXAMPLE-
"United Five, runway one eight, taxi into position and hold. Traffic a Boeing Seven Thirty Seven, six mile final."

Or, when only one runway is active:

"United Five, taxi into position and hold. Traffic a Boeing Seven Thirty Seven, six mile final."

d. *USAF.* When an aircraft is authorized to taxi into takeoff position to hold, inform it of the closest traffic within 6 miles on final approach to the same runway. If the approaching aircraft is on a different frequency, inform it of the aircraft taxing into position.

e. Do not authorize an aircraft to taxi into position and hold when the departure point is not visible from the tower, unless the aircraft's position can be verified by ASDE or the runway is used for departures only.

f. Do not authorize an aircraft to taxi into position and hold at an intersection between sunset and sunrise or at anytime when the intersection is not visible from the tower.

g. *USN.* Do not authorize aircraft to taxi into takeoff position to hold simultaneously on intersecting runways.

PHRASEOLOGY-
CONTINUE HOLDING,

or

TAXI OFF THE RUNWAY.

REFERENCE-
FAAO 7110.65, Altitude Restricted Low Approach, Para 3-10-10.

h. When a local controller delivers or amends an ATC clearance to an aircraft awaiting departure and that aircraft is holding short of a runway or is holding in position on a runway, an additional clearance shall be issued to prevent the possibility of the aircraft inadvertently taxiing onto the runway and/or beginning takeoff roll. In such cases, append one of the following ATC instructions as appropriate:

1. HOLD SHORT OF RUNWAY, *or*

2. HOLD IN POSITION.

i. *USAF/USN.* When issuing additional instructions or information to an aircraft holding in takeoff position, include instructions to continue holding or taxi off the runway, unless it is cleared for takeoff.

PHRASEOLOGY-
CONTINUE HOLDING,

or

TAXI OFF THE RUNWAY.

REFERENCE-
FAAO 7110.65, Altitude Restricted Low Approach, Para 3-10-10.

3-9-5. ANTICIPATING SEPARATION

Takeoff clearance needs not be withheld until prescribed separation exists if there is a reasonable assurance it will exist when the aircraft starts takeoff roll.

3-9-6. SAME RUNWAY SEPARATION

Separate a departing aircraft from a preceding departing or arriving aircraft using the same runway by ensuring that it does not begin takeoff roll until:

a. The other aircraft has departed and crossed the runway end or turned to avert any conflict. If you can determine distances by reference to suitable landmarks, the other aircraft needs only be airborne if the following minimum distance exists between aircraft: (See FIG 3-9-1 and FIG 3-9-2.)

1. When only Category I aircraft are involved- *3,000 feet.*

2. When a Category I aircraft is preceded by a Category II aircraft- *3,000 feet.*

3. When either the succeeding or both are Category II aircraft- *4,500 feet.*

4. When either is a Category III aircraft- *6,000 feet.*

5. When the succeeding aircraft is a helicopter, visual separation may be applied in lieu of using distance minima.

FIG 3-9-1

Same Runway Separation [View 1]

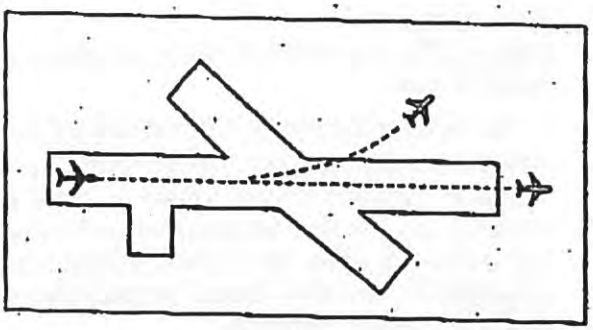
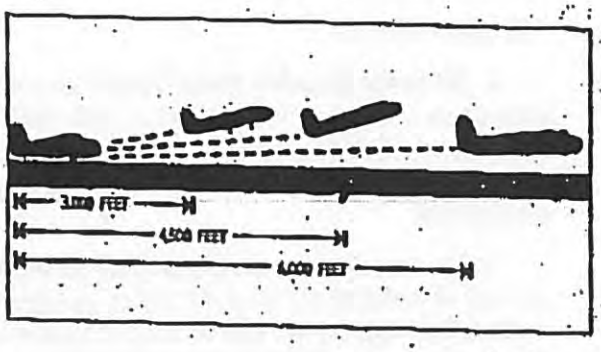


FIG 3-9-2

Same Runway Separation [View 2]



NOTE-
Aircraft same runway separation (SRS) categories are specified in Appendices A, B, and C and based upon the following definitions:

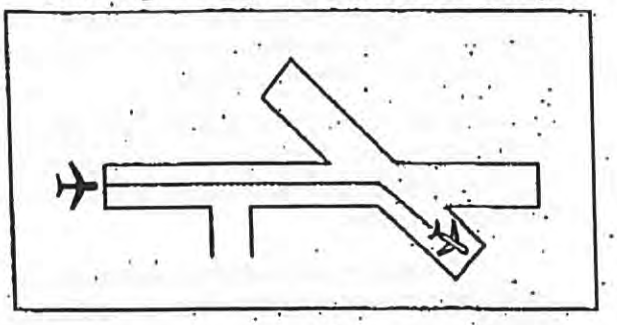
CATEGORY I- small aircraft weighing 12,500 lbs. or less, with a single propeller driven engine, and all helicopters.

CATEGORY II- small aircraft weighing 12,500 lbs. or less, with propeller driven twin-engines.

CATEGORY III- all other aircraft.

b. A preceding landing aircraft is clear of the runway. (See FIG 3-9-3.)

FIG 3-9-3
Preceding Landing Aircraft Clear of Runway



REFERENCE-
PCG Term- Clear of the Runway.

WAKE TURBULENCE APPLICATION

c. Do not issue clearances which imply or indicate approval of rolling takeoffs by heavy jet aircraft except as provided in para 3-1-14, Ground Operations When Volcanic Ash is Present.

d. Do not issue clearances to a small aircraft to taxi into position and hold on the same runway behind a departing heavy jet aircraft to apply the necessary intervals.

REFERENCE-
AC 90-23, Aircraft Wake Turbulence.

e. The minima in para 5-5-4, Minima, may be applied in lieu of the 2-minute requirement in subpara f. When para 5-5-4, Minima, are applied, ensure that the appropriate radar separation exists at or prior to the time an aircraft becomes airborne when taking off behind a heavy jet/B757.

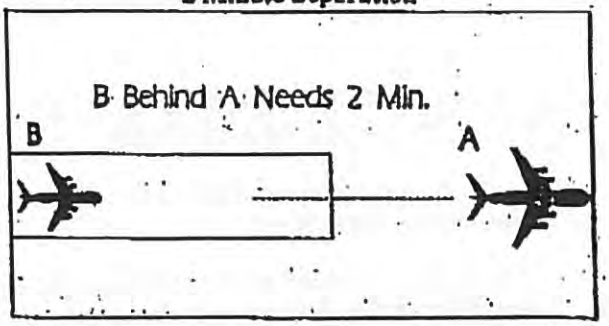
NOTE-
The pilot may request additional separation; i.e., 2 minutes vs. 4 miles, but should make this request before taxiing on the runway.

f. Separate IFR/VFR aircraft taking off behind a heavy jet/B757 departure by 2 minutes, when departing:

NOTE-
Takeoff clearance to the following aircraft should not be issued until 2 minutes after the heavy jet/B757 begins takeoff roll.

1. The same runway. (See FIG 3-9-4.)

FIG 3-9-4
2 Minute Separation



2. A parallel runway separated by less than 2,500 feet.

g. Separate an aircraft from a heavy jet/B757 when operating on a runway with a displaced landing threshold if projected flight paths will cross- *2 minutes when:*

1. A departure follows a heavy jet/B757 arrival.

2. An arrival follows a heavy jet/B757 departure.

h. Air traffic controllers shall not approve pilot requests to deviate from the required wake turbulence time interval if the preceding aircraft is a heavy jet/B757.

i. Separate a small aircraft behind a large aircraft taking off or making a low/missed approach when utilizing opposite direction takeoffs on the same runway by *3 minutes* unless a pilot has initiated a request to deviate from the 3-minute interval. In the latter case, issue a wake turbulence advisory before clearing the aircraft for takeoff.

NOTE-
1. A request for takeoff does not initiate a waiver request.
2. To initiate a waiver of the 3-minute rule, the request for takeoff must be accompanied by a request to deviate from the 3-minute rule.

REFERENCE-
FAAO 7110.65, Aircraft Information: Appendix A, Appendix B, and Appendix C.

j. Separate aircraft behind a heavy jet/B757 departing or making a low/missed approach when utilizing opposite direction takeoffs or landings on the same or parallel runways separated by less than 2,500 feet- *3 minutes.*

k. Inform an aircraft when it is necessary to hold in order to provide the required *3-minute* interval.

PHRASEOLOGY-
HOLD FOR WAKE TURBULENCE.

REFERENCE-
FAAO 7110.65, Wake Turbulence Separation for Intersection Departures, Para 3-9-7.

3-9-7. WAKE TURBULENCE SEPARATION FOR INTERSECTION DEPARTURES

a. Apply the following wake turbulence criteria for intersection departures:

1. Separate a small aircraft taking off from an intersection on the same runway (same or opposite direction takeoff) or a parallel runway separated by less than 2,500 feet with runway thresholds offset by 500 feet or more behind a preceding departing large aircraft by ensuring that the small aircraft does not start takeoff roll until at least 3 minutes after the large aircraft has taken off.

2. Separate any aircraft taking off from an intersection on the same runway (same or opposite direction takeoff), parallel runways separated by less than 2,500 feet, and parallel runways separated by less than 2,500 feet with runway thresholds offset by 500 feet or more, by ensuring that the aircraft does not start takeoff roll until at least 3 minutes after a heavy aircraft/B757 has taken off.

NOTE-
Parallel runways separated by less than 2,500 feet with runway thresholds offset by less than 500 feet shall apply para 3-9-6, Same Runway Separation, subpara f.

3. Separate a small aircraft weighing 12,500 lbs. or less taking off from an intersection on the same runway (same or opposite direction takeoff) behind a preceding small aircraft weighing more than 12,500 lbs. by ensuring the following small aircraft does not start takeoff roll until at least 3 minutes after the preceding aircraft has taken off.

4. Inform an aircraft when it is necessary to hold in order to provide the required 3-minute interval.

PHRASEOLOGY-
HOLD FOR WAKE TURBULENCE.

NOTE-
Aircraft conducting touch-and-go and stop-and-go operations are considered to be departing from an intersection.

REFERENCE-
FAAO 7110.65, Touch-and-Go or Stop-and-Go or Low Approach, Para 3-8-2.

b. The 3-minute interval is not required when:

1. A pilot has initiated a request to deviate from that interval unless the preceding departing aircraft is a heavy aircraft/B757.

NOTE-
A request for takeoff does not initiate a waiver request; the request for takeoff must be accomplished by a request to deviate from the 3-minute interval.

2. USA NOT APPLICABLE. The intersection is 500 feet or less from the departure point of the preceding aircraft and both aircraft are taking off in the same direction.

3. Successive touch-and-go and stop-and-go operations are conducted with a small aircraft following another small aircraft weighing more than 12,500 lbs. or a large aircraft in the pattern, or a small aircraft weighing more than 12,500 lbs. or a large aircraft departing the same runway, provided the pilot of the small aircraft is maintaining visual separation/spacing behind the preceding large aircraft. Issue a wake turbulence cautionary advisory and the position of the large aircraft.

EXAMPLE-
"Caution wake turbulence, DC-9 on base leg."

4. Successive touch-and-go and stop-and-go operations are conducted with any aircraft following a heavy aircraft/B757 in the pattern, or heavy aircraft/B757 departing the same runway, provided the pilot of the aircraft is maintaining visual separation/spacing behind the preceding heavy aircraft/B757. Issue a wake turbulence cautionary advisory and the position of the heavy aircraft/B757.

EXAMPLE-
"Caution wake turbulence, heavy Lockheed C5A departing runway two three."

5. If action is initiated to reduce the separation between successive touch-and-go or stop-and-go operations, apply 3 minutes separation.

c. When applying the provision of subpara b:

1. Issue a wake turbulence advisory before clearing the aircraft for takeoff.

2. Do not clear the intersection departure for an immediate takeoff.

3. Issue a clearance to permit the trailing aircraft to deviate from course enough to avoid the flight path of the preceding large departure when applying subpara b1 or b2.

4. Separation requirements in accordance with para 3-9-6, Same Runway Separation, must also apply.

REFERENCE-
FAAO 7110.65, Same Runway Separation, Para 3-9-6.

3-9-8. INTERSECTING RUNWAY SEPARATION

Separate departing aircraft from an aircraft using an intersecting runway, or nonintersecting runways when the flight paths intersect, by ensuring that the departure does not begin takeoff roll until one of the following exists:

a. The preceding aircraft has departed and passed the intersection, has crossed the departure runway, or is turning to avert any conflict.
(See FIG 3-9-5 and FIG 3-9-6.)

FIG 3-9-5
Intersecting Runway Separation

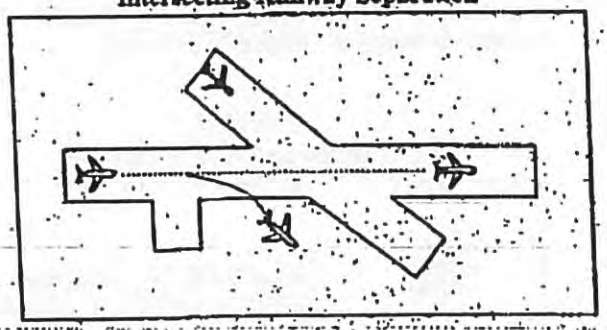
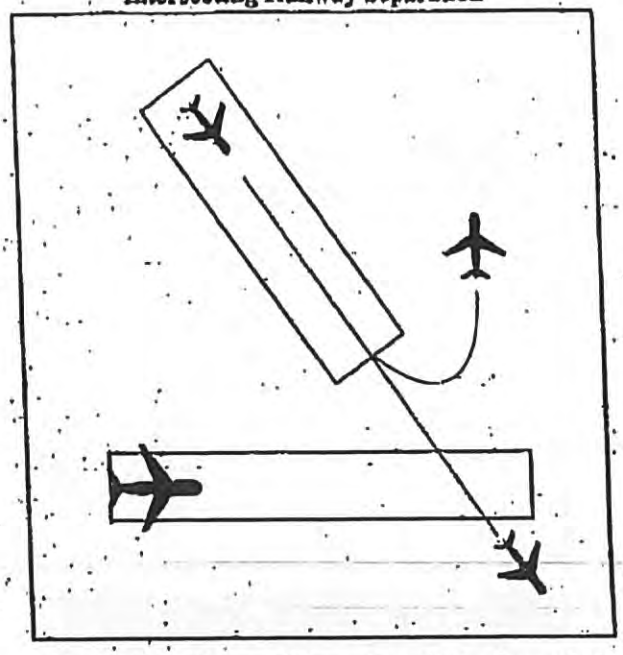


FIG 3-9-6
Intersecting Runway Separation



b. A preceding arriving aircraft is clear of the landing runway, completed the landing roll and will hold short of the intersection, passed the intersection, or has crossed over the departure runway.
(See FIG 3-9-7 and FIG 3-9-8.)

REFERENCE-
PCG Term- Clear of the Runway.

FIG 3-9-7
Intersecting Runway Separation

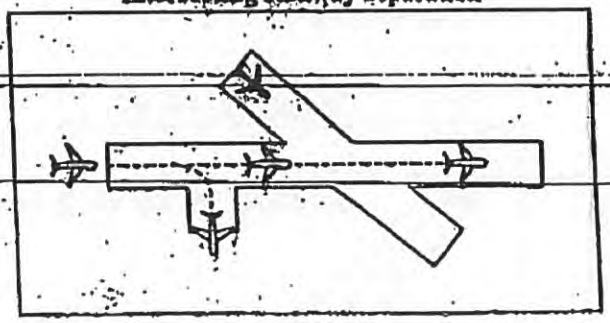
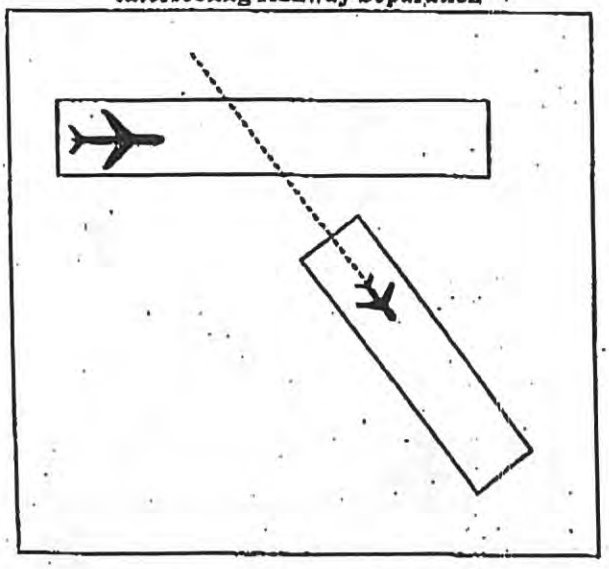


FIG 3-9-8
Intersecting Runway Separation



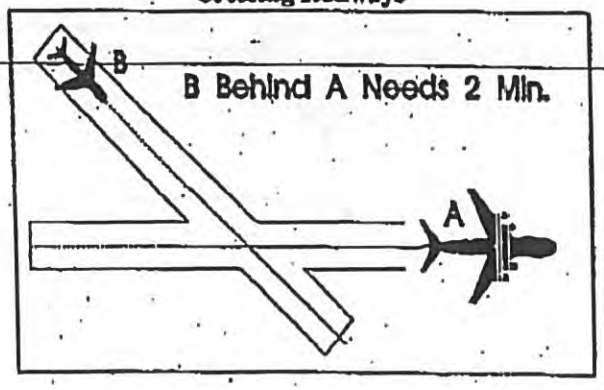
WAKE TURBULENCE APPLICATION

e. Separate IFR/VFR aircraft taking off behind a heavy jet/B757 departure by *2 minutes* when departing:

NOTE-
Takeoff clearance to the following aircraft should not be issued until 2 minutes after the heavy jet/B757 begins takeoff roll.

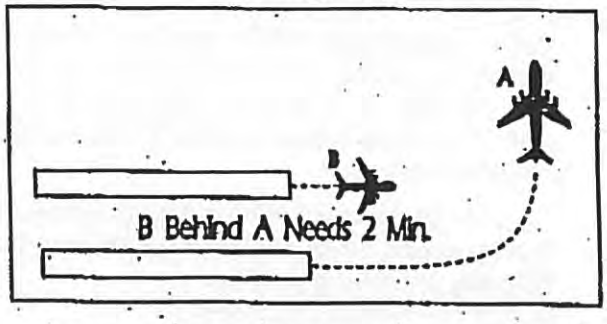
1. Crossing runways if projected flight paths will cross. (See FIG 3-9-9.)

FIG 3-9-9
Crossing Runways



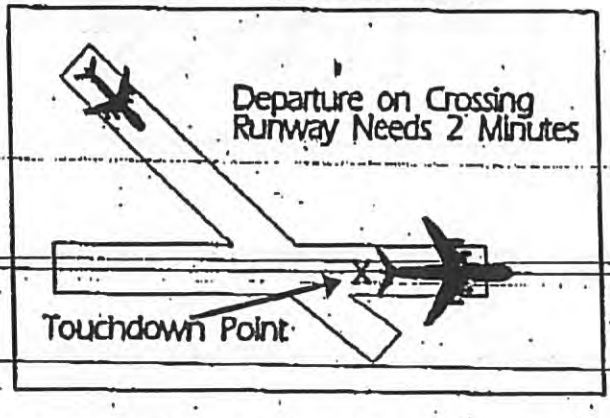
2. A parallel runway separated by 2,500 feet or more if projected flight paths will cross. (See FIG 3-9-10.)

FIG 3-9-10
Parallel Runway



d. Separate IFR/VFR aircraft departing behind a landing heavy jet/B757 on a crossing runway if the departure will fly through the airborne path of the arrival- *2 minutes.* (See FIG 3-9-11.)

FIG 3-9-11
Departure on Crossing Runway



e. Air traffic controllers shall not approve pilot requests to deviate from the required wake turbulence time interval if the preceding aircraft is a heavy jet/B757.

REFERENCE-
FAAO 7110.65, Successive or Simultaneous Departures, Para 5-8-3.
FAAO 7110.65, Departures and Arrivals on Parallel or Nonintersecting Diverging Runways, Para 5-8-5.

January 17, 2001

BFI 7232.2D CHG 2

CHAPTER 7. LOCAL CONTROL

7-1. PROCEDURES AND RESPONSIBILITIES

a. Area of Jurisdiction

(1) LCW has jurisdiction of the following areas: Local West

(a) Runway 13R/31L.
(b) Taxiways A2, A4, A7, and A8 between the runways.
(c) The Boeing Class D Airspace, southwest of a line parallel to and midway between the runway centerlines, below 2,000 feet and below the Seattle Class B Airspace.

(2) LCE has jurisdiction of the following areas: Local East

(a) Runway 13L/31R.
(b) Pad 1.
(c) The Boeing Class D Airspace, northeast of a line parallel to and midway between the runway centerlines, below 2,000 feet and below the Seattle Class B Airspace.

b. Flight progress strips shall be posted as follows:

(1) LCW shall manage the IFR and SVFR departure strips from the time the aircraft has been taxied to the runway, until communications have been transferred to departure or the aircraft has exited BFI airspace, then FD may remove and file the strip.

(2) LCW shall manage the arrival flight progress strips from the time the aircraft has been observed on the DBRITE, or coordinated inbound, until the aircraft exits all runways. After the aircraft exits all runways, FD may remove and file the strip.

(3) IFR departure strips that have been amended to VFR flight following may be discarded after communications have been transferred.

(4) Strips for VFR departures from other than the designated departure point may be discarded after takeoff.

c. When LC's are decombined, coordination and approval is required as follows: Whenever LCW is in the way = LCW and LCE must coordinate

(1) LCW shall coordinate and obtain approval from LCE for the following operations:

(a) To cross Runway 13L/31R.
(b) Heavy jet or B737 departures.
(c) All operations in LCE's area of jurisdiction, including:
1 Helicopter operations.
2 Pattern operations.
3 Visual approaches entering other than the normal approach gate.
4 Overflights.
5 Takeoffs, landings, touch and goes, etc. on Runway 13L/31R.

for wake Turbulence

(2) LCE shall coordinate and obtain approval from LCW for the following operations:

(a) To cross Runway 13R/31L.
(b) IFR departures on Runway 13L/31R.
(c) All operations in LCW's area of jurisdiction, including:
1 Helicopter operations.
2 Pattern operations.
3 Visual approaches entering other than the normal approach gate.

Section 10. Arrival Procedures and Separation

3-10-1. LANDING INFORMATION

Provide current landing information, as appropriate, to arriving aircraft. Landing information contained in the ATIS broadcast may be omitted if the pilot states the appropriate ATIS code. Runway, wind, and altimeter may be omitted if a pilot uses the phrase "have numbers." Issue landing information by including the following:

NOTE-
Pilot use of "have numbers" does not indicate receipt of the ATIS broadcast.

a. Specific traffic pattern information (may be omitted if the aircraft is to circle the airport to the left).

PHRASEOLOGY-
ENTER LEFT/RIGHT BASE.

STRAIGHT-IN.

MAKE STRAIGHT-IN.

STRAIGHT-IN APPROVED.

RIGHT TRAFFIC.

MAKE RIGHT TRAFFIC.

RIGHT TRAFFIC APPROVED, CONTINUE.

b. Runway in use.

c. Surface wind.

d. Altimeter setting.

REFERENCE-
FAAO 7110.65, Current Settings, Para 2-7-1.

e. Any supplementary information.

f. Clearance to land.

g. Requests for additional position reports. Use prominent geographical fixes which can be easily recognized from the air, preferably those depicted on sectional charts. This does not preclude the use of the legs of the traffic pattern as reporting points.

NOTE-
At some locations, VFR checkpoints are depicted on sectional aeronautical and terminal area charts. In selecting geographical fixes, depicted VFR checkpoints are preferred unless the pilot exhibits a familiarity with the local area.

h. Ceiling and visibility if either is below basic VFR minima.

i. Low level wind shear advisories when available.

REFERENCE-
FAAO 7110.65, Low Level Wind Shear Advisories, Para 3-1-8.

j. Issue braking action for the runway in use as received from pilots or the airport management when Braking Action Advisories are in effect.

REFERENCE-
FAAO 7110.65, Braking Action Advisories, Para 3-3-5.

3-10-2. FORWARDING APPROACH INFORMATION BY NONAPPROACH CONTROL FACILITIES

a. Forward the following, as appropriate, to the control facility having IFR jurisdiction in your area. You may eliminate those items that, because of local conditions or situations, are fully covered in a letter of agreement or a facility directive.

1. When you clear an arriving aircraft for a visual approach.

REFERENCE-
FAAO 7110.65, Visual Approach, Para 7-4-1.

2. Aircraft arrival time.

3. Cancellation of IFR flight plan.

4. Information on a missed approach, unreported, or overdue aircraft.

5. Runway in use.

6. Weather as required.

REFERENCE-
FAAO 7110.65, Reporting Weather Conditions, Para 2-6-6.

b. When the weather is below 1,000 feet or 3 miles or the highest circling minimums, whichever is greater, issue current weather to aircraft executing an instrument approach if it changes from that on the ATIS or that previously forwarded to the center/approach control.

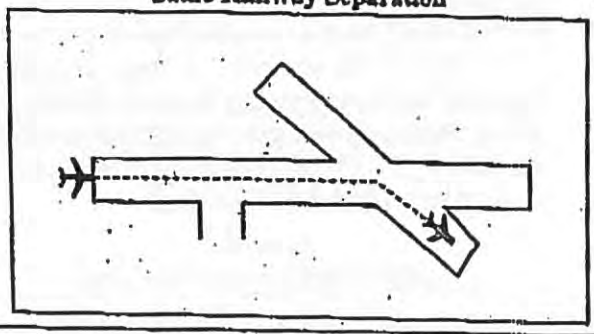
3-10-3. SAME RUNWAY SEPARATION

a. Separate an arriving aircraft from another aircraft using the same runway by ensuring that the arriving aircraft does not cross the landing threshold until one of the following conditions exists or unless authorized in para 3-10-10, Altitude Restricted Low Approach.

1. The other aircraft has landed and is clear of the runway. Between sunrise and sunset, if you can determine distances by reference to suitable landmarks and the other aircraft has landed, it need not be clear of the runway if the following minimum distance from the landing threshold exists: (See FIG 3-10-1.)

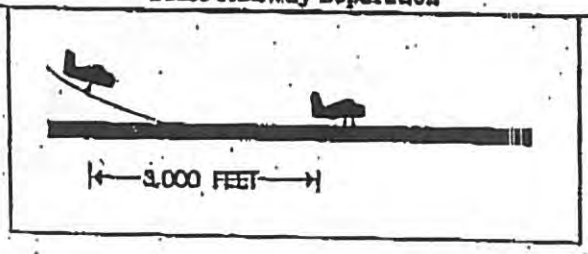
REFERENCE-
PCG Term- Clear of the Runway.

FIG 3-10-1
Same Runway Separation



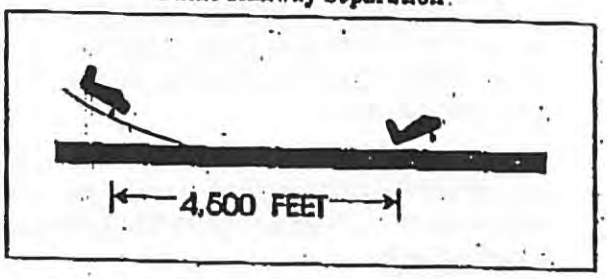
(a) When a Category I aircraft is landing behind a Category I or II- *3,000 feet.* (See FIG 3-10-2.)

FIG 3-10-2
Same Runway Separation



(b) When a Category II aircraft is landing behind a Category I or II- *4,500 feet.* (See FIG 3-10-3.)

FIG 3-10-3
Same Runway Separation



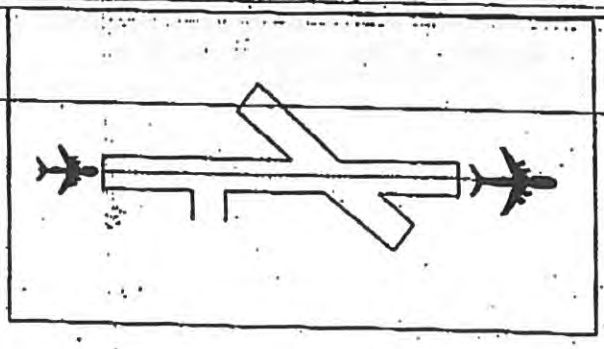
2. The other aircraft has departed and crossed the runway end. If you can determine distances by reference to suitable landmarks and the other aircraft is airborne, it need not have crossed the runway end if the following minimum distance from the landing threshold exists:

(a) Category I aircraft landing behind Category I or II- *3,000 feet.*

(b) Category II aircraft landing behind Category I or II- *4,500 feet.*

(c) When either is a category III aircraft- *6,000 feet.* (See FIG 3-10-4 and FIG 3-10-5.)

FIG 3-10-4
Same Runway Separation



4. Issue the measured distance from the landing threshold to the hold short point rounded "down" to the nearest 50-foot increment if requested by either aircraft.

EXAMPLE-
"Five thousand fifty feet available."

5. The conditions in subparas b2, 3, and 4 shall be met in sufficient time for the pilots to take other action, if desired, and no later than the time landing clearance is issued.

6. Land and Hold Short runways must be free of any contamination as described in the current LAHSO directive, with no reports that braking action is less than good.

7. There is no tailwind for the landing aircraft restricted to hold short of the intersection. The wind may be described as "calm" when appropriate.

REFERENCE-
FAAO 7110.65, Calm Wind Conditions, Para 2-6-5.

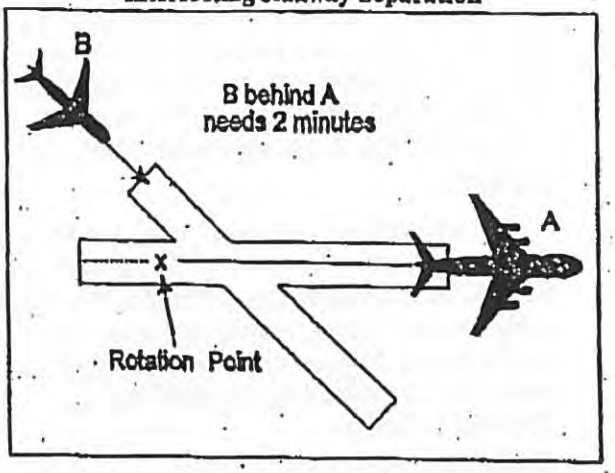
8. The aircraft required landing distances are listed in the current LAHSO directive.

9. STOL aircraft operations are in accordance with a letter of agreement with the aircraft operator/pilot or the pilot confirms that it is a STOL aircraft.

WAKE TURBULENCE APPLICATION

c. Separate IFR/VFR aircraft landing behind a departing heavy jet/B757 on a crossing runway if the arrival will fly through the airborne path of the departure: *2 minutes* or the appropriate radar separation minima. (See FIG 3-10-10.)

FIG 3-10-10
Intersecting Runway Separation

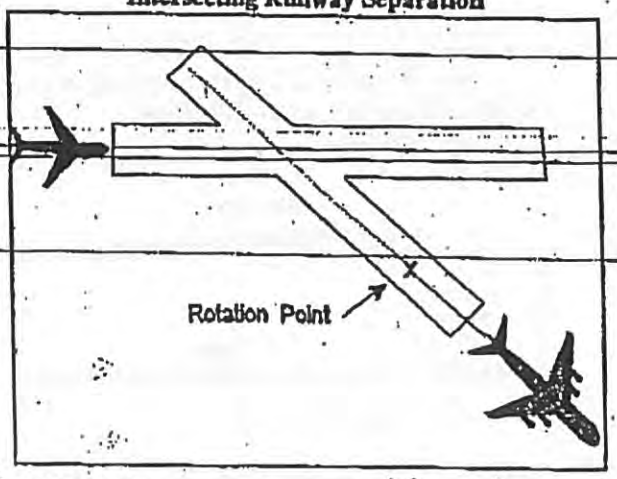


d. Issue wake turbulence cautionary advisories, the position, altitude if known, and direction of flight of the heavy jet/B757 to:

REFERENCE-
AC 90-23, Aircraft Wake Turbulence, Pilot Responsibility, Para 12.

1. IFR/VFR aircraft landing on crossing runways behind a departing heavy jet/B757; if the arrival flight path will cross the takeoff path behind the heavy jet/B757 and behind the heavy jet/B757 rotation point. (See FIG 3-10-11.)

FIG 3-10-11
Intersecting Runway Separation



EXAMPLE-
"Runway niner cleared to land. Caution wake turbulence, heavy C-One Forty One departing runway one five."

Section 5. Radar Separation

5-5-1. APPLICATION

a. Radar separation shall be applied to all RNAV aircraft operating on a random (impromptu) route at or below FL 450.

b. Radar separation may be applied between:

1. Radar identified aircraft.

2. An aircraft taking off and another radar identified aircraft when the aircraft taking off will be radar-identified within 1 mile of the runway end.

3. A radar-identified aircraft and one not radar-identified when either is cleared to climb/descend through the altitude of the other provided:

(a) The performance of the radar system is adequate and, as a minimum, primary radar targets or ASR-9/Full Digital Radar Primary Symbol targets are being displayed on the display being used within the airspace within which radar separation is being applied; and

(b) Flight data on the aircraft not radar-identified indicate it is a type which can be expected to give adequate primary/ASR-9/Full Digital Radar Primary Symbol return in the area where separation is applied; and

(c) The airspace within which radar separation is applied is not less than the following number of miles from the edge of the radar display:

(1) When less than 40 miles from the antenna- *6 miles;*

(2) When 40 miles or more from the antenna- *10 miles;*

(3) Narrowband radar operations- *10 miles;* and

(d) Radar separation is maintained between the radar-identified aircraft and all observed primary, ASR-9/Full Digital Radar Primary Symbol, and secondary radar targets until nonradar separation is established from the aircraft not radar identified; and

(e) When the aircraft involved are on the same relative heading, the radar-identified aircraft is vectored a sufficient distance from the route of the aircraft not radar identified to assure the targets are not superimposed prior to issuing the clearance to climb/descend.

REFERENCE-
FAAO 7110.65, Exceptions, Para 4-1-2.
FAAO 7110.65, Route Use, Para 4-4-1.
FAAO 7110.65, Application, Para 5-3-1.
FAAO 7110.65, Additional Separation for Formation Flights, Para 5-5-8.
FAAO 7110.65, Approach Separation Responsibility, Para 5-9-5.

5-5-2. TARGET SEPARATION

a. Apply radar separation:

1. Between the centers of primary radar targets; however, do not allow a primary target to touch another primary target or a beacon control slash.

2. Between the ends of beacon control slashes.

NOTE-
At TPX-42 sites, the bracket video feature must be activated to display the beacon control slash.

3. Between the end of a beacon control slash and the center of a primary target.

4. All-digital displays. Between the centers of digitized targets. Do not allow digitized targets to touch.

REFERENCE-
FAAO 7110.65, Simultaneous Independent ILS/MLS Approaches-Dual & Triple, Para 5-9-7.

5-5-3. TARGET RESOLUTION

a. A process to ensure that correlated radar targets or digitized targets do not touch.

b. Mandatory traffic advisories and safety alerts shall be issued when this procedure is used.

NOTE-
This procedure shall not be provided utilizing mosaic radar systems.

c. Target resolution shall be applied as follows:

1. Between the edges of two primary targets or the edges of primary digitized targets.

2. Between the end of the beacon control slash and the edge of a primary target or primary digitized target.

3. Between the ends of two beacon control slashes.

5-5-4. MINIMA

Separate aircraft by the following minima:

NOTE-
Wake turbulence procedures specify increased separation minima required for certain classes of aircraft because of the possible effects of wake turbulence.

a. Broadband Radar System or Full Digital Terminal Radar System:

NOTE-
1. *Includes single sensor long range radar mode.*

2. *When less than 40 miles from the antenna- 3 miles.*

3. *When 40 miles or more from the antenna- 5 miles.*

EN ROUTE

b. Stage A/DARC, M-EARTS Mosaic Mode, Terminal Mosaic Mode:

NOTE-
Mosaic Mode combines radar input from 2 to 16 sites into a single picture utilizing a mosaic grid composed of radar sort boxes.

1. Below FL 600- *5 miles.*

2. At or above FL 600- *10 miles.*

3. For areas meeting all of the following conditions:

(a) Radar site adaptation is set to single sensor.

(b) Significant operational advantages can be obtained.

(c) Within 40 miles of the antenna.

(d) Below FL 180.

(e) Facility directives specifically define the area where the separation can be applied. Facility directives may specify 3 miles.

REFERENCE-
FAAO 7210.3, Single Site Coverage Stage A Operations, Para 8-2-1.
FAAO 7210.3, Single Site Coverage ATTS Operations, Para 11-8-15.

4. When transitioning from terminal to en route control, 3 miles increasing to 5 miles or greater, provided:

(a) The aircraft are on diverging routes/courses, and/or

(b) The leading aircraft is and will remain faster than the following aircraft; and

(c) Separation constantly increasing and the first center controller will establish 5 NM or other appropriate form of separation prior to the aircraft departing the first center sector; and

(d) The procedure is covered by a letter of agreement between the facilities involved and limited to specified routes and/or sectors/positions.

c. M-EARTS Sensor Mode:

NOTE-
1. *Sensor Mode displays information from the radar input of a single site.*

2. *Procedures to convert M-EARTS Mosaic Mode to M-EARTS Sensor Mode at each PVD/MDM will be established by facility directive.*

1. When less than 40 miles from the antenna- *3 miles.*

2. When 40 miles or more from the antenna- *5 miles.*

WAKE TURBULENCE APPLICATION

d. Separate aircraft operating directly behind, or directly behind and less than 1,000 feet below, or following an aircraft conducting an instrument approach by:

NOTE-
Consider parallel runways less than 2,500 feet apart as a single runway because of the possible effects of wake turbulence.

1. Heavy behind heavy- *4 miles.*

2. Large/heavy behind B757- *4 miles.*

3. Small behind B757- *5 miles.*

4. Small/large behind heavy – *5 miles.*

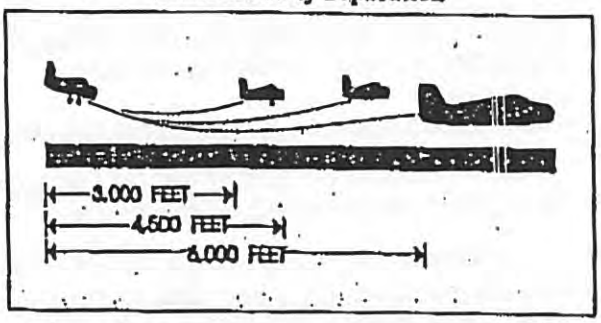
WAKE TURBULENCE APPLICATION

e. *TERMINAL.* In addition to subpara d, separate an aircraft landing behind another aircraft on the same runway, or one making a touch-and-go, stop-and-go, or low approach by ensuring the following minima will exist at the time the preceding aircraft is over the landing threshold:

NOTE-
Consider parallel runways less than 2,500 feet apart as a single runway because of the possible effects of wake turbulence.

1. Small behind large- *4 miles.*

FIG 3-10-5
Same Runway Separation



3. When the succeeding aircraft is a helicopter, visual separation may be applied in lieu of using distance minima.

WAKE TURBULENCE APPLICATION.

b. Issue wake turbulence advisories, and the position, altitude if known, and the direction of flight of:

1. The heavy jet/B757 to aircraft landing behind a departing/arriving heavy jet/B757 on the same or parallel runways separated by less than 2,500 feet.

2. The large aircraft to a small aircraft landing behind a departing/arriving large aircraft on the same or parallel runways separated by less than 2,500 feet.

REFERENCE-
AC 90-23, Aircraft Wake Turbulence, Pilot Responsibility, Para 12.
FAAO 7110.65, Altitude Restricted Low Approach, Para 3-10-10.

EXAMPLE-
1. "Runway two seven left cleared to land, caution wake turbulence, heavy Boeing 747 departing runway two seven right."

2. "Number two follow Boeing 757 on two-mile final Caution wake turbulence."

3-10-4. INTERSECTING RUNWAY SEPARATION

a. Separate an arriving aircraft using one runway from another aircraft using an intersecting runway or a nonintersecting runway when the flight paths intersect by ensuring that the arriving aircraft does not cross the landing threshold or flight path of the other aircraft until one of the following conditions exists:

1. The preceding aircraft has departed and passed the intersection/flight path or is airborne and turning to avert any conflict.
(See FIG 3-10-6 and FIG 3-10-7.)

FIG 3-10-6
Intersecting Runway Separation

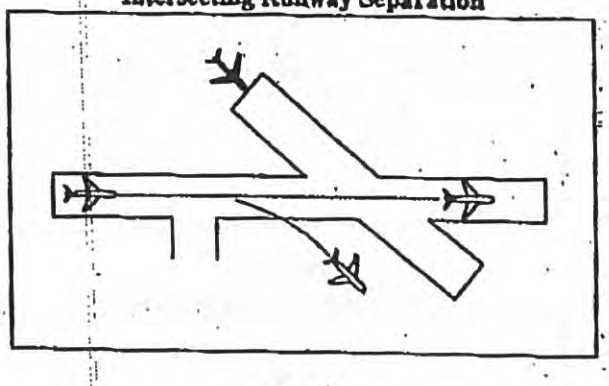
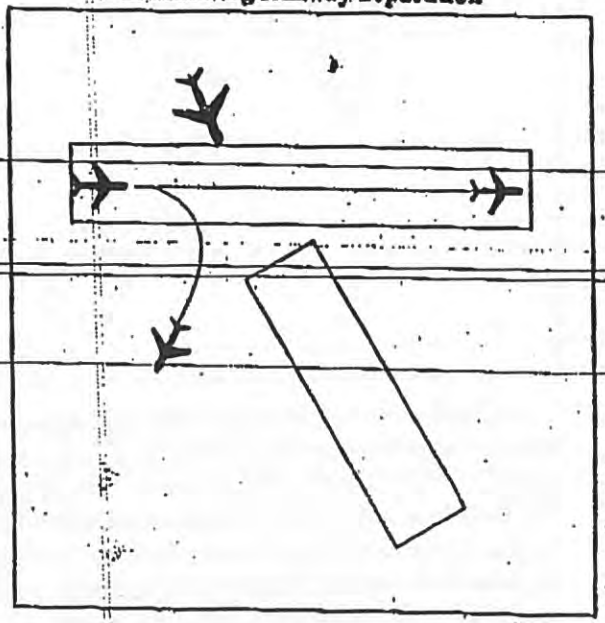


FIG 3-10-7
Intersecting Runway Separation



2. A preceding arriving aircraft is clear of the landing runway, completed landing roll and will hold short of the intersection/flight path, or has passed the intersection/flight path.
(See FIG 3-10-8 and FIG 3-10-9.)

FIG 3-10-8
Intersection Runway Separation

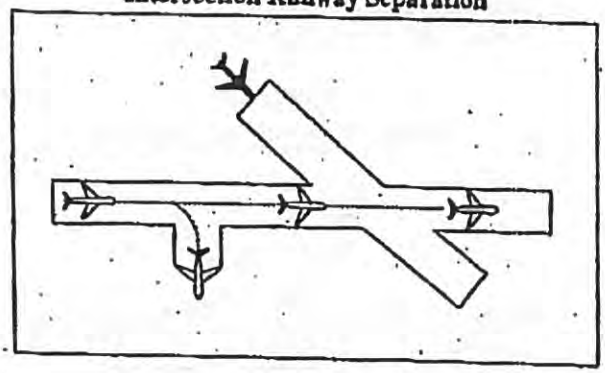
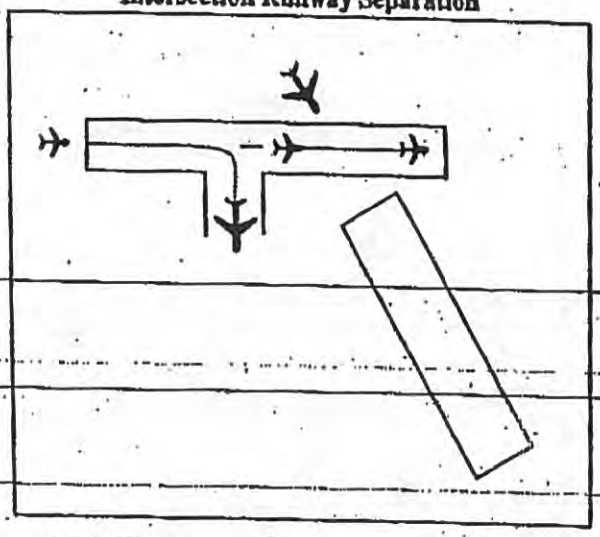


FIG 3-10-9
Intersection Runway Separation



b. *USAF must secure major command approval prior to conducting Land and Hold Short Operations (LAHSO).* "USN NOT APPLICABLE." An aircraft may be authorized to takeoff from one runway while another aircraft lands simultaneously on an intersecting runway or an aircraft lands on one runway while another aircraft lands simultaneously on an intersecting runway, or an aircraft lands to hold short of an intersecting taxiway or some other predetermined point such as an approach/departure flight path using procedures specified in the current LAHSO directive. The procedure shall be approved by the air traffic manager and be in accordance with a facility directive. The following conditions apply:

NOTE-
Application of these procedures does not relieve controllers from the responsibility of providing other appropriate separation contained in this order.

REFERENCE-
FAAO 7210.3, Land and Hold Short Operations (LAHSO), Para 10-3-7.

1. A simultaneous takeoff and landing operation shall only be conducted in VFR conditions.

2. Instruct the landing aircraft to hold short of the intersecting runway being used by the aircraft taking off. In the case of simultaneous landings and no operational benefit is lost, restrict the aircraft of the lesser weight category (if known). LAHSO clearances shall only be issued to aircraft that are listed in the current LAHSO directive, whose Available Landing Distance (ALD) does not exceed the landing distance requirement for the runway condition.

PHRASEOLOGY-
HOLD SHORT OF RUNWAY (runway number), (traffic, type aircraft or other information).

NOTE-
Pilots who prefer to use the full length of the runway or a runway different from that specified are expected to advise ATC prior to landing.

3. Issue traffic information to both aircraft involved and obtain an acknowledgment from each. Request a read back of hold short instructions when they are not received from the pilot of the restricted aircraft.

EXAMPLE-
1. *"Runway one eight cleared to land, hold short of runway one four left, traffic, (type aircraft) landing runway one four left."*

(When pilot of restricted aircraft responds with only acknowledgment):

"Runway one four left cleared to land, traffic, (type aircraft) landing runway one eight will hold short of the intersection."

"Read back hold short instructions."

2. *"Runway three six cleared to land, hold short of runway three three, traffic, (type aircraft) departing runway three three."*

"Traffic, (type aircraft) landing runway three six will hold short of the intersection, runway three three cleared for takeoff."

Appendix Four

Boeing 767-300 Aircraft Planning Manual F.A.R. Takeoff and Landing Length Charts

BFI

MASTER PLAN UPDATE

King County International Airport/ Boeing Field

Mead & Hunt

CHARACTERISTICS	UNITS	767-300 FREIGHTER (1)					
		CF6-80C2F		PW 4000		RB211-524	
MAX DESIGN TAXI WEIGHT	POUNDS	409,000	413,000	409,000	413,000	409,000	413,000
	KILOGRAMS	185,519	187,334	185,519	187,334	185,519	187,334
MAX DESIGN TAKEOFF WEIGHT	POUNDS	408,000	412,000	408,000	412,000	408,000	412,000
	KILOGRAMS	185,066	186,880	185,066	186,880	185,066	186,880
MAX DESIGN LANDING WEIGHT	POUNDS	326,000	326,000	326,000	326,000	326,000	326,000
	KILOGRAMS	147,871	147,871	147,871	147,871	147,871	147,871
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	309,000	309,000	309,000	309,000	309,000	309,000
	KILOGRAMS	140,160	140,160	140,160	140,160	140,160	140,160
SPEC OPERATING EMPTY WEIGHT (2)	POUNDS	188,000	188,000	188,100	188,100	190,000	190,000
	KILOGRAMS	85,275	85,275	85,321	85,321	86,183	86,183
MAX STRUCTURAL PAYLOAD	POUNDS	121,000	121,000	120,900	120,900	119,000	119,000
	KILOGRAMS	54,885	54,885	54,839	54,839	53,978	53,978
MAX CARGO - MAIN DECK	(3) UP TO 24 TYPE A PALLETS AND 2 SPECIAL CONTOURED PALLETS						
	(4) UP TO 14 M-1 PALLETS AND 2 SPECIAL CONTOURED PALLETS						
MAX CARGO - LOWER DECK	CUBIC FEET	4,030	4,030	4,030	4,030	4,030	4,030
	CUBIC METERS	114.1	114.1	114.1	114.1	114.1	114.1
USABLE FUEL	US GALLONS	24,140	24,140	24,140	24,140	24,140	24140
	LITERS	91,380	91,380	91,380	91,380	91,380	91,380
	POUNDS	161,740	161,740	161,740	161,740	161,740	161,740
	KILOGRAMS	73,364	73,364	73,364	73,364	73,364	73,364

NOTES: (1) SPEC WEIGHT FOR TYPICAL ENGINE/WEIGHT CONFIGURATION SHOWN SEE TABLE 1.3.1 FOR COMBINATIONS AVAILABLE. CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) TYPICAL OPERATING EMPTY WEIGHT SHOWN. ACTUAL WEIGHT WILL DEPEND ON SPECIFIC AIRLINE CONFIGURATION.

(3) 767-300 FREIGHTER - SEE SEC 2.4.6 FOR PALLET DETAILS.

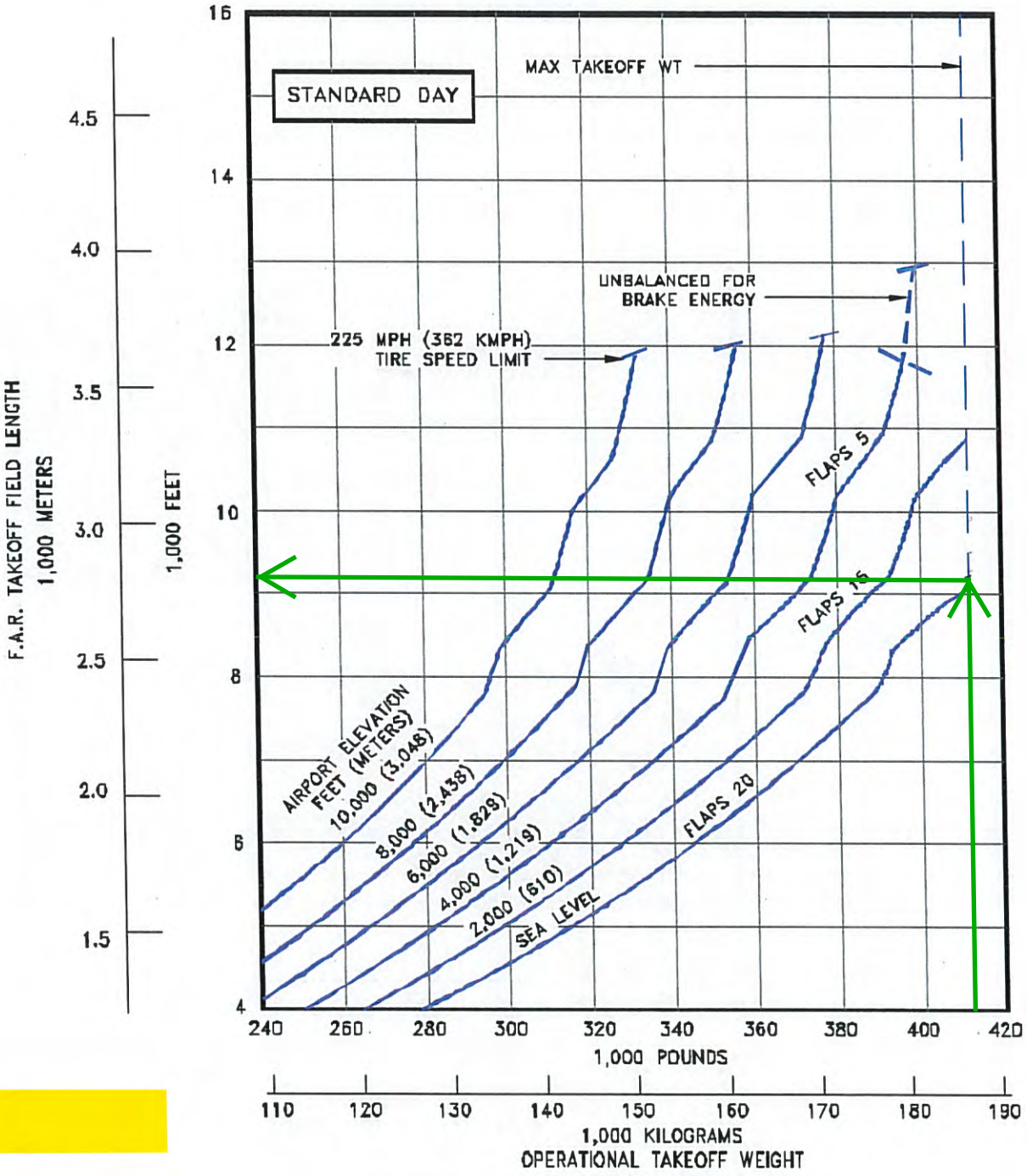
(4) 767-300 GENERAL MARKET FREIGHTER - SEE SEC 2.4.6 FOR PALLET DETAILS

2.1.5 GENERAL CHARACTERISTICS

MODEL 767-300 FREIGHTER

NOTES:

- CF6–80C2B6, PW4060, RB211–524H ENGINES
- ZERO RUNWAY GRADIENT
- ZERO WIND
- AIR CONDITIONING OFF
- CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN

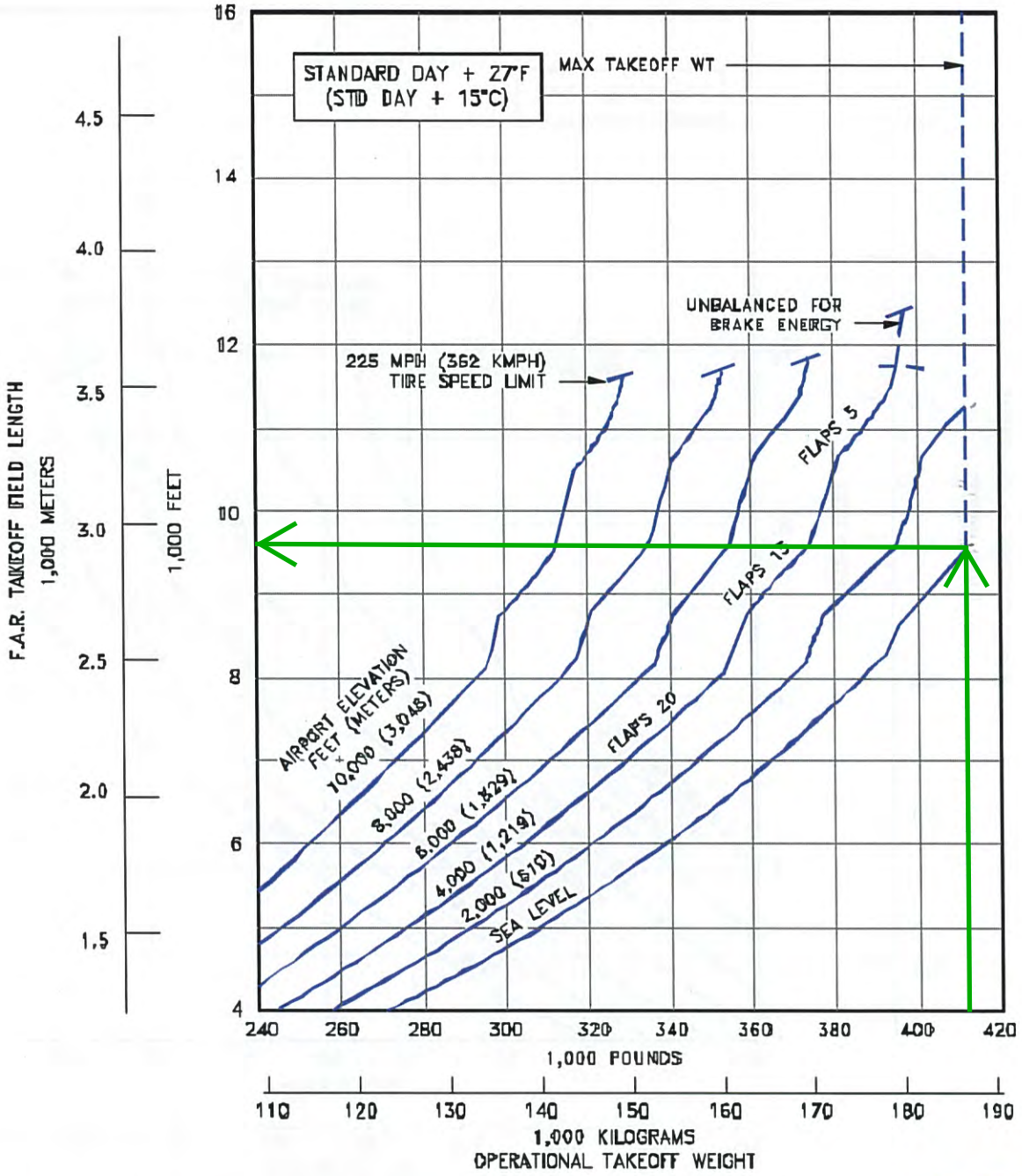


3.3.15 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY

MODEL 767-300ER, -300 FREIGHTER (CF6-80C2B64, PW4060, RB211-524H ENGINES)

NOTES:

- CF6-80C2B6, PW4060, RB211-524H ENGINES
- ZERO RUNWAY GRADIENT
- ZERO WIND
- AIR CONDITIONING OFF
- CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN



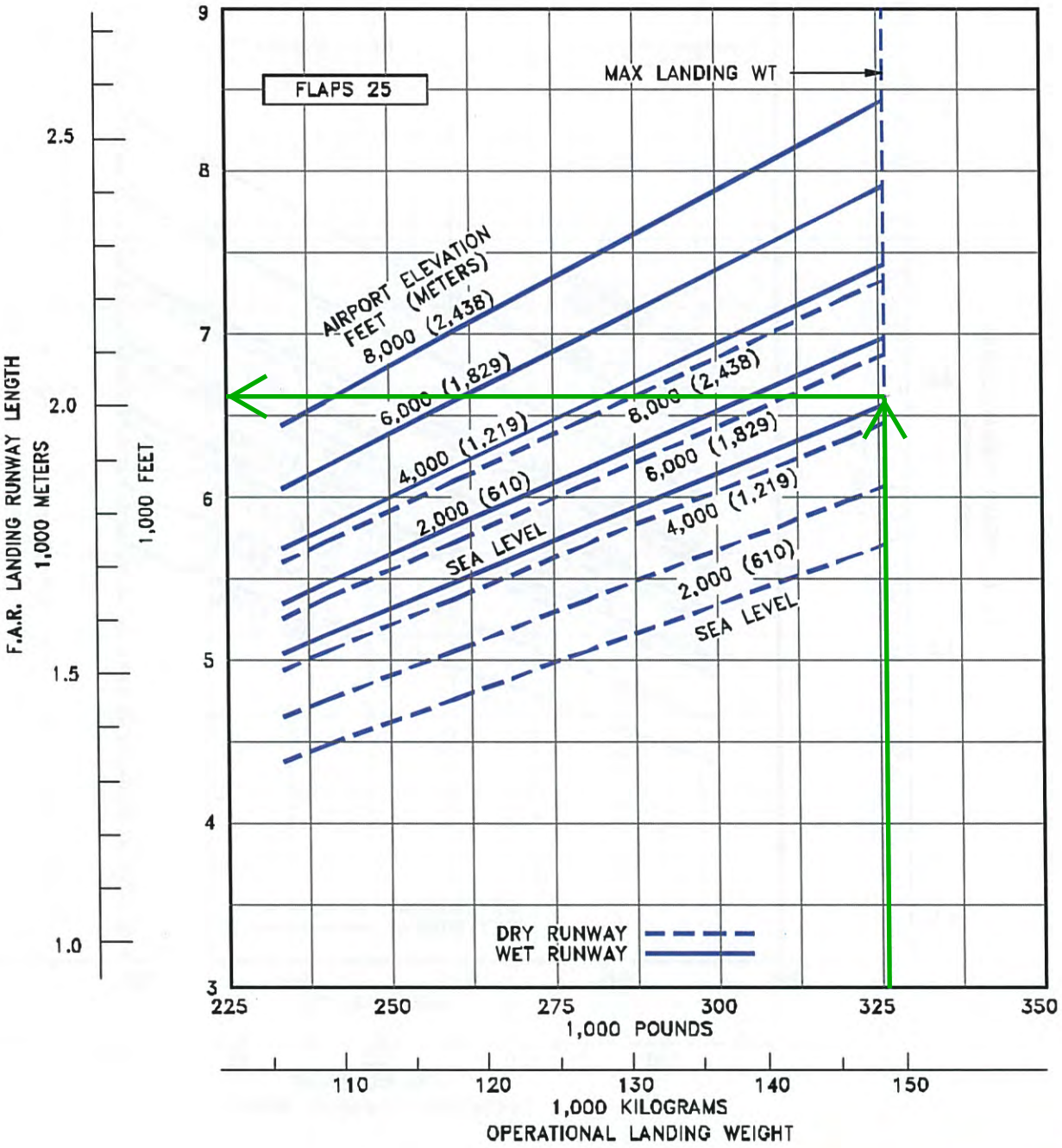
3.3.16 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS

STANDARD DAY + 27°F (STD + 15°C)

MODEL 767-300ER, -300 FREIGHTER (CF6-80C2B6, PW4060, RB211-524H ENGINES)

NOTES:

- NO REVERSE THRUST
- ANTI–SKID ON
- AUTO SPEED BRAKES
- ZERO WIND, ZERO RUNWAY SLOPE
- CONSULT USING AIRLINE FOR SPECIFIC OPERATING PROCEDURE PRIOR TO FACILITY DESIGN



3.4.7 FAA LANDING RUNWAY LENGTH REQUIREMENTS - FLAPS 25

MODEL 767—300 FREIGHTER

Appendix Five

AC 150/5325-4B Runway Length Curves

BFI

MASTER PLAN UPDATE

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Figure 2-1. Small Airplanes with Fewer than 10 Passenger Seats
(Excludes Pilot and Co-pilot)

Example:

Temperature (mean day max hot month): 59° F (15° C)
Airport Elevation: Mean Sea Level

Note: Dashed lines shown in the table are mid values of adjacent solid lines.

Recommended Runway Length:

For 95% = 2,700 feet (823 m)
For 100% = 3,200 feet (975 m)

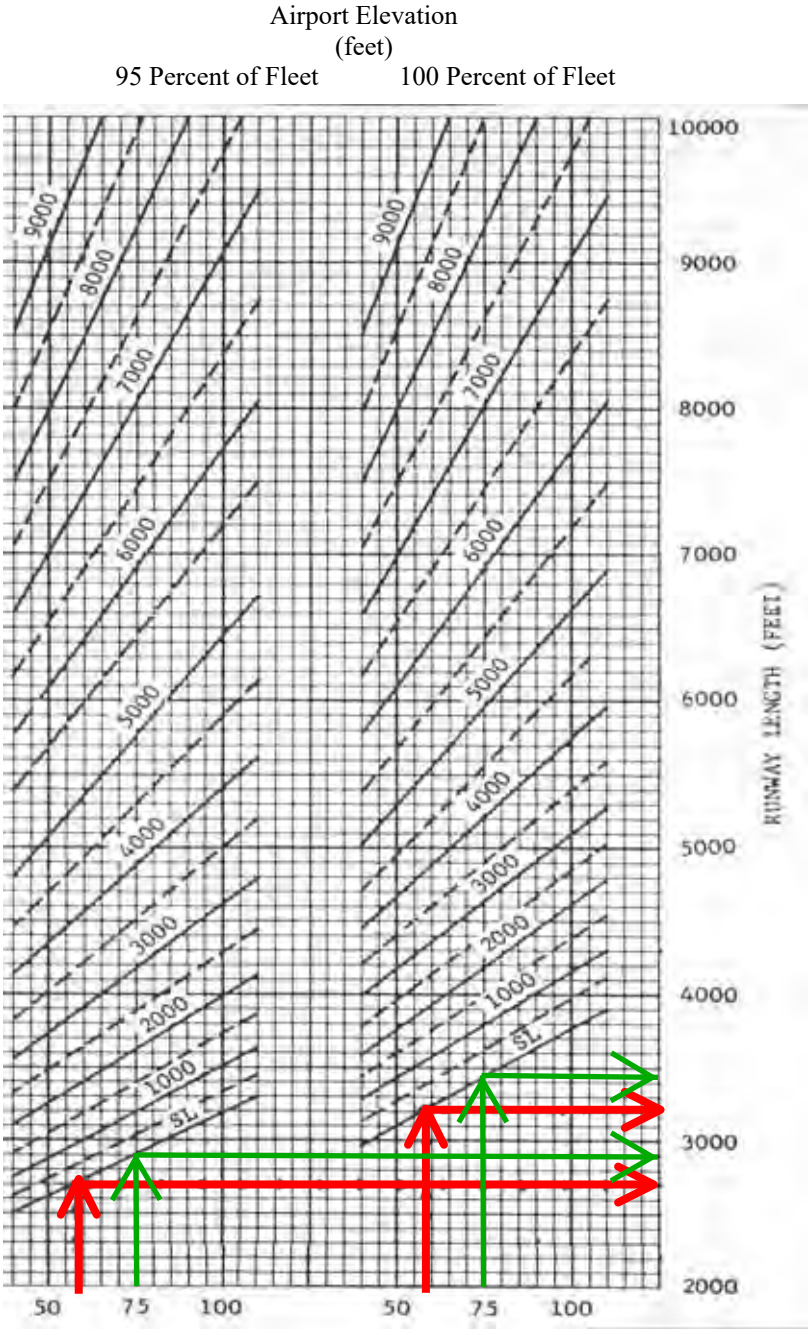
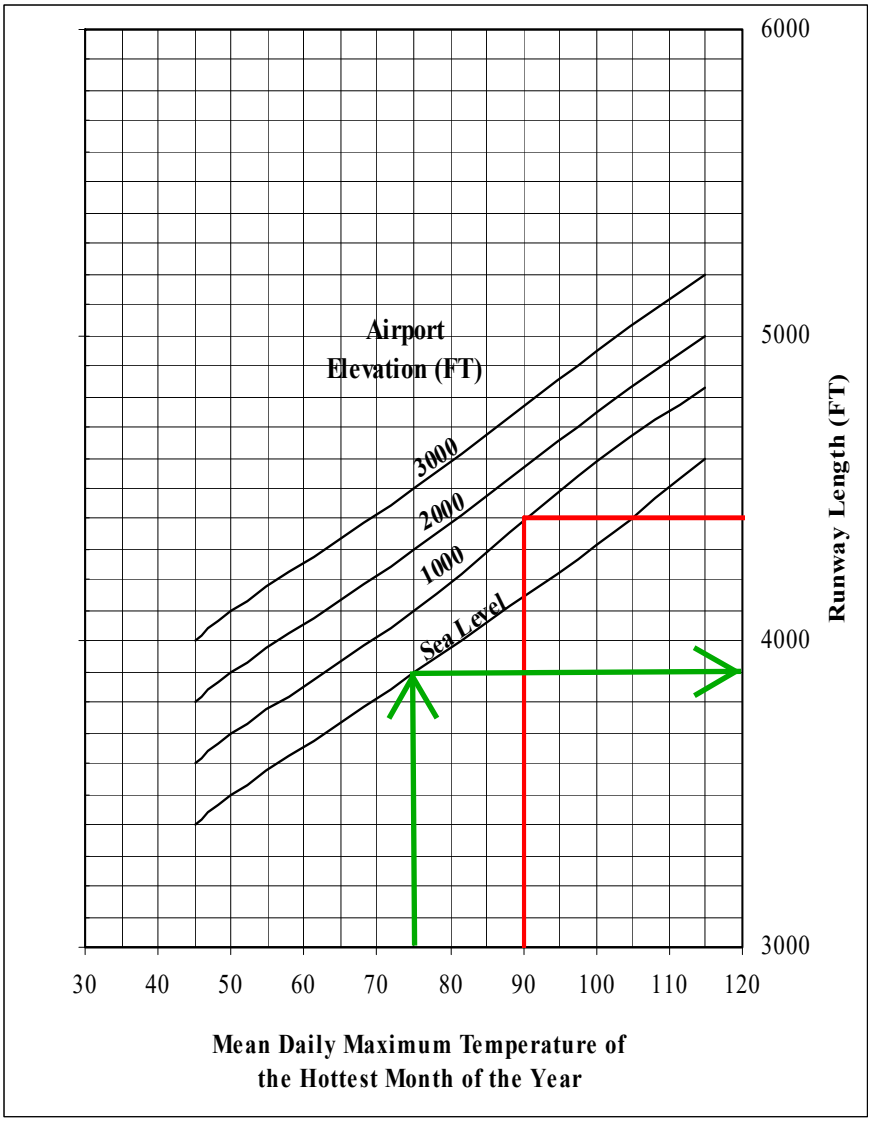


Figure 2-2. Small Airplanes Having 10 or More Passenger Seats
(Excludes Pilot and Co-pilot)

Representative Airplanes	Runway Length Curves
Raytheon B80 Queen Air **Raytheon** E90 King Air **Raytheon** B99 Airliner **Raytheon** A100 King Air (Raytheon formerly Beech Aircraft) **Britten-Norman** Mark III-I Trilander **Mitsubishi** MU-2L **Swearigen** Merlin III-A **Swearigen** Merlin IV-A **Swearigen** Metro II	**Example:** Temperature (mean day max hot month) 90° F (32° C) Airport Elevation (msl) 1,000 feet (328 m) Recommended Runway Length 4,400 feet (1,341 m) **Note:** For airport elevations above 3,000 feet (915 m), use the 100 percent of fleet grouping in figure 2-1. 

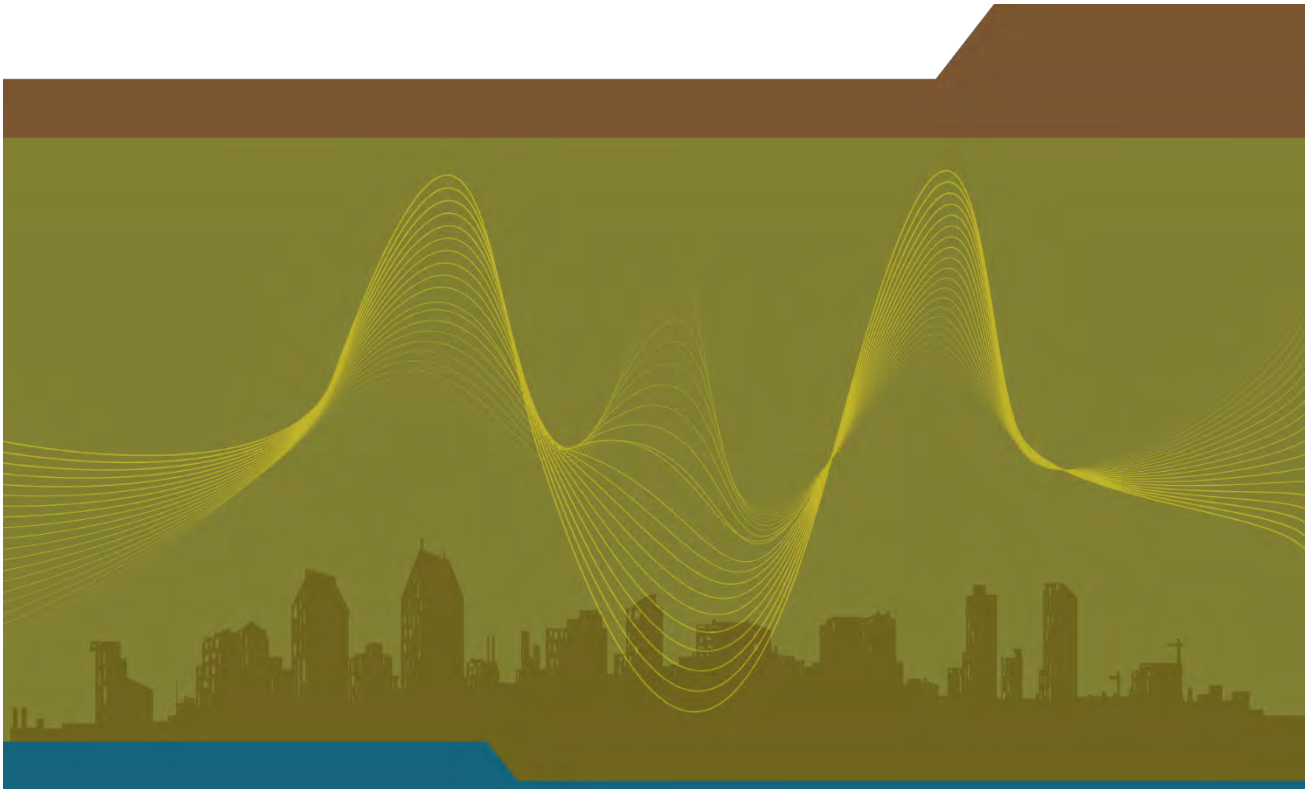
Appendix Six

Noise Technical Report for the Master Plan Update

MASTER PLAN UPDATE

King County International Airport/ Boeing Field

Mead & Hunt



King County International Airport/Boeing Field

Noise Technical Report for the Master Plan Update

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FINAL | August 4, 2020

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Table of Contents

1.0 Introduction

This Noise Technical Report summarizes the aircraft noise analysis in support of Boeing Field (BFI) Master Plan Update. The objective of this study is to analyze existing conditions (year 2018) and three future year scenarios for 2023 and 2035 to determine the noise exposure levels related to the proposed Master Plan.

For the purposes of this analysis, the aircraft-related noise exposure is described using noise contours prepared with the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT) Version 3b, in compliance with 14 CFR Part 150 *Airport Noise Compatibility Planning,* FAA Order 1050.1F and FAA Order 5050.4B the *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, 42 U.S.C. 4332(2)(c), 49 U.S.C. 303, 23 U.S.C. 138, and the Council on Environmental Quality (CEQ) guidelines.

2.0 Noise and Effects on People

The following section provides basic information on noise and its characteristics, and the effects of noise on people.

2.1 Characteristics of Sound

Sound can be described in terms of amplitude (loudness), frequency (pitch), and duration (time). The standard unit of measurement of the loudness of sound is the decibel (dB). Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter scale used to measure earthquakes.

The human hearing system is not equally sensitive to sound at all frequencies. Sound waves below 16 Hz are not heard at all but are "felt" as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear. Community noise levels are measured in terms of the A-weighted decibel abbreviated dBA or dB.

2.2 Propagation of Noise

Outdoor sound levels decrease as a result of several factors, including distance from the sound source, atmospheric absorption (characteristics in the atmosphere that absorb sound), and ground attenuation (characteristics on the ground that absorb sound). If sound is radiated from a source in a homogeneous and undisturbed manner, the sound travels in spherical waves. As the sound wave travels away from the source, the sound energy is spread over a greater area dispersing the sound power of the wave.

Temperature and humidity of the atmosphere also influence the sound levels received by the observer. The influence of the atmosphere and the resultant fluctuations increase with distance and become particularly important at distances greater than 1,000 feet. The degree of absorption depends on frequency of the sound as well as the humidity and air temperature. For example, when the air is cold and humid, and therefore denser, atmospheric absorption is lowest. Higher frequencies are more readily absorbed than the lower frequencies. Over large distances, lower frequency sounds become dominant as the higher frequencies are attenuated.

2.3 Noise Metrics

The analysis and reporting of community noise levels around communities has to account for the complexity of human response to noise and the variety of noise metrics that have been developed for describing noise impacts. Each of these metrics attempts to quantify noise levels with respect to community response.

Noise metrics can be divided into two categories: single event and cumulative. Single event metrics describe the noise levels from an individual event such as an aircraft flyover. Cumulative metrics average the total noise over a specific time period, which is typically from one to 24-hours for community noise levels. This study presents both single event and cumulative noise modeling results.

Maximum Noise Level (Lmax) is the peak sound level during an aircraft noise event. The metric only accounts for the instantaneous peak intensity of the sound, and not for the duration of the event. As an aircraft passes by an observer, the sound level increases to a maximum level and then decreases. Typical single event noise levels range from over 90 dBA close to the airport to 50-60 dBA at more distant locations.

Sound Exposure Level (SEL) is calculated by summing the decibel levels during a noise event and compressing that noise into one second. The SEL value is the integration of all the acoustic energy contained within the noise event (for example, an aircraft overflight or automobile pass-by). This metric considers both the maximum noise level of the event and the duration of the event. For aircraft flyovers, the SEL value is approximately 10 dB higher than the maximum noise level.

Day-Night Average Sound Level (DNL) is a measure of twenty-four hours and applies a weighting factor which places greater significance on noise events occurring during the night hours. DNL is a 24-hour, time-weighted average noise level based on the A-weighted decibel. Time-weighted refers to the fact that noise which occurs during certain sensitive time periods is penalized for occurring at these times. The night time period (10 p.m. to 7 a.m.) is penalized by 10 dB. This penalty was selected to attempt to account for increased human sensitivity to noise during the quieter period of a day, where sleep is the most common activity. DNL levels near airports range from DNL 75 dB on airport property to below DNL 45 dB at more distant locations.

3.0 Noise Regulations and Policies

The noise analysis was conducted in compliance with 14 CFR Part 150 *Airport Noise Compatibility Planning,* FAA Order 1050.1F, and FAA Order 5050.4B. The thresholds for significant aircraft noise impact are defined using the DNL metric. According to the Land Use Guidance Table in 14 CFR Part 150, DNL 65 dB is the threshold to determine land use compatibility for noise-sensitive land uses (e.g., residences, schools, places of worship, etc.). In general, commercial, industrial, and outdoor recreation land uses are compatible with aircraft noise.

4.0 Existing and Future Noise Conditions

The existing aircraft noise environment at BFI was evaluated based upon the modeling of the aircraft operations in 2018. This section of the report provides a description of the data and assumptions used to develop the noise exposure map for 2018 existing conditions and future year 2023 and 2035 conditions. For this analysis, data from multiple sources were used, including:

- FAA System Wide Information Management (SWIM) radar data (January 2018 - December 2018)
- FAA Traffic Flow Management System Counts (TFMSC) operations and fleet mix data
- FAA Operations and Performance Data (OPSNET) tower counts
- FAA Terminal Area Forecast (TAF) data
- Airport Master Plan Update Forecasts

Runway utilization and day/night distribution were estimated based upon an analysis of annual aircraft operational data and radar tracks collected through the FAA data sources listed above.

The AEDT requires a variety of operational data to model the noise environment around an airport. These data include the following information, which are discussed in detail in the following paragraphs:

- Aircraft activity levels
- Aircraft fleet mix
- Time of day
- Stage length
- Runway utilization
- Flight paths and utilization

4.1 Existing Conditions Aircraft Activity

Activity levels for 2018 Existing Conditions at BFI were derived from the sources listed above in Section 4.0. The specific data for aircraft types, time of day, runway use, and flight tracks for 2018 existing conditions are discussed in this section.

4.1.1 Aircraft Operations

As shown below in **Table 1**, there were 183,402 operations at the Airport in 2018 (an average of 502 operations per day). An operation is one takeoff or one landing. As indicated by the table, the largest number of operations was conducted by single engine piston aircraft mostly conducted by training aircraft (i.e., touch and go operations) that accounted for 108,170 operations, or 59% of operations. Of note, commercial scheduled operations are those by Kenmore Air, which utilize a Cessna Caravan, a turbo propeller aircraft; unscheduled operations are operated by turbojet and turbo propeller aircraft, including JSX (Jet SuiteX) that operate Embraer turbojet aircraft.

The Boeing Company has a manufacturing facility at BFI with associated aircraft testing activities; aircraft activity related to this manufacturing facility account for 4,281 flights in 2018, or approximately 12 daily flights. There is also a robust corporate jet component at BFI, representing 29,482 flights in 2018, or approximately 80 daily flights.

Table 1 – Operations by Aircraft Category, 2018 Existing Conditions

Category	Annual Operations
Commercial (Scheduled and Non-Scheduled)	3,718
Boeing Jets	4,281
Air Cargo	13,664
Business Jets	29,482
Air Taxi	22,893
Piston Prop	108,170
Military	1,194
Grand Total	**183,402**

Source: Master Plan, 2019

4.1.2 Fleet Mix

Table 2 presents the operational data for 2018 used to develop this study's AEDT inputs. It includes the detailed fleet mix and operations by time of day for each type of aircraft used in the AEDT noise model during 2018. As shown, this table lists the specific aircraft in the 2018 fleet mix as well as identifies the AEDT category for each aircraft type.

There are several aircraft operating the in the BFI fleet that are unique to this airport. For example, cargo operators based at BFI operate several models of older narrow body aircraft that have been largely retired elsewhere. The existing operations (and the forecast for 2023 and 2035) include Boeing B-727 and DC-9 aircraft; the operators of these narrow body air cargo fleets at BFI do not have plans for replacement because the relatively low "sill height" of these aircraft is very important to them for cargo loading/unloading operations at the airport. The majority of the cargo operations are conducted by UPS with Boeing B-757 and B-767 aircraft, as well as Airpac Airlines with Cessna Caravan aircraft.

In addition to aircraft type, the time of day an operation occurs can affect the DNL contours due to the nighttime 10-dB penalty applied from 10:00pm to 7:00am. In this study, the approximate percentage of flights occurring during nighttime hours throughout the year was 8%. For a given aircraft category, this percentage varies, as commercial and cargo jet operations occur more than 8% at night and general aviation and piston aircraft operations occur less than 8% at night annually.

Table 2 – Fleet Mix for 2018 Existing Conditions

Category	AEDT ID	AEDT Description	2018 Operations
Commercial Service			
Kenmore Air	CNA208	Cessna 208 Caravan	1,857
Scheduled [Total]			**1,857**
Commercial Service	A319-131	Airbus A319-100 Series	95
Non-Scheduled	A320-211	Airbus A320-200 Series	58
	A321-232	Airbus A321-200 Series	22
	A330-301	Airbus A330-200 Series	37
	737300	Boeing 737-300 Series	251
	737400	Boeing 737-400 Series	609
	MD83	Boeing MD-83	126
	CL600	Bombardier CRJ-100	16
	CL600	Bombardier CRJ-200-LR	42
	CRJ9-LR	Bombardier CRJ-700-LR	123
	DHC830	Bombardier de Havilland Dash 8 Q400	134
	EMB145	Embraer ERJ145	123
	EMB170	Embraer ERJ170-LR	37
	EMB175	Embraer ERJ175	43
	EMB175	Embraer ERJ175-LR	9
	EMB190	Embraer ERJ190	135
Non-Scheduled [Total]			**1,861**
Boeing Operations	737MAX8	Boeing 737 MAX 7	92
	737MAX8	Boeing 737 MAX 8	353
	737700	Boeing 737-700 Series	216
	737800	Boeing 737-800 Series	2,681
	737800	Boeing 737-900-ER	356
	767CF6	Boeing 767-200 Series	506
	767CF6	Boeing 777-200-ER	11
	777200	Boeing 777-200-LR	25
	7773ER	Boeing 777-300 ER	4
	777300	Boeing 777-300 Series	4
	7878R	Boeing 787-8 Dreamliner	9
	7878R	Boeing 787-9 Dreamliner	25
Boeing [Total]			**4,281**
Air Cargo	A300-622R	Airbus A300F4-600 Series	97
	74720B	Antonov 124 Ruslan	2
	727EM2	Boeing 727-200 Series	31
	747400	Boeing 747-400 Series	12
	747400	Boeing 747-400 Series Freighter	2
	7478	Boeing 747-800 Series	8
	757RR	Boeing 757-200 Series	1,705
	767300	Boeing 767-300 Series	2,931
	DC910	Boeing DC-9-10 Series	44
	MD11PW	Boeing MD-11	320
	DHC6	C-26A	344
	CNA208	Cessna 208 Caravan	3,578
	CNA441	Cessna 441 Conquest II	147
	CVR580	Convair CV-580	13
	EMB120	Embraer EMB120 Brasilia	2,688
	DHC6	Fairchild SA-227-AC Metro III	1,632
	DHC6	Mitsubishi MU-2	110
Air Cargo [Total]			**13,664**
Air Taxi	(All)	(All)	
Air Taxi [Total]			**24,339**
General Aviation	(All)	(All)	
Corporate Jet			
Corporate [Total]			**28,036**
General Aviation	(All)	(All)	
Recreational/Training			
Recreational/Training [Total]			**108,170**
Military	737800	BOEING 737-800 Poseidon	161
	CH47D	Boeing CH-46 Sea Knight	13
	F-18	Boeing F/A-18 Hornet	79
	A37	Cessna T-37 Tweet	158
	C130	Lockheed C-130 Hercules	38
	CNA208	North American T-6 Texan II (FAS)	590
	F5AB	Northrop F-5E/F Tiger II	9
	T-38A	T-38 Talon	147
Military [Total]			**1,194**
Grand Total			**183,402**

Source: BridgeNet International, 2020; Master Plan, 2019
Note: Totals are subject to rounding +/- 1 operation. Air taxi and general aviation are shown only as subtotals to save space.

4.1.3 Departure Stage Length

Aircraft departures were grouped within the following five stage length categories:

- Departure stage length 1: 0 to 500 nautical miles (great circle distance[1])
- Departure stage length 2: 501 to 1,000 nautical miles
- Departure stage length 3: 1,001 to 1,500 nautical miles
- Departure stage length 4: 1,501 miles to 2,500 nautical miles
- Departure stage length 5: 2,501 nautical miles or greater

An aircraft with a short stage length is assumed to be carrying less fuel, passengers, and cargo than an aircraft with a long stage length. Aircraft with longer stage lengths are assumed to be heavier, with longer stage lengths requiring more fuel. Stage length impacts noise levels because weight affects aircraft performance and resulting noise levels.

4.1.4 Runway Use

An additional consideration in developing the noise exposure contours is the percentage of time each runway is utilized. The speed and direction of the wind and other operational factors dictate the runway direction that is utilized by an aircraft. From a safety standpoint it is desirable, and usually necessary, to arrive and depart an aircraft into the wind. When the wind direction changes, the operations are shifted to the runway end that favors the wind direction.

Table 3 shows the runway use percentage as based on the runway use compiled from the above-referenced FAA data sources. As a part of the noise analysis, runway use assumptions were confirmed with a spatial analysis of the radar track geometry for each category of aircraft. The annual 2018 runway use was assessed using the full year of radar track data.

[1] Great circle distance is the shortest distance between any two points on the surface of the earth.

Table 3 – Runway Utilization, Existing Conditions 2018

ARRIVALS							
Category	**14L**	**14R**	**32L**	**32R**	**H1**	**H2**	**Total**
Kenmore Air	5.9%	65.0%	29.1%				**100%**
Non-Scheduled	1.9%	79.2%	18.0%	1.0%			**100%**
Boeing		70.9%	29.1%				**100%**
Air Cargo	1.5%	68.4%	29.8%	0.2%			**100%**
Air Taxi	1.1%	73.7%	25.2%				**100%**
Corporate	0.7%	69.9%	29.3%				**100%**
Recreational/Training	2.2%	59.1%	35.6%	0.4%	2.4%	0.3%	**100%**
Military		74.6%	24.5%			0.9%	**100%**
All Arrivals	**1.5%**	**66.4%**	**30.8%**	**0.2%**	**0.9%**	**0.1%**	**100%**
DEPARTURES							
Category	**14L**	**14R**	**32L**	**32R**	**H1**	**H2**	**Total**
Kenmore Air	3.2%	66.6%	27.8%	2.4%			**100%**
Non-Scheduled	3.7%	68.1%	26.4%	1.8%			**100%**
Boeing		75.3%	24.7%				**100%**
Air Cargo	1.5%	70.9%	26.2%	1.4%			**100%**
Air Taxi	1.1%	70.7%	27.4%	0.8%			**100%**
Corporate	0.9%	73.3%	25.2%	0.6%			**100%**
Recreational/Training	2.4%	54.6%	34.3%	3.5%	4.9%	0.3%	**100%**
Military	1.4%	80.4%	15.9%	0.9%	1.4%		**100%**
All Departures	**1.6%**	**65.0%**	**29.3%**	**1.9%**	**2.0%**	**0.1%**	**100%**

Source: BridgeNet International, 2020
Note: Totals and percentages are subject to rounding of +/- 0.1%. Blank cell indicates 0%.

4.1.5 Flight Paths and Flight Path Utilization

The identification of the location and use of the flight tracks was based upon radar data provided by the airport. Radar tracks from October 2017 to September 2018 were used in the development of the AEDT flight paths. A sample of over 22,000 flight tracks was derived from all of the flight paths flown throughout the year.

4.2 Existing Conditions Noise Exposure

The compiled data as described in the preceding sections was used as input to the FAA's AEDT computer model for the calculation of noise in the airport environs. The DNL contours do not represent the noise levels present on any specific day; rather, they represent the daily energy-average of all 365 days of operation during the year. The noise contour pattern extends from the Airport, from the runway ends, reflective of the flight tracks used. The relative distance of the contours from the Airport along each route is a function of the frequency of use of each runway for total arrivals and departures, time of day, and the type of aircraft assigned to it.

Based upon the operational conditions presented previously DNL contours were developed. The existing conditions noise exposure contours are presented in **Figure 1**. This figure presents the DNL 55, 60, and

65 dB noise exposure contours. **Table 4** summarizes noise exposure for 2018 Existing Conditions. As shown, there are 214 persons located within the DNL 65 dB and higher noise contour; however, there are no persons located in areas with a DNL greater than 70 dB.

Table 4 – Summary of Noise Exposure 2018 Existing Conditions

Category	Noise Level Range (DNL)				
	>55 dB	>60 dB	>65 dB	>70 dB	>75 dB
Population Count (persons)	18,365	3,588	214	0	0
Land Area (acres)	6,717	2,456	937	409	218

Sources: AEDT version 3b, 2020; U.S. Census 2010

4.3 Future Year Noise Conditions – Year 2023 and 2035

The future noise environment for BFI was analyzed based upon year 2023 and 2035 operational conditions as compared to existing conditions in 2018. The aircraft operational levels and fleet mix were from the approved aviation forecast from the ongoing Master Plan Update. **Table 5** shows a summary of the forecast data and **Table 6** shows the detailed fleet mix data for the two future years.

Table 5 – Forecast Operations by Aircraft Category

Category	Annual Operations			
	2023 Operations Forecast	2023 Change from 2018	2035 Operations Forecast	2035 Change from 2018
Commercial (Scheduled and Non-Scheduled)	4,159	+ 441	5,178	+ 1,460
Boeing Jets	5,747	+ 1,466	6,819	+ 2,538
Air Cargo	13,296	– 368	15,052	+ 1,388
Business Jets	30,537	+ 1,055	39,208	+ 9,726
Air Taxi	24,918	+ 2,025	34,076	+ 11,183
Piston Prop	75,881	– 32,289	68,756	– 39,414
Military	1,701	+ 507	1,867	+ 673
Grand Total	**156,239**	**– 27,163**	**170,955**	**– 12,447**

Source: Master Plan, 2019

Note: Subject to rounding of +/- 1 operation.

Table 6 – Forecast Fleet Mix for Years 2023 and 2035

Category	AEDT ID	AEDT Description	2023 Operations	2035 Operations
Commercial Service				
Kenmore Air	CNA208	Cessna 208 Caravan	1,932	2,100
Scheduled [Total]			**1,932**	**2,100**
Commercial Service	A319-131	Airbus A319-100 Series	114	157
Non-Scheduled	A320-211	Airbus A320-200 Series	69	95
	A321-232	Airbus A321-200 Series	27	37
	A330-301	Airbus A330-200 Series	44	61
	737300	Boeing 737-300 Series	301	416
	737400	Boeing 737-400 Series	729	1,008
	MD83	Boeing MD-83	150	208
	CL600	Bombardier CRJ-100	20	27
	CL600	Bombardier CRJ-200-LR	50	69
	CRJ9-LR	Bombardier CRJ-700-LR	148	204
	DHC830	Bombardier de Havilland Dash 8 Q400	161	222
	EMB145	Embraer ERJ145	148	204
	EMB170	Embraer ERJ170-LR	44	61
	EMB175	Embraer ERJ175	52	71
	EMB175	Embraer ERJ175-LR	10	14
	EMB190	Embraer ERJ190	161	223
Non-Scheduled [Total]			**2,227**	**3,078**
Boeing Operations	737MAX8	Boeing 737 MAX 7	124	147
	737MAX8	Boeing 737 MAX 8	474	562
	737700	Boeing 737-700 Series	290	344
	737800	Boeing 737-800 Series	3,600	4,271
	737800	Boeing 737-900-ER	478	567
	767CF6	Boeing 767-200 Series	679	805
	767CF6	Boeing 777-200-ER	14	17
	777200	Boeing 777-200-LR	33	39
	7773ER	Boeing 777-300 ER	5	6
	777300	Boeing 777-300 Series	6	7
	7878R	Boeing 787-8 Dreamliner	12	14
	7878R	Boeing 787-9 Dreamliner	33	39
Boeing [Total]			**5,747**	**6,819**
Air Cargo	A300-622R	Airbus A300F4-600 Series	95	107
	74720B	Antonov 124 Ruslan	0	0
	727EM2	Boeing 727-200 Series	30	34
	747400	Boeing 747-400 Series	11	13
	747400	Boeing 747-400 Series Freighter	2	3
	7478	Boeing 747-800 Series	9	11
	757RR	Boeing 757-200 Series	1,659	1,878
	767300	Boeing 767-300 Series	2,852	3,228
	DC910	Boeing DC-9-10 Series	43	49
	MD11PW	Boeing MD-11	311	352
	DHC6	C-26A	335	379
	CNA208	Cessna 208 Caravan	3,482	3,941
	CNA441	Cessna 441 Conquest II	143	162
	CVR580	Convair CV-580	13	15
	EMB120	Embraer EMB120 Brasilia	2,615	2,961
	DHC6	Fairchild SA-227-AC Metro III	1,588	1,798
	DHC6	Mitsubishi MU-2	107	121
Air Cargo [Total]			**13,296**	**15,052**
Air Taxi	(All)	(All)		
Air Taxi [Total]			**24,918**	**34,076**
General Aviation	(All)	(All)		
Corporate Jet				
Corporate [Total]			**30,537**	**39,208**
General Aviation	(All)	(All)		
Recreational/Training				
Recreational/Training [Total]			**75,881**	**68,756**
Military	737800	BOEING 737-800 Poseidon	229	251
	CH47D	Boeing CH-46 Sea Knight	18	20
	F-18	Boeing F/A-18 Hornet	113	124
	A37	Cessna T-37 Tweet	224	246
	C130	Lockheed C-130 Hercules	54	59
	CNA208	North American T-6 Texan II (FAS)	841	923
	F5AB	Northrop F-5E/F Tiger II	13	14
	T-38A	T-38 Talon	209	229
Military [Total]			**1,701**	**1,867**
Grand Total			**156,239**	**170,955**

Source: BridgeNet International, 2020; Master Plan, 2019
Note: Totals are subject to rounding +/- 1 operation. Air taxi and general aviation are shown only as subtotals to save space.

These forecast data show that for year 2023, a total of 156,239 operations are anticipated to occur at BFI. This equates to an average of 428 operations per day. For future year 2035, a total of 170,955 operations are anticipated to occur, or an average of 468 operations per day. The future year 2023 and 2035 forecasts both include an *overall reduction* of operations from existing year operations. This reflects a reduction in general aviation training operations. However, there is an *increase* of *all other* aircraft categories, including air cargo and other jet operations which primarily comprise the noise levels surrounding the airport. The noise modeling inputs for runway utilization, flight tracks, and flight track use were kept the same as the existing conditions for each future year.

Subsequent to the original noise analysis for existing and future year conditions conducted in 2019, a second future year scenario was added and analyzed in July 2020. This scenario includes extending Runway 14R by 300 feet to the north. The same noise model and version (AEDT version 3b) was used for this scenario.

The future year operations assumptions remain the same for the runway extension scenario; the only change was to the departure and arrival points on Runway 14R. All the flight tracks modeled were from radar, which tracks an aircraft position every four seconds and each track is usually made of approximately 150 points. That information is then used to create flight tracks used to model the future year scenarios. For the Runway 14R extension, the first of these points for each departure was moved to the new runway end. And for arrivals, the last point in the track was moved to reflect the new landing point. No displaced thresholds were modeled for the runway extension.

Based upon the forecast operational conditions, the future year DNL contours were developed. The year 2018, 2023 and 2035 noise exposure contours (without runway extension) are presented in **Figure 1.** This figure presents DNL 55, 60, and 65 dB noise exposure contours. **Figure 2** shows the DNL 55, 60, and 65 dB noise exposure contours for 2018 and 2035 (with and without the runway extension).

Table 7 summarizes the noise exposure effects for 2023 and 2035 future year conditions. In 2023, the population exposed to 65-70 DNL increases by 13 persons as a result of the future year operations. And in 2035, the population exposed increases 157 persons compared to existing conditions. There are also increases in the population between 60-65 DNL in both years.

Of note, the population and overall land area affected by DNL 65 dB and greater noise levels would change in the future in comparison to 2018 noise exposure due to the forecast increase in jet operations each year (despite the lower overall total operations).

Table 7 – Noise Exposure Summary for Years 2023 and 2035

Year 2023					
Category	**Noise Level Range (DNL)**				
	>55 dB	**>60 dB**	**>65 dB**	**>70 dB**	**>75 dB**
Population Count (persons)	18,019	3,662	227	0	0
Land Area (acres)	6,674	2,484	959	422	229
Change from Existing 2018:					
Population Count (persons)	-346	+74	+13	0	0
Land Area (acres)	-43	+28	+22	+12	+11
Year 2035					
Category	**Noise Level Range (DNL)**				
	>55 dB	**>60 dB**	**>65 dB**	**>70 dB**	**>75 dB**
Population Count (persons)	21,853	4,397	371	0	0
Land Area (acres)	7,577	2,829	1,085	457	244
Change from Existing 2018:					
Population Count (persons)	+3,488	+809	+157	0	0
Land Area (acres)	+859	+373	+148	+48	+26
Year 2035 with Runway Extension					
Category	**Noise Level Range (DNL)**				
	>55 dB	**>60 dB**	**>65 dB**	**>70 dB**	**>75 dB**
Population Count (persons)	21,836	4,403	356	0	0
Land Area (acres)	7,565	2,815	1,085	464	249
Change from Existing 2018:					
Population Count (persons)	+3,471	+815	+142	0	0
Land Area (acres)	+848	+359	+148	+55	+31

Sources: AEDT version 3b, 2020; U.S. Census, 2010

Note: Totals and difference calculations subject to rounding of +/- 1 acre or +/- 1 population count.

5.0 Summary

This analysis considered the noise exposure levels due to aircraft sources, for existing conditions in 2018 and future forecast scenarios in 2023 and 2035. The existing conditions aircraft noise contours encompass residences near the airport, and some are within the 65 DNL contour. In both future scenarios, the area affected by the 65 DNL noise contour would increase compared to existing conditions. The increase in DNL from existing to future conditions is due to the growth in jet aircraft operations projected for 2023 and 2035 (with and without the runway extension), despite the decrease in total operations. The future year aircraft activity increases the number of persons exposed to aircraft noise between DNL 65 and 70 dB as compared to the existing conditions. According to the Land Use Guidance Table in 14 CFR Part 150, DNL 65 dB is the threshold to determine land use compatibility for noise-sensitive land uses (e.g., residences, schools, places of worship, etc.). In general, commercial, industrial, and outdoor recreation land uses are compatible with aircraft noise.

6.0 Figures

Figure 1 – 2018, 2023, and 2035 without Runway Extension DNL Contours

Figure 2 – 2018, 2035 without Runway Extension, and 2035 with Runway Extension DNL Contours

Appendix Seven

Draft Report Comment/ Response Log

- *350 Seattle Aviation Team and Climate Reality Project*
- *Airport Work Group*
- *City of Seattle*
- *City of Tukwila*
- *KCIA Community Coalition*
- *Community Outreach*
- *Friends of Boeing Field (FOBFI)*
- *Georgetown Community Council*
- *The Museum of Flight*
- *National Business Aviation Association*
- *Post Public Meeting Emails*
- *Draft Report PUBLIC MEETING #1*
- *Draft Report PUBLIC MEETING #2*
- *Draft Report PUBLIC MEETING #3*
- *Refugee Women's Alliance*
- *Seattle City Light (SCL)*
- *The Boeing Company*
- *Washington Seaplane Pilots Association*
- *Washington Pilots Association*
- *WSDOT Aviation*

MASTER PLAN UPDATE

King County International Airport/ Boeing Field

Mead & Hunt

350 Seattle Aviation Team and Climate Reality Project

Comments and Responses: 350 Seattle Aviation Team and Climate Reality Project - received 12/01/20

Code for Response Action:
1. Concur that changes are or may be needed.
2. Disagree with intent or context of comment, no changes recommended.
3. FAA decisions required or additional information necessary from King County, FAA, etc.
4. No action necessary (i.e., an opinion given, or only clarification requested, etc.)

Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
#1	1	Airport Master Plan's potential impact on generation of future climate, air, and noise pollution.	---	As "one of the busiest primary non-hub airports" in the country, KCIA is a major source of climate, air, and noise pollution in our region. [2] In the last five years, as traffic at the airport has steadily increased, so has the pollution generated by KCIA. [3] You are now proposing to spend over $250,000,000 on various projects that would, in large part, further increase the amount of climate, air, and noise pollution generated by KCIA. [4] This, in turn, would further destabilize our climate and harm neighboring communities, and is in conflict with King County's stated climate goals and commitments to equity and environmental justice. As outlined below, we urge you to make significant amendments to the Master Plan Update and accompanying workpapers before they are given further consideration. In addition, we also support the demands of the representatives of impacted communities previously presented to KCIA.	Comments noted. Yes, total aircraft operations at KCIA have increased in recent years, since recording a low in 2016 of 1ess than 166,000 operations, which compares to less than 185,000 operations in 2019. However, aircraft operations have steadily declined at the Airport since the 1990's when total operations in 1992 and 1994 exceeded 400,000. In addition, the potential environmental impacts of all projects recommended in the Airport Master Plan Update must be evaluated in separate environmental review documents (i.e., specified NEPA and SEPA studies) and receive environmental clearance prior to implantation or construction.	4
#2	2 & 3	King Co. control of GHG emissions generated by the operation of the Airport.	---	THE MASTER PLAN UPDATE LAYS THE GROUNDWORK FOR AN UNTENABLE INCREASE IN GHG EMISSIONS AND CLIMATE WARMING FROM NEW AVIATION ACTIVITY. As King County has recognized, "[c]limate change is one of the paramount environmental and economic challenges for our generation." [5] And as "global GHG emissions continue to accelerate and climate impacts grow, the urgency to act on climate change increases." [6] We are no longer awaiting the onset of the climate crisis, we are living it. Temperatures continue to skyrocket, and extreme fires, flooding, and storms are the new norm. [7] We must cut emissions by at least half in the next nine years to avoid even more catastrophic, and semi-permanent, impacts of climate change. [8] In King County, aviation is a major contributor—if not the major contributor—to climate change. One reason for this is that aviation emissions have a three-fold greater warming impact on the climate than on-the-ground emissions. [9] The pie chart below reflects this phenomenon, and demonstrates	Comments noted. It is important to recognize as Owner/Sponsor of a Public Use Airport that is FAA obligated, King County does not have the authority to limit or restrict the operation of aircraft to and from the facility (the ability of local airport sponsors to unilaterally implement curfews and/or restrictions that affect access to a publicly funded/public-use airport by any type of aircraft has been removed by Congress and authority given to FAA). We concur that a projected increase in aircraft operations, as outlined in the Master Plan Update, would result in an increase in GHG emissions. However, as documented in the *King County International Airport Greenhouse Gas Emissions Inventory: 1990, 2007 &* 2020 and summarized in the *Inventory* chapter of the MP Update, over 98 percent of the CO_2 emissions associated with the Airport were generated by aircraft operations (takeoffs, landings, and taxi), which the County does not have the authority to control.	4

Comments and Responses: 350 Seattle Aviation Team and Climate Reality Project - received 12/01/20

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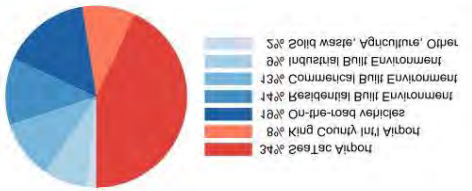
				why reducing total emissions from KCIA is critical to meeting our climate goals. [10]   The Master Plan Update states that a goal "intended to guide the preparation of the Master Plan Update, and direct the future development" of KCIA is to "[a]lign KCIA programs and services with County climate change goals." [11] KCIA's Strategic Plan 2014-2020 reiterates this. [12] King County's major shared climate goal is to reduce countywide GHG emissions by 50 percent by 2030 (compared to 2007). [13] However, this GHG emission reduction goal is not mentioned once in the Master Plan Update. To the contrary, the Master Plan Update lays the groundwork for a substantial increase in emissions. As shown in Table E2, **GHG emissions from aircraft operation in and out of KCIA is forecasted to increase by nearly 30 percent by 2035.** [14]		
#3	3	Reference to current GHG emissions analysis presented in	---	KCIA staff has confirmed that they have completed no analysis of how, if at all, KCIA operations align with King County's climate goals, stating: "Any analysis of the Airport's future role in meeting GHG emission reduction targets set by the City of Seattle, King County, and	Please note that KCIA is one of the few airport's in the country that has prepared a comprehensive GHG inventory (entitled, *King County International Airport Greenhouse Gas Emissions Inventory: 1990, 2007* & 2020), which was published in 2011.	4

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		the Airport MP Update.		Washington State would need to be based on a more comprehensive evaluation of the greenhouse gas emissions for the overall operation of the Airport." [15] Staff also confirmed that only a small fraction of emissions from fuel pumped at KCIA is reflected in the Master Plan Update. [16] (Emissions from fuel pumped make up 99 percent of KCIA's emissions. [17]) Staff also confirmed that the fact that aviation emissions have a three-times greater warming impact than on-the-ground emissions was not considered in the Master Plan Update. [18]	Also, as a County entity, KCIA is aligned with the King County Strategic Climate Action Plan (KCSCAP). Specifically, KCIA supports the KCSCAP by managing GHG emissions (that they can control), conducting climate preparedness, and promoting climate/community resiliency. These include, but are not limited to, initiating an Airport Carbon Accreditation (ACA) program, managing fleet emissions, Green Building Scorecards for project planning, mitigating the impacts of climate change to Airport assets, participating in County task forces (green building, energy, and climate preparedness), and optimizing the involvement of interns and disadvantaged business to participate in capital projects. In addition, following KCIA's confirmation in the ACA program, the County will be required to prepare a current GHG Emissions Inventory that meets the ACA protocols.	
#4	3	Request for updated GHG emissions inventory and reduction plan.	---	King County is well known as a leader in the fight against climate change, which gives us a unique opportunity to set an example for other cities around the country and world. KCIA's current emissions reduction efforts are insufficient— we can and must do better. The Master Plan Update should not go forward without a comprehensive GHG emission inventory of KCIA, including total emissions from all fuel pumped and factoring in the greater warming impact of aviation emissions. Following that, KCIA should develop a detailed, concrete plan to reduce total emissions from KCIA by 50 percent (compared to 2007) no later than 2030.	Comments noted. See response to comment #'s 2 & 3 above.	4
#5	3 & 4	Potential Social justice impacts of the Airport MP Update.	---	THE MASTER PLAN UPDATE CLEARS A PATH FOR GREATER HARM TO NEIGHBORING COMMUNITIES. The areas impacted by KCIA include some of the most vibrant and diverse residential neighborhoods in Seattle. Within a two-mile radius of the KCIA, there are five playgrounds, seven playfields, 21 parks, 31 schools, and 63 places of worship. 19 Unlike King County as a whole, most of the people living in the neighborhoods bordering the	Comments noted. King County is well aware of the economic and racial diversity of the residential neighborhoods located in the vicinity of KCIA. Significant special efforts have been made by KCIA staff, through targeted, ongoing meetings with community groups from the surrounding neighborhoods,	4

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				KCIA—Georgetown South Park, Allentown, New Holly, and Beacon Hill—are Black, Indigenous, or people of color. Each of these neighborhoods has a rich history and unique community, and each has been contaminated for years by increasing pollution from KCIA. The Master Plan Update references King County's "commitment to equity and social justice" when discussing outreach, but no actions in the Master Plan Update reflect this commitment . The Master Plan Update also states that KCIA has a goal to "[a]ct as a partner to neighboring residents," but nothing in the Master Plan Update explains how KCIA can "partner" with residents while subjecting them to increasing amounts of life-threatening pollution. [20] The reality is that the Master Plan Update stands in contrast to King County's equity and social justice commitments and ensures greater harm for neighboring communities. [21] This is an environmental justice issue: the communities closest to KCIA that take the brunt of this pollution are more diverse and lower-income than King County as a whole. [22] They also have higher exposure to pollution from other nearby sources, including industrial trucking routes, I-5, and Sea-Tac.	partnering with Refugee Woman's Alliance (ReWA) for input from the refugee and immigrant communities and the provision of translation services, to gather input on the MP Update from these stakeholders throughout the planning process. Please note that the environmental review process (e.g., an Environmental Assessment) is the proper venue to address any potential Environmental Justice impacts that may result from the implementation of projects recommended in the Master Plan Update.	
#6	4	Consideration of the potential impacts ultra-fine particulate ("UFP") pollution from airplanes in the Master Plan Update.	---	The Master Plan Update fails to acknowledge ultra-fine particulate ("UFP") pollution from airplanes, and the fact that the Plan will cause impacted communities to face even higher rates of UFP pollution. The full impacts of sustained exposure to UFPs are still unknown, but current studies show that it leads to adverse health outcomes including negative effects on the brain, nervous system, and respiratory system, and higher rates of preterm births. [23] The Master Plan Update also fails to acknowledge potential harms caused by leaded fuel pumped at KCIA and burned by planes leaving the airport. General aviation piston-driven aircraft are now the largest source of lead emitted to the atmosphere. Lead from burned aviation fuels can be	Comments noted. It's correct that potential UFP pollution generated from airplanes was not addressed in the Master Plan Update. However, there is not yet an industry-accepted way of quantifying potential UFP pollution from aircraft operations and there is no requirement to specifically address UFP in NEPA, as FAA guidance does not recognize it. Certainly, it's possible that the science on UFP pollution will be advanced in the coming years and its assessment/impact as an aircraft-generated pollutant could be included in future environmental review studies.	4

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				inhaled, ingested, and absorbed through the skin. It then accumulates in bones, blood, and soft tissue, and leads to a variety of negative health impacts, affecting neurological, renal, reproductive, and physical development systems. [24] Even low levels of blood lead in children are associated with lower IQ and cognitive and behavioral effects such as attention-deficit behavior, conduct problems, memory loss, and poor language performance. [25]		
#7	5	Existing and future noise impacts on neighboring communities.	---	We also can't ignore the fact that increased KCIA traffic means increased noise pollution for impacted communities. Noise is not, as the Master Plan Update purports, simply an "unwanted sound that can disturb routine activities and… cause annoyance." [26] In fact, studies have shown that noise pollution causes a wide array of life-threatening health conditions, higher rates of depression, anxiety, and dementia, and lower learning outcomes. [27] Accordingly, the World Health Organization has strongly recommended reducing aircraft noise levels given the health risks associated with exposure to aviation noise pollution. [28] The Master Plan Update must directly address the disparate impacts current and future KCIA pollution has, and will have, on neighboring communities. While individual environmental review may be completed for each project in the Master Plan Update, the cumulative impacts on neighboring communities will not be acknowledged and addressed under the Update as currently drafted.	Comments noted. As presented in the response to Comment #2, "King County does not have the authority limit or restrict the operation of aircraft to and from the facility". We concur that a projected increase in aircraft operations, as outlined in the Master Plan Update, would result in an increase in aircraft noise at KCIA, which was documented in the Environmental Overview chapter of the MP Update (see pgs. E.10-19). However, please note that King Co. completed a comprehensive noise study for KCIA in 2005 (i.e., an FAR Part 150 Noise Compatibility Program) that resulted in FAA approval and funding of several noise mitigation projects at KCIA. One of these key projects from the Program provided a voluntary multi-year sound attenuation program for single-family homes located in parts of the Georgetown, Beacon Hill and Tukwila/Allentown neighborhoods. This project, which was 95% federally funded by the FAA, provided $40 million for the sound insulation of just under 600 homes in these neighborhoods. It should also be noted that the updated existing and future noise contours, generated for this Master Plan Update, are significantly smaller than the previous contours generated for the KCIA Part 150 Noise Compatibility Study, and would likely result in a much smaller Noise Mitigation Boundary if the Study were updated today. This current reduction in the KCIA-related noise footprint is the result of both fewer	4

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					aircraft operations being conducted at the Airport and changes in the fleet mix of those operations due to the retirement of many older/noisier aircraft, along with the continued advancement of quieter engine technology.	
#8	5 & 6	General summary of comments on the Airport MP Update.	---	WE URGE YOU TO MAKE SIGNIFICANT AMENDMENTS TO THE MASTER PLAN UPDATE TO ALIGN WITH KING COUNTY CLIMATE GOALS AND COMMITMENTS TO EQUITY AND ENVIRONMENTAL JUSTICE. Before any further consideration is given to the Update, we urge you to revise the Master Plan Update and accompanying technical working papers as follows: ● Remove any projects that are intended to accommodate future aviation demands and are not necessary to ensure immediate safety at current levels of use. For instance, it appears that the new fuel farm is being proposed to accommodate larger amounts of fuel storage and "future expansion considerations," rather than immediate safety. [29] It also appears that KCIA may be able to remain in compliance with FAA regulations without making any modifications to its primary runway. [30] ● Complete a comprehensive GHG emission inventory, including emissions from all fuel pumped and factoring in the greater warming impact of aviation emissions (using a factor of three). [31] ● Develop a plan with attainable measures to reduce CO2 and other emissions so that total KCIA operations, including emissions from all fuel pumped, independently meets all near- and long-term goals set by Seattle, King County, and Washington State without reliance on biofuels or offsets. ● In conjunction with community representatives, including those on the Roundtable Advisory Board, develop an outreach plan to educate the public about the climate	Comments noted. See response to comments above.	4

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Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
				impact of KCIA operations and impacts of air and noise pollution on communities near the airport and under flight paths. ● Immediately fill community representative vacancies on the Roundtable Advisory Board, and compensate Roundtable Advisory Board community representatives in order to increase participation by people (e,g., working parents or those with elderly parents at home) who might not otherwise be able to take the time to be on the Board. ● Increase membership in the Roundtable Advisory Board to include representatives of other impacted neighborhoods and climate and environmental justice organizations. Ensure that the Roundtable Advisory Board has an integral and authoritative role in all decision-making going forward. ● Complete a study of the disparate impact of air and noise pollution on communities near KCIA or under its flight paths, and institute programs to remediate and redress all of them. Fund the study, remedial measures, and redress from airport usage fees, and ensure that impacted communities and the community representatives on the Roundtable Advisory Board play an integral role in developing and reviewing the study, its findings, and remediation and redress programs. Finally, we also support the demands of the representatives of impacted communities previously presented to KCIA.		

Airport Work Group

Comments and Responses: DRAFT REPORT MEETING (10/26/20)

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AWG Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
Tim Croll/ #1	NA	Local adoption of the Master Plan Update (MPU) report & Airport Layout Plan (ALP) Drawing Set	---	Can you say more about any future review / assessment steps that would be required prior to adoption of the AMPP/ALP?	Next Steps for King Co. adoption of the MPU Report & ALP Drawing Set: • Review/incorporate public comments • Review/incorporate FAA comments • Review/incorporate County Executive comments • Complete County Council transmittal, motion, and acceptance • Finalize approved ALP Drawing Set for FAA & County signatures • Publish final MPU Report	4
Tim Croll/ #2	NA	FAA approval of the ALP	---	Will FAA have NEPA obligations before they approve ALP (if I am correct, they need to approve ALP – isn't that a Federal Action)	In most instances, ALPs that are updated as an element of a Master Plan Update receive a "Conditional Approval" designation from the FAA. This signifies that the FAA's Airports Division has not yet completed its review of the potential environmental impacts that could result from the implementation of the recommended development projects that are identified on the ALP. Also, you are correct noting that FAA approval of the ALP is a "federal action" which requires environmental processing. However, a conditionally approved ALP typically qualifies as a categorical exclusion.	4
Rick Lentz/ #1	NA	Future loss of existing general aviation (GA) development areas	---	What are we going to do with the GA – plans have changed since the 2019 ALP This is a regional issue.	Yes, the FAA's decision to no longer support the Threshold Crossing Height (TCH) waiver on Runway 14R landings for large aircraft was made late in the MP Update study and ultimately required the 300-foot relocation of the Runway 14R threshold to be reflected on the updated ALP. This proposed threshold relocation and associated repositioning of the RPZ eliminated the potential development of a new GA aircraft storage area at the north end of the Airport. In addition, maintenance of the ¾-mile visibility minimums associated with several of the Runway 14R instrument approach procedures, which specifies a larger RPZ footprint,	4

Comments and Responses: DRAFT REPORT MEETING (10/26/20)

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					will require the future decommissioning of the N.E. Apron area.	
Rick Lentz/ #2	---	Future GA aircraft parking issues	---	Will the master plan allude to the ongoing issues with GA Parking?	In addition to the issues noted in the above response for the N.E. apron area, the MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. Airport Staff is evaluating other locations on the west side of the Airport that is being used by Boeing for temporary overflow B-737 MAX parking and could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii*.**	1
Clare Gallagher/ #1	---	General	---	Thanks for the information - I will follow up with our planners at SEA and we may have some additional questions.	Comment noted.	4

City of Seattle

Comments and Responses: City of Seattle - received 12/16/20

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#1	1	Add reference to current County emission reduction goals in the MP Update and update the Airport's GHG Emissions Inventory.	---	King County's Strategic Climate Action Plan states its goal is to reduce county-wide emissions by 50% by 2030. We recommend noting this goal in the Airport Master Plan report and including any examples of mitigation strategies. We recommend a comprehensive analysis is performed to identify any increase in climate pollution related to the Airport Master Plan and how it will align with the King County Climate Action Plan and WA State emission reduction targets. Additionally, emission reductions are often challenging in the aviation sector (King County's largest source of emissions), therefore, it is important that the County invest in adjacent communities with deeper emissions reductions that provide co-benefits that support health, comfort and reduced displacement.	Comments noted. Yes, we will add reference in the Airport Master Plan to King County's Strategic Climate Action Plan goal is to reduce county-wide emissions by 50% by 2030. In addition, the Airport is currently in the process of initiating an Airport Carbon Accreditation (ACA) program. Following the Airport's confirmation in the ACA program, the County will be required to prepare a current GHG Emissions Inventory that meets the ACA protocols. **See revised Chapter A text on pg. A.47.**	1
#2	1	Add reference in the MP Update to local studies re: the evidence of compromised air quality and health disparities in the Duwamish Valley.	---	Reduction of emissions should be prioritized at this location to avoid further affecting communities that already experience disproportionate health disparities and inequities. The evidence of compromised air quality and health disparities in the Duwamish Valley has been well-documented in several studies[1]. We recommend these studies be included in the Environmental Overview section and subsequent SEPA documents.	Comments noted. Yes, reference to these studies will be added to the Environmental Overview chapter and subsequent SEPA documents. **See revised Chapter A text on pg. A.46.**	1
#3	1	Additional information on health impacts of particulate matter.	---	We recognize that particulate matter (fine and ultrafine) has an impact on health, especially communities with high levels of air-pollution and high levels of asthma and other respiratory illnesses as a result of prolonged exposure to pollution. An increase in particulate matter should be more deeply analyzed on neighboring communities such as South Park, Georgetown, Beacon Hill and the impact of a	Comments noted. Please refer to the Air Quality section of the Environmental Review chapter (see pgs. E.1-E.3) for additional information on particulate matter. In addition, there is not yet an industry-accepted way of quantifying potential UFP pollution	4

[1] http://dl.pscleanair.org/DEEDS/DEEDS_Tech_Report_Exec_Summary.pdf, https://static1.squarespace.com/static/5d744c68218c867c14aa5531/t/5e0edc05d2e16f330fa0071d/1578032180988/CHIA_low_res+report.pdf, https://www.duwamishcleanup.org/moss-study

Comments and Responses: City of Seattle - received 12/16/20

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				projected increase in flights to frontline communities should be acknowledged in the report. To that end we recommend an Equity Impact Review be completed.	from aircraft operations and there is no requirement to specifically address UFP in NEPA, as FAA guidance does not recognize it. Certainly, it's possible that the science on UFP pollution will be advanced in the coming years and its assessment/impact as an aircraft-generated pollutant could be included in future environmental review studies.	
#4	1 & 2	Noise impacts & mitigation options.	---	The issue of noise should be further addressed and adequately defined in the report. Noise is simply not an issue of "annoyance" or something that disrupts everyday routines. The impacts of noise have been shown to affect health including heart disease, high blood pressure, sleep disturbances, children's learning, and stress2. For our neighbors living near the airport, noise severely impacts their ability to open their windows, enjoy their backyard or close-by park, sleep without disturbances or be able to focus on tasks or learning. The report should and cite findings from community noise complaints, decibel level monitoring data, and any community outreach/feedback concerning noise. Additionally, in Table E3 Land Use Compatibility Matrix, the notes section footnote recommends that measures that achieve noise level reductions (NLR) of 20-30 db, should be incorporated into residential building code but does not address how mitigation strategies for existing residential buildings will be attained. Most of the existing residential building stock in Seattle was building prior to 1950 and most homes do not have the level of insulation and noise mitigative measures to attain the desired db threshold. The proposed 300 feet extension of the runway will have additional noise impacts on the Georgetown community.	Comments noted. Yes, reference to the recommended measures that can achieve noise level reductions (NLR) of 20-30 db, is a national standard recognized for new residential construction, and it's understood that these NLRs are typically not achievable when sound attenuating older properties. However, King Co. completed a comprehensive noise study for KCIA in 2005 (i.e., an FAR Part 150 Noise Compatibility Program) that resulted in FAA approval and funding of several noise mitigation projects for KCIA. One of these key projects from the Program provided a voluntary multi-year sound attenuation program for single-family homes located in parts of the Georgetown, Beacon Hill and Tukwila/Allentown neighborhoods. This project, which was 95% federally funded by the FAA, provided $40 million for the sound insulation of just under 600 homes in these neighborhoods. It should also be noted that the updated existing and future noise contours, generated for this Master Plan Update, are significantly smaller than the previous contours generated for the KCIA Part 150 Noise Compatibility Study, and would likely result in a much smaller Noise Mitigation Boundary if the Study were updated today. This current reduction in the KCIA-related noise footprint is the result of both fewer aircraft operations being conducted at the Airport and	4

[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5437751/

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					changes in the fleet mix of those operations due to the retirement of many older/noisier aircraft, along with the continued advancement of quieter engine technology.	
#5	2	Requested environmental review and analysis recommendations for the future fuel storage facility.	---	Per the Environmental Overview[3]: The proposed Fuel Facility that includes land acquisition and construction near the Lower Duwamish Waterway shoreline could include impacts to ESA-listed aquatic species that occur in the Duwamish River if construction activities include disturbances below the shoreline Mean Higher High Water (MHHW) elevation. In addition to construction activities, it is important that the King County International Airport acknowledge the impact to aquatic species due to run off. The proposed Fuel Facility may also be in floodplain risk area and will require more analysis and include the most recent FEMA 2020 floodplain data in addition to other data, such as from the UW Climate Impacts Group, that projects higher levels of precipitation could lead to more standing water issues at the Airport4. Additionally, we recommend that sea level rise projections are incorporated into the Environmental Overview and taken into consideration as to the viability of proposed construction and proposed fuel storage facility.	Comments noted. Yes, once the proposed development site is confirmed, the potential environmental impacts of constructing the Airport's fuel storage facility must undergo a comprehensive environmental review process and obtain environmental approvals and permitting prior to construction.	4
#6	2	Consideration of Environmental Justice impacts in the Master Plan Update.	---	Environmental Justice: The Environmental Overview of the Master Plan Update states - "None of the Proposed Projects are anticipated to have a disproportionately high and adverse impact on the minority or low-income populations." We recommend that the report include information on outreach, research and sources that led to this board conclusion, such as community events, surveys, workshops, interviews with residents and businesses, with respondent data reported by race, income, etc.. The City of Seattle is aware of community-based organizations such as the	Comments noted. Special efforts have been made by KCIA staff, through targeted meetings and the provision of translation services, to gather input on the MP Update from the resident stakeholders located in the vicinity of the Airport throughout the planning process. We acknowledge receiving comments from the community-based organizations (CBOs) that you cited. However, KCIA staff have also coordinated with other CBOs (e.g., the Refugee Women's Alliance – ReWa) for interviews	4

[3] https://www.kingcounty.gov/~/media/services/airport/documents/master-plan-update/Draft_Chapter_E_Environmental_Overview.ashx?la=en
[4] https://cig.uw.edu/wp-content/uploads/sites/2/2014/11/ps-sok_sec12_builtenvironment_2015.pdf

Comments and Responses: City of Seattle - received 12/16/20

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				Georgetown Community Council and the Beacon Hill Community Council, who have already communicated their concerns about anticipated impacts to their communities– both having high populations of Black, Indigenous and people of color residents as well as a high percentage of residents with lower incomes and lower wealth. Again, we recommend that the report include an Equity Impact Review to identify how the proposed actions will impact fence line communities.	on the Master Plan Update and the vast majority of these comments were positive. We stand by our preliminary assessment that "None of the Proposed Projects are anticipated to have a disproportionately high and adverse impact on the minority or low-income populations." Please note the environmental review process (e.g., an Environmental Assessment) is the proper venue to officially document and address any potential Environmental Justice impacts that may result from the implementation of projects recommended in the Master Plan Update.	

City of Tukwila

City of Tukwila

Allan Ekberg, Mayor

Mayor's Office – David Cline, City Administrator

March 9, 2021

SENT via email to jparrott@kingcounty.gov

John Parrott, Director
King County International Airport
7277 Perimeter Rd. S.
Seattle, WA 98108-3844

Dear Director Parrott,

We appreciate your recent presentation to the Tukwila City Council regarding the King County International Airport Master Plan. We recognize the important role the King County Airport has in serving our region, and we thank you for the opportunity to engage on this effort.

Neighborhood livability is one of our community's greatest values – it emerges as a key concern during any budgeting or planning effort on which we embark. We know from talking with our residents that quality of life impacts such as noise and air pollution are of utmost concern, and we are committed to advocating for our residents on these issues wherever we can, particularly because South King County communities experience disproportionate health disparities.

As King County International Airport moves ahead with the Master Plan implementation process, we urge ongoing community discussion and involvement, particularly with our Tukwila neighborhoods in Allentown-Duwamish and Tukwila Hill. We understand that there will be future environmental analyses on specific projects and look forward to working through those in partnership with you. We'd like to offer our assistance as you work through your forthcoming Airport Communications Plan.

Sincerely,

Allan Ekberg
Mayor

Kate Kruller
Council President

KCIA Community Coalition

KCIA Community Coalition Comments and Answers based on the conversation at the KCIA Community Working Group meeting 11.23.2020:

1. *A thorough assessment of the environmental impact of the proposed Master Plan.*

With-in the County's control. This is not within the scope of the Master Plan itself, but any project proposed in the Master Plan is required to go through traditional project process, including the National Environmental Policy Act (NEPA) and SEPA processes.

2. *Include KCIA into the King County Climate Strategic Plan with target greenhouse gas emission targets.*

With-in the County's control This is not within the scope of the Master Plan, however as a County entity, we are aligned with the King County Strategic Climate Action Plan. We are supporting SCAP through our Airport Carbon Accreditation Program (where we are working to become carbon neutral by 2030), managing fleet emissions, Green Building Scorecards for project planning, mitigating the impacts of climate change to Airport assets, and participating in County task forces such as green building, energy, and climate preparedness.

3. *Have KCIA develop an environmental, social, and economic policy that will guide the level of accommodation of flight increases*

Outside the County's control. KCIA, as a public airport that does not use any tax-payer funding but does accepts FAA grant funding, cannot turn away aircraft per the FAA Grant Assurances. When KCIA accepts FAA grant funding we are also accepting all the grant assurances (or "strings attached") and must maintain the grant assurances for 20 years after taking FAA funding or we must pay the funding back.

4. *Include Beacon Hill and Georgetown with near KCIA communities in targeted local hire recruitment and targeted selection of BIPOC communities for KCIA training apprenticeships, jobs, and contracts.*

With-in the County's control. Hiring practices are not within the scope of the Master Plan and legally we cannot require applicants for apprenticeships, jobs or contracts be from a certain geographic area or demographic group. However, we do plan to link jobs and contracts for bid to our website to provide more visibility to all those who are interested.

For our internship program we already do extensive outreach in the local high schools and community colleges as well as connect with the Museum of Flight and their robust youth engagement network to help get the word out about our internship opportunities. This allowed school counselors to work with interested students to apply for the open internships.

Due to Covid, we had to pivot our internship program this year but were still able to host three interns, two from high school and one from Seattle Central. All three of them identified as BIPOC students and one is currently going to school to become a pilot. We were able to host them because of a newly formed partnership with DCHS and were one of the only agencies in King County's Department of Executive Services to host interns this year.

5. *Have KCIA engage with Beacon Hill Council, Georgetown, and other affected residents to*

a) plot the KCIA air flights and type of aircraft over Beacon Hill and Georgetown
b) measure current and future air and noise emission, and
c) identify and implement the mitigation.

Outside and with-in the County's control. KCIA cannot regulate where airplanes fly after they take off. That is under the control of the FAA control tower. We do however have a tool on our website to allow the public to track flights in real time (minus a required security delay). KCIA is also open to accommodating an air and noise monitor from the Puget Sound Clean Air Agency.

6) Inform us when the projected flight increases approach exceeding or exceed the schedule or the total flights to reopen the Community Benefits Agreement.

Outside and with-in the County's control. KCIA, as a public airport that accepts FAA funding, cannot turn away aircraft. However, we would propose an annual review of this document to see how we can continue to meet the needs of the community in ways within our control. We also can create a formal community communication plan for this community coalition's review on the ways to keep dialog open between community groups and KCIA.

7) Include the Duwamish River Clean up Coalition in the development of a health and mitigation plan near communities of the fuel storage farm.

With-in the County's control. There will be a significant community outreach effort and environmental reviews to find a new location of the fuel farm. We are still working on finding a permanent operator for the new fuel farm so we are a way off before we get to that point. We will continue to communicate the status of this effort.

8) KCIA create a green canopy around the airport to buffer noise.

With-in the County's control to a point. Landscaping is not within the scope of the Master Plan, but we are looking for a short tree or shrub that absorbs the most carbon, does not grow too tall and does not attract wildlife to plant around the airport. We welcome any suggestions community members may have.

9) Include bike pathways to help slow down the traffic.

Outside the County's control. A bike path is not within the scope of the Master Plan however, we are currently working with SDOT to assist in a plan to create a bike path between Georgetown and South Park. While it is out of scope for the Master Plan, KCIA continue to investigate other ways to beautify the area within the County's jurisdiction. However, the streets surrounding the airport are the jurisdiction or the City of Seattle or the City of Tukwila.

10) No military planes.

Outside the County's control. KCIA, as a public airport that accepts FAA funding, cannot turn away aircraft. (see answer to #2)

For items that are outside the County's control, we have contacted the FAA to find the best point of contact for these concerns and will forward that information when we get it. That will be after the holiday.

Community Outreach

Comments and Responses: Community Outreach - received 12/16/20

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#1 Stephen Taylor	1	Objection to proposed redevelopment of the existing Southwest General Aviation Area with future Air Cargo facilities.	---	Over the five decades that I've been associated with the airport, the one and only visible trend is that the airport has marginalized "the little guy." The airport has become the provenance of billionaires who have bought up all of the available general aviation space to build massive hangars to house their toys and the little remaining space has been given over to other high-bidders such as freight carriers and up-scale FBO's. At present, the ONLY remaining space where a general aviation pilot can see any degree of acceptance is on the Southwest side of the field at the Museum of Flight. The proposed development would displace that last remaining connection for aviators. Perhaps even more troubling, the proposed air cargo ramp would be directly in front of the World-Class facilities that the Museum of Flight and the Raisbeck Aviation High School have created with the help of our civic leaders over recent years. I find it unconscionable that the airport would even consider displacing the few remaining private operators and placing an eye-sore of a commercial operation in front of the High School and the Museum's beautiful Aviation Pavilion.	Comments noted. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. The future development boundary for this site will maintain the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. Please note the decision to redevelop this area of the Airport was introduced in the previous Master Plan, with the planned removal of the three T-hangars and the acquisition of the adjacent Woods Meadow property being reflected on the current 2007 Airport Layout Plan. For this MP Update, the Airport Staff's initial recommendation to propose the new Southwest Air Cargo Area originally included a provision for the development of a new North General Aviation Aircraft Storage Area to accommodate the relocation of displaced based aircraft. However, FAA's decision to no longer support the Threshold Crossing Height (TCH) waiver on Runway 14R landings for large aircraft resulted in the required 300-foot relocation to the north of the Runway 14R threshold. This future threshold relocation thus eliminated the potential development of the site for new GA aircraft storage. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.***	1

Comments and Responses: Community Outreach - received 12/16/20

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#1 Charles Hogan & Joshua Weinstein	1	Objection to proposed redevelopment of the existing Southwest General Aviation Area with future Air Cargo facilities.	---	We expressly oppose the removal of general aviation parking spaces on the southwest ramp, just to the north of The Museum of Flight (item 2 in the Master Plan Update Summary and Request for Feedback), without accommodations for replacing them elsewhere on the airport grounds. General aviation parking provides an equal access opportunity for ALL aviators alike, to access the public King County facilities. Moreover, the proximity of this parking to The Museum of Flight, provides critical access to the museum's facilities in the case of educational and public safety events. In addition, this ease of access is a requirement to accommodate those aviators with disabilities and allows for educational opportunities inclusive of access to both operational (on the flight line) and non-operational (static display) aircraft.	Comments noted. See response to comment above.	1
#2 Charles Hogan & Joshua Weinstein	1	Additional info on GA operational activity at BFI.	---	Per King County reports, general aviation aircraft represent approximately half of all aircraft operations at KBFI. King County's forecast predicts a sudden decline in general aviation activity, a figure in stark contrast to the continued growth of general aviation in our region, and one worth re-examining. Further evidence of supporting general aviation growth exists in the Federal Aviation Administration's (FAA) "Air Traffic Activity System" data, showing an increase in itinerant general aviation, plus local civil operations, from 124,050 in 2015 to 149,316 in 2019.	Comments noted. Regarding a growth plan for GA at BFI, the decline in GA operations at BFI was steady between 2000 and 2015, with average annual reductions of 4.9% for itinerant GA and 7.1% for local GA ops. 2015 was the base year of the forecasts for the MPU and GA ops later recorded recent year lows in 2016. The GA operations forecast for the MPU reflect a projected growth in the Business/Corporate and Air Taxi sectors with a corresponding decrease in recreational/training activity. However, even though fewer small GA aircraft operations have been recorded at BFI in recent years, the Airport still maintains a high based aircraft occupancy rate for both T-hangars and apron tiedowns.	4
#3 Charles Hogan & Joshua Weinstein	1	Objection to proposed redevelopment of the existing Southwest	---	While we recognize that commercial interests and tax revenue generation are a key focal point of the KBFI management, the county needs to recognize KBFI as more than just a cost and profit center. KBFI represents an access point for our community, a landmark for our young	Comments noted. Airport Staff acknowledges the challenges of planning for the future development of an airport that is severely site constrained, but has high demand for facilities to serve all	1

Comments and Responses: Community Outreach - received 12/16/20

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		General Aviation Area with future Air Cargo facilities.		aviators, and a gathering place for volunteers within the general aviation community. Further elimination of general aviation parking areas will continue a decades long trend and diaspora of general aviation services and access at KBFI. We ask that King County reconsider their adoption of the master plan, to specifically consider the negative impacts this plan will have on the general aviation community at KBFI, and the devaluation of KBFI as an asset to the King County community and tax payers.	sectors of aviation. However, King County is currently investigating how some of the existing Airport property that is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii*.**	

Friends of Boeing Field

Comments and Responses: Friends of Boeing Field (FOBFI) - received 03/12/21

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Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
#1 FOBFI	1	Runway 14R Approach	---	"KCIA will analyze alternatives to address the non-standard Threshold Crossing Height (TCH) of the ILS approach for runway 14R. The airport will first evaluate the RNAV/LPV approach designs currently under development by Hughes Aerospace [insert here the goal of what Hughes is trying to accomplish in their design in terms of addressing the TCH issue]. If approach designs do not offer a feasible solution for TCH, then the airport will pursue a Displaced Threshold to resolve the TCH. The airport will make their best effort to minimize the impacts of the Displaced Threshold, due to the 32L departure RPZ, on GA parking capacity by preserving as many spots as possible and replacing displaced spots elsewhere on the airport. Furthermore, RPZ acceptable use guidance and/or waivers will be pursued."	Additional changes or revisions regarding the existing Runway 14R non-standard Threshold Crossing Height (TCH) will have to be addressed in a future BFI planning effort. This supplemental planning could also include an evaluation of the FAA's current Interim Guidance on Land Uses Within a Runway Protection Zone, which is required when an airfield project would result in the introduction of new or modified incompatible land uses to an RPZ. The alternatives that would be prepared for this analysis should include the concept of the RW 14R displaced threshold and options for the positioning of the RW 32L departure RPZ. The evaluation of these alternatives should also include further analysis regarding the potential retention of the existing northeast general aviation parking apron.	4
#2 FOBFI	1	Northwest (NW) Airport GA Hangars and Parking	---	"KCIA will design a GA Hangar and Parking area for the NW area of the airport with the assumption that a solution can be agreed upon with FAA for the 14R Approach TCH issue and the current threshold location maintained, with accommodation for the 32L departure RPZ."	Alternatives for GA hangar and apron storage in the northwest area of the Airport were previously prepared for this MP Update and presented in the draft Working Paper Three planning document. These alternatives were later removed from consideration due to the proposed 300-foot shift/relocation of the RW 14R threshold, which would reposition the future approach RPZ over this area of airport property, thus precluding the development. Any future development considerations for this area of airport property would need to be examined following the completion of the supplemental planning efforts described in the response to Comment #1 (if applicable).	4
#3 FOBFI	1	NW GA Parking & Maintenance	---	"KCIA will evaluate building a Light GA parking area in the NW area of the airport. This would be an alternate to the same portion of the airport maintenance buildings shown in the ALP. The airport will prioritize all other possible locations for maintenance, including the purchase of adjacent and nearby properties for maintenance facilities which are not required to be on airport property."	See response to comment #2 above.	4
#4	2	NE Parking	---	"KCIA will seek a solution for the NE GA parking such that	As noted in the response to Comment #1 above, any	4

Comments and Responses: Friends of Boeing Field (FOBFI) - received 03/12/21

Code for Response Action:
1. Concur that changes are or may be needed.
2. Disagree with intent or context of comment, no changes recommended.
3. FAA decisions required or additional information necessary from King County, FAA, etc.
4. No action necessary (i.e., an opinion given, or only clarification requested, etc.)

Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
FOBFI				the aircraft may continue to park within the RPZ for runway 14R. The FAA provides for the ability to evaluate land uses within the RPZ on case by case basis. Since it is an acceptable existing land use and the airport does not have ability to relocate displaced aircraft due to space constraints on the airfield, the FAA should allow aircraft parking to continue to remain with the RPZ."	reevaluation of the existing northeast GA aircraft parking area will need to be addressed in a separate BFI planning effort that includes FAA's current Interim Guidance on Land Uses Within a Runway Protection Zone. Given the sequence of events that originally triggered the expanded boundary of the RPZ (i.e., the initial visibility upgrade of the RW 14R instrument approach procedure) and the current proposal in the MP Update to reposition the RPZ, this supplemental planning will be required.	
#5 FOBFI	2	Light GA Hangars (SW and Midfield)	---	"KCIA will plan to repair or replace the Light GA Hangars located in the southwest and mid-field areas of the airport."	Please note the proposal to redevelop the existing Southwest GA area of the Airport was introduced in the previous Master Plan, with the planned removal of the three T-hangars and the acquisition of the adjacent Woods Meadow property being reflected on the current 2007 Airport Layout Plan. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. The future development boundary for this site would exclude the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix*, including revised Figure ES1/pg. *xliii*.**	1
#6 FOBFI	2	Central Light GA Parking	---	"KCIA will initiate a reconfiguration of the Central Light GA Parking area to increase the number of GA tie-down spaces."	Airport Staff acknowledges the challenges of planning for the future development of an airport that is severely site constrained, but has high demand for facilities to serve all sectors of aviation. However, King County is currently investigating how some of the existing Airport property that	1

Comments and Responses: Friends of Boeing Field (FOBFI) - received 03/12/21

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					is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii*.**	
#7 FOBFI	2	Area 13 Light GA Parking	---	"KCIA will make the Area 13 available for GA Parking, following Boeing's vacating of Area 13."	See response to comment #6 above.	1
#8 FOBFI	2	Light GA Parking Capacity	---	"KCIA will maintain or grow the available quantity of Light GA parking spaces based on the 2015 Baseline of 263 spaces (Master Plan Chapter B – Forecast). If spaces need to be eliminated, the airport will locate, on the airport grounds, additional spaces to offset those displaced spaces. KCIA will initiate a project to provide a website so that pilots can apply for parking and check on the status and progress of their request in a transparent fashion."	See response to comment #6 above. In addition, KCIA will investigate options to automate the process of submitting based aircraft storage applications and monitoring the status of availability.	4

Georgetown Community Council

Comments and Responses: Georgetown Community Council - received 12/14/20

Code for Response Action:
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2. Disagree with intent or context of comment, no changes recommended.
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Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
#1	1	Recommendation regarding the Airport Master Plan's potential impact on generation of future noise and air pollution.	---	**Measure current and future air and noise emission and identify and implement mitigation measures**. The current master plan update calls for a 300-foot runway expansion, north in Georgetown. KCIA admits that this encroachment into the residential and commercial area of Georgetown will increase noise. We ask that a mitigation and monitoring strategy be included for both air and noise. These strategies should be co-created with community and other agencies. We also for a semi-annual review, with community, of the master plan and racial equity, health, and social justice outcomes before taking on projects that lead to additional airport growth.	Comments noted. For clarification, the proposal is for the runway to be relocated 300 ft to the north on airport property not expanding the runway. As part of this project, the airport would also be removing 500 ft. of special use pavement so reducing the overall runway available for departures by 500 ft. This project fixes a non-standard condition at the airport that FAA will no longer sign a waiver for. The potential environmental impacts of all projects recommended in the Airport Master Plan Update, including noise impacts, must be evaluated in separate environmental review documents (i.e., specified NEPA and SEPA studies) and receive environmental clearance prior to implantation or construction. The Airport Director and staff are always open to continued dialog and attending community meetings when invited.	4
#2	1	Recommendation regarding the Airport Master Plan's potential impact on the various environmental impact categories.	---	**Conduct a thorough assessment of the environmental impact of the master plan.** Ensure that KCIA examines both the impacts to community project by project AND the cumulative impacts during the National Environmental Policy Act (NEPA) and SEPA processes for each project and develop racial equity and social justice outcomes.	Comments noted. See response to comment above.	4
#3	1	Proposals to maintain/expand green buffers between the Airport and Georgetown development areas.	---	**Create a green canopy around the airport to improve health outcomes for impacted communities.** Preserve the grove of pine trees along Ellis Ave S at the current Army Reserves facility. Work with current airport tenants to provide living, green screens across from residential use.	King County is currently coordinating with the City of Seattle regarding the relocation of a segment of Airport fencing to improve the existing pedestrian connection between Georgetown and South Park neighborhoods of Seattle. This project could also include a combination of artwork and a landscape buffer along a segment of the Airport's perimeter fencing.	4

Comments and Responses: Georgetown Community Council - received 12/14/20

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					In addition, The Boeing Company has constructed an elevated wall system adjacent to several of their aircraft parking positions on the west side of the Airport that likely serve multiple purposes related to jet blast and noise mitigation, as well as provides a visual barrier. It is possible that some variant of this wall system could constructed at the north end of the Airport, in conjunction with the current artwork and a landscape buffer project that is being planned in this area. The Airport is currently looking into greenery that does not attract wildlife, absorbs the most carbon and does not grow too tall to use for increased foliage where appropriate around the airport.	
#4	1	Request for updated GHG emissions inventory and reduction plan.	---	**Include KCIA in the King County Climate Strategic Plan with target greenhouse gas emissions.** Publicly document alignment with the King County Strategic Climate Action Plan and Airport Carbon Accreditation Program. Develop racial equity, health, and social justice outcomes for each KCIA strategy toward its goal of carbon neutrality.	Comments noted. Also, as a County entity, KCIA is aligned with the King County Strategic Climate Action Plan (KCSCAP). Specifically, KCIA supports the KCSCAP by managing GHG emissions (that they can control), conducting climate preparedness, and promoting climate/community resiliency. These include, but are not limited to, initiating an Airport Carbon Accreditation (ACA) program, managing fleet emissions, Green Building Scorecards for project planning, mitigating the impacts of climate change to Airport assets, participating in County task forces (green building, energy, and climate preparedness), and optimizing the involvement of interns and disadvantaged business to participate in capital projects. In addition, following KCIA's confirmation in the ACA program, the County will be required to prepare a current GHG Emissions Inventory that meets the ACA protocols	4
#5	2	Proposal for	---	**Include Beacon Hill, Georgetown and surrounding KCIA communities in targeted local hire recruitment**	Comments noted.	4

Comments and Responses: Georgetown Community Council - received 12/14/20

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		expanding job opportunities for local residents surrounding KCIA.		**and targeted selection of BIPOC communities for KCIA training apprenticeships, jobs, and contracts.**	Yes, King County has existing programs to promote targeted outreach for our internship program and a robust disadvantaged business program for capital projects at the Airport. In addition, there are a wide variety of jobs provided by BFI tenants - from entry level, customer service reps, fuel line personnel, drivers, engineers and pilots at Boeing and UPS. Not all of the jobs are specifically located on the Airport, but include transportation providers getting to and from BFI and support for entertainment/food and beverage establishments in Georgetown.	
#6	2	Proposals to expand bike pathways in the vicinity of the Airport and surrounding neighborhoods.	---	**Include bike pathways to help slow down the traffic and integrate the airport into the neighborhood.**	Comments noted. King County is currently coordinating with the City of Seattle regarding the relocation of a segment of Airport fencing to improve the existing pedestrian connection between the Georgetown and South Park neighborhoods of Seattle. Hopefully, this planning can also include the integration of bike pathways to expand transportation linkages with the neighboring communities.	4

The Museum of Flight

Comments and Responses: The Museum of Flight - received 12/16/20

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Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
#1	1	Potential concern land use compatibility between the MOF and an adjacent future air cargo facility.	---	Of most grave concern, however, is the proposal to build out a large commercial air cargo terminal adjacent to the north and east of The Museum of Flight and to the east of Raisbeck Aviation High School, a Highline public school.	Comments noted. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. The future development boundary for this site will maintain the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. The future development boundary of the proposed new Aviation Redevelopment Area will be revised as described above on the updated draft Airport Layout Plan. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii*.**	1
#2	2	Proposed redevelopment of the existing Southwest General Aviation Area with future Air Cargo facilities.	---	Finally, we are concerned about what would be lost in the proposed area of development. General aviation is the entry point for aviation and key to industry growth. There is no current solution for the displacement of more than 75 parking slots. In addition, the ramp to the north of MOF is one of constant activity. This proposal could eliminate our ability to provide first flights for young girls at our Women Fly event, likely eliminate the ability to accommodate the Blue Angels for Seafair, and eliminate visiting aircraft from other Museums, Air and Rescue demonstrations, NASA, and more.	Comments noted. As noted above, the future development boundary for this area will maintain the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. So, an existing small general aviation development area will be maintained directly adjacent to the MOF facility, which would allow the MOF to maintain its current aviation-related educational programs (e.g., first flights) with King County youth. Please note the decision to redevelop this area of the Airport was introduced in the previous Master Plan, with the planned removal of the three T-hangars and the acquisition of the	4

Comments and Responses: The Museum of Flight - received 12/16/20

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					adjacent Woods Meadow property being reflected on the current 2007 Airport Layout Plan. Airport Staff's initial recommendation to propose the new Southwest Air Cargo Area in this MP Update originally included a provision for the development of a new North General Aviation Aircraft Storage Area to accommodate the relocation of displaced based aircraft. Schematic layouts for these new GA facilities were presented the draft Working Paper Three document and meeting notes on this topic are presented on the MP Update website, under the tabs: Master Plan Update – Meeting 3 Summary and Master Plan Update – Meeting 4 Summary. FAA's decision to no longer support the Threshold Crossing Height (TCH) waiver on Runway 14R landings for large aircraft, which was received late in the MP Update study process, required the 300-foot relocation to the north of the Runway 14R threshold, and thus eliminated the potential development of a new GA aircraft storage area at the north end of the Airport. This information is presented in Draft Chapter D Alternatives Development and Evaluation (see pgs. D.95 & D.96).	

National Business Aviation Association

Comments and Responses: National Business Aviation Association - received 12/16/20

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#1	1	Response to the impacts of the proposed RW 14R threshold relocation and RPZ enlargement.	---	We recognize the county's efforts to improve safety by making changes to the runway 14R/32L Runway Protection Zone (RPZ) and in making various airfield geometry and lighting upgrades necessary to maintain the airfield in accordance with current FAA design standards. We understand that GA areas on the north side of the airfield must be eliminated as a result of the RPZ improvements. While we recognize that the airfield is space constrained, we urge the country to find ways to minimize loss of GA capacity and ensure continued accommodation for GA activities by identifying other areas on the airport to relocate facilities displaced as the result of the changes to the RPZ, and to specifically include that plan in the Master Plan.	Comments noted. Airport Staff acknowledges the challenges of planning for the future development of an airport that is severely site constrained, but has high demand for facilities to serve all sectors of aviation. However, they are currently investigating how some of the existing Airport property that is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.***	1
#2	1	Concern regarding the MP Update recommendations to relocate GA aircraft storage facilities.	---	NBAA advocates for the entire spectrum of general aviation aircraft that rely on BFI and contribute to its success. While we recognize the jobs and potential for revenue growth an additional cargo area can bring to the airport, we are concerned that other changes proposed in the Master Plan, such as transition of Southwest Air Park area to cargo, without an accompanying plan in the Master Plan to fully relocate affected tenants if such a transition occurs, will negatively impact GA users at all levels.	Comments noted. Yes, the MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.***	1

Comments and Responses: National Business Aviation Association - received 12/16/20

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					Airport Staff's initial recommendation to propose the new Southwest Air Cargo Area in this MP Update originally included a provision for the development of a new North General Aviation Aircraft Storage Area to accommodate the relocation of displaced based aircraft. Schematic layouts for these new GA facilities were presented in the draft Working Paper Three document and meeting notes on this topic are presented on the MP Update website, under the tabs: Master Plan Update – Meeting 3 Summary and Master Plan Update – Meeting 4 Summary. FAA's ultimate decision to no longer support the Threshold Crossing Height (TCH) waiver on Runway 14R landings for large aircraft required the 300-foot relocation to the north of the Runway 14R threshold, and thus eliminated the potential development of a new GA aircraft storage area at the north end of the Airport. Please note the decision to redevelop this area of the Airport was introduced in the previous Master Plan, with the planned removal of the three T-hangars and the acquisition of the adjacent Woods Meadow property being reflected on the current 2007 Airport Layout Plan.	
#3	1 & 2	Concern regarding the MP Update recommendations to relocate GA aircraft storage facilities.	---	In closing, we applaud the county's leadership for recognizing the benefits general aviation facilities contribute to securing a robust, sustainable future for King County Airport and the safety efforts the county is planning to undertake. We believe a successful Master Plan envisions positive change for all types of aviation activities. We ask that the county give strong consideration to find ways in the Master Plan to not only maintain current capacity to accommodate general aviation, but to also lay the foundation for enhancements.	Comments noted. See responses to comments 1 & 2 above.	4

Post Public Meeting Emails

Comments and Responses: DRAFT REPORT Post Public Meeting Email Comment Log

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Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
#1 Sarah Shiftly sarah.shifley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		Table E2 "Greenhouse Gas Emissions" (in Chapter E) appears to show metric tons of CO2 emitted during various legs of flights in and out of KCIA. However, there's no explanation in the chapter of how those numbers were calculated. Did you take a percentage of total emissions from fuel pumped, or use a different methodology? And could you provide whatever source data and formulae were used to calculate these numbers.	There are two methods used at airports to calculate airport-related emissions, and they are slightly different: Airport Cooperative Research Program (ACRP) Report 11, and the Airport Carbon Accreditation (ACA). The method used should be tailored to the inventory purpose and the data available. In the case of the BFI MP Update, a hybrid was used given the information available (Appendix Six of the MP Update references the data used for the noise analysis, which was the same data used to calculate emissions using the AEDT. The evaluation of greenhouse gases focused on aircraft emissions, which represent the significant majority of aviation emissions and were calculated using the FAA's Aviation Environmental Design Tool (AEDT) Version 3b. The AEDT model calculates aircraft fuel burn in the landing and takeoff phase which is basically operation of the aircraft on arrival from a 3,000-foot altitude above ground to the airport and then on departure to 3,000 feet. This is referred to as the LTO (Landing and Takeoff cycle). The AEDT model then takes fuel burn and calculates CO2 emissions based upon the type of fuel used by the individual aircraft (recognizing that Jet A fuel has a slightly different carbon content than Aviation Gas (100LL). The MP Update did not prepare a forecast of future fuel that might be dispensed which is dependent on the distance that aircraft would travel. However, to evaluate aircraft noise, future aircraft operations (number of operations and aircraft type) enabled the evaluation of aircraft noise and emissions in the LTO. The LTO approach is consistent with ACA protocol, which is one of the intermediate calculations noted in ACRP Report Greenhouse gas emissions and were not estimated for other sources. While somewhat dated, King County prepared an inventory following the ACRP Report 11 protocol for KCIA	4

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					in 2011 identifying emissions in 1990, 2007, and 2020. Radiative forcing was also not calculated as there is no industry consensus of the specific forcing that aviation contributes. FAA continues to do research in its center of excellence about the radiative forcing nature of aviation. Sources about the airport greenhouse gas calculations can be found at: ACRP Report 11 https://crp.trb.org/acrp0267/acrp-report-11-guidebook-on-preparing-airport-ghg-inventories/ Note that there is a section of this report that discussed radiative forcing. ACRP Report 11 https://crp.trb.org/acrp0267/acrp-report-11-guidebook-on-preparing-airport-ghg-inventories/ Note that there is a section of this report that discussed radiative forcing. ACA https://www.airportcarbonaccreditation.org/ FAA Aviation Emissions https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/media/primer_jan2015.pdf Example radiative forcing article: https://journals.ametsoc.org/bams/article/97/4/561/216221/Impact-of-Aviation-on-Climate-FAA-s-Aviation	
#2 Sarah Shiftly sarah.shifley@gmail.		Environmental Concerns – part of 350 Seattle Aviation Team		Could you confirm that the Master Plan Update reports do *not* consider any non CO2-caused climate warming from aviation emissions (often referred to as radiative forcing)?	As noted above, there has not been industry acceptance of an approach to capturing radiative forcing, and it's potential impact was not included in the MP Update report.	4

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com						
#3 Sarah Shiftly sarah.shifley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		Chapter E also includes this statement in the Environmental Justice section: "None of the Proposed Projects are anticipated to have a disproportionately high and adverse impact on the minority or low-income populations." Could you please provide all substantiation that KCIA has for this statement?	Based upon the overlay/comparison of the baseline environmental inventory documentation with the recommended project list from the MP Update, we believe that the statement above regarding potential Environmental Justice impacts is correct. A definitive conclusion would have to be either confirmed or mitigated through a NEPA and SEPA evaluation prior to the development of any specific airport development project. If a project is determined to have disproportionately high and adverse impacts on the minority or low-income populations then mitigation measures may be required. As an example, the future noise analysis as an element of the NEPA process may need to include a census tract analysis to identify potential impacts on any minority or low-income populations.	4
#4 Sarah Shiftly sarah.shifley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		What, if any, analyses were done to determine the impact the forecasted increase in flights and proposed projects would have on the achievability of the GHG emission reduction targets set by Seattle, King County, and Washington State?	The MP Update only documented a snapshot of the aircraft operations-related GHG emissions data for the years 2018, 2023, and 2035. Any analysis of the Airport's future role in meeting GHG emission reduction targets set by the City of Seattle, King County, and Washington State would need to be based on a more comprehensive evaluation of the greenhouse gas emissions for the overall operation of the Airport.	4
#5 Sarah Shiftly sarah.shifley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		The "Executive Summary" references a "strategic vision established by King County" (p. xxiii). Could you please provide me a copy of that "strategic vision"?	This information is in reference to the County's Strategic Plan Goals and Objectives, as defined in the King County Strategic Plan and the King County International Airport Strategic Plan 2014-2020. This document was to serve as an Airport Management business decision-making tool (i.e., the roadmap) for the development of capital projects, sustainability, and customer service.	4
#6 Sarah		Environmental Concerns –		The "Executive Summary" states that the plan's basic assumptions were formulated with input from "stakeholders,	At the beginning of the master plan a group of stakeholders was developed which created the airport working group. You	4

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Shiftly sarah.shiflley@gmail.com		part of 350 Seattle Aviation Team		airport staff, and the FAA." Could you please provide a list of all stakeholders who participated in this formulation and the input provided by each stakeholder? Could you also explain how stakeholders were identified and selected?	can find the working group charter and meeting notes on the master plan update page of our project website. https://www.kingcounty.gov/services/airport/master-plan-update.aspx	
#7 Sarah Shiftly sarah.shiflley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		The "Executive Summary" states that the basic assumptions "include a commitment for continued airport development that supports ...sustainable planning objectives in the region." Could you please provide me a copy of these "sustainable planning objectives" and an explanation of where and how they are included in the assumptions?	A listing of the planning goals and supporting objectives defined in the King County International Airport Strategic Plan 2014-2020 are presented on pages A.2-A.3 of the Inventory of Existing Conditions chapter of the Master Plan Update. Additionally, as a County Agency we will be aligned with the King County Strategic Climate Action Plan (SCAP). Outside of the Master Plan we are working on an Airport Carbon Accreditation Program through the Airports Council International , managing fleet emissions, Using Green Building Scorecards for project planning, and participating in County task forces (green building energy, and climate preparedness). The County SCAP is located at the link below. It is still under County Council review. https://www.kingcounty.gov/services/environment/climate/actions-strategies/strategic-climate-action-plan/2020-SCAP-update.aspx	4
#8 Sarah Shiftly sarah.shiflley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		Have you looked at more recent research on radiative forcing? The sources you provide don't appear particularly current.	As presented below in your response, we have not been actively reviewing this since there has not been industry acceptance of an approach to capturing radiative forcing.	4

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#9 Sarah Shiftly sarah.shifley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		Is it correct that the last GHG emission inventory completed by KCIA was in 2011? (I think I may be misreading your response.)	Please see the draft environmental section on the Master Plan website (link) page E.2 for the table on aircraft operation emissions inventory conducted for the master plan. The master plan is not an in-depth GHG study. The last full GHG emissions inventory in was done in 2011 however it will be updated through Airport Accreditation program through Airports Council International which we have just begun.	4
#10 Sarah Shiftly sarah.shifley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		Can you provide a copy of the most recent GHG emission inventory completed by KCIA?	A copy of the report was sent to you via email.	4
#11 Sarah Shiftly sarah.shifley@gmail.com		Environmental Concerns – part of 350 Seattle Aviation Team		Can you provide an explanation of how the master plan update -- and KCIA generally -- is "aligned" with the SCAP? I'd also appreciate any supporting documentation.	There are instances in the King County SCAP that discusses the Airport's actions that include fleet and climate preparedness. Please see the King County SCAP document (link) page 269, 270 and 290 for documentation.	4
#1 John Hallock hallock.john@gmail.com		Environmental Impact Concerns		Hi I'm a resident who lives just north of the runway in Georgetown. I'm concerned that the extension of the runway will significantly impact the health and safety of my family. The planes come in low and loud enough and the extension of the runway will only make that issue worse. I would suggest the airport consider offering the impacted residents potential buyouts of their property if the airport intends to expand the runway and expand operations it doesn't seem like a long-term viable place to live for my family.	Comments noted. The potential noise impacts of repositioning the RW 14 threshold 300 ft to the north on airport property will have to evaluated in separate environmental review documents (i.e., specified NEPA and SEPA studies) and receive environmental clearance prior to implementation or construction. In addition, the updated existing and future noise contours that were generated for this Master Plan Update are significantly smaller than the previous contours generated for the KCIA Part 150 Noise Compatibility Study, and would likely result in a much smaller Noise Mitigation Boundary if the Study were updated today. This current reduction in the KCIA-related noise footprint is the result of	4

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					both fewer aircraft operations being conducted at the Airport and changes in the fleet mix of those operations due to the retirement of many older/noisier aircraft, along with the continued advancement of quieter engine technology.	
#1 Robert Ferry robert.ferry@gmail.com		Potential Ruby Chow Park expansion		Below is the area of land I was referring to in my question today about using vacant land to double the size of Ruby Chow parl In fact the traffic on Hardy and 13th Ave S is so little that it could be closed to provide a contiguous park that is more than twice the size of Ruby Chow. I would note that Ruby Chow is also already within the protection zone and a passive park use should be compatible with the nature of the protection zone 	Comments noted. As specified in FAA's Airport Design Advisory Circular (AC 150/5300-13A) "The RPZ function is to enhance the protection of people and property on the ground. Where practical, airport owners should own the property under the runway approach and departure areas to at least the limits of the RPZ. It is desirable to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, as a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities." Since a public park is not an approved recommended land use within the RPZ boundary, the proposed expansion of Ruby Chow Park on Airport Property (into the future repositioned boundary area of the RPZ) would not be approved by the FAA.	4
#1 Richard Gelb		Aviation fuel flowage fees		Hi John, I'm following up to see if you might be able to summarize leaded fuel vendor sales volume per day/per week.	Hi Richard, This is Tony E from the Airport. We've met during ESJ interdepartmental trainings on Equity Impact Review Tool	4

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Richard. Gleb@kingcounty.gov 206-477-4536 Healthy Community Planning and Partnering Team Documentation Unit Lead, COVID-19 Response Public Health Seattle/King County				Thank you for any info you can provide on this topic.	implementation for capital projects. The Airport receives fuel flowage fees for two types of aviation fuel: $0.08/gallon for Jet-A (kerosene-based fuel for turbine engines); & $0.055/gallon for 100LL (Avgas 100 octane low-lead fuel for reciprocating piston engines) Please let me know if either or both of these fuel types meet criteria for your Duwamish Valley Air Quality meeting discussion. The Airport has monthly reporting data received from six fuel providers for these two fuel types; to break down this data more granularly into daily/weekly fuel quantities would be a manual "heavy lift." Followed up on 11/17/2020 Listed below are the Airport's fuel flowage numbers as reported by BFI fuel providers (i.e., Air BP, AvFuel, World Fuel Services, etc.) from 2017 thru SEP-2020. Source documents for this data are the Airport's fuel audits. (to big of a file to include here) Please let me know if you have any questions or need additional information.	
#1 Adam Malone				This is feedback in response to the Update Summary and Q&A during the Open House sessions regarding the planned removal of a large portion of light General Aviation (GA) parking: A statement should be added to the Master Plan that	Adam, Thank you for your feedback. Airport Staff acknowledges the challenges of planning for the future development of an airport that is severely site	1

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				identifies that the impact to light GA parking due to the planned removal of NE and SW Parking is an issue for which mitigation plans are needed and creative solutions are being sought (e.g. parking at Lot 13). Perhaps this could be stated in the Airport Development Plan portion of the updated Master Plan. Although addressing this issue will be a challenge due to airport size constraints, stating it in the Master Plan would indicate the willingness of KCIA to collaboratively look for creative solutions. Light GA is still forecasted to be the largest category of airport operations through 2035, and providing access for the light GA pilot community that lives in King County is an important and appreciated part of the airport's mission.	constrained, but has high demand for facilities to serve all sectors of aviation. However, we are currently investigating how some of the existing Airport property that is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix*, including revised Figure ES1/pg. *xliii*.**	
#1 Maureen Sánchez LDW Site Manager Washington State Department of Ecology NWRO		Proposed fuel farm relocation site.		Hello, The Jorgensen Forge Site is located at 8531 E Marginal Way S Seattle and adjacent to the Lower Duwamish Waterway (LDW) Superfund site. This is also the location of the Jorgensen Forge Corp contaminated site which cleanup is overseen by the Washington State Department of Ecology (Ecology). Because of the historic upland contamination present at this site as well as the potential risk for additional contamination into the LDW that may result during and after the cleanups are conducted; siting of a fuel farm at this location is not recommended. The potential risks to human health and the environment that may result from spills and other activities known to be associated to fuel farms make this location an undesirable choice for the community and the environment. Please take this under consideration during plan revisions and contact	Comments noted. The MP Update has identified the Jorgensen Forge Site property as a potential redevelopment site for the Airport's existing fuel storage facility. However, the property would still need to be acquired by the Airport (following the completion of an Environmental Due Diligence Audit) to support the project, and the potential environmental impacts associated with the future development of this site (e.g., existing site contamination) would have to be evaluated and receive both NEPA and SEPA environmental clearances prior to development.	4

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				Ecology for additional information regarding this contaminated site.		
We had – number of people with the same comment. See attached list.		Environmental Concerns		Dear Planners and Outreach, The King County International Airport (KCIA) Master Plan Update lays the groundwork for an untenable increase in greenhouse gas (GHG) emissions and climate warming from new aviation activity. In King County, aviation is already a major contributor to climate warming. Before the Master Plan Update goes forward, KCIA should perform a full GHG emission inventory, including total emissions from all fuel pumped and factoring in radiative forcing. The Master Plan Update should also include concrete steps for meeting the emission reductions goals laid out in King County's Strategic Climate Action Plan: a 50% reduction from 2007 levels by 2030. We need a decrease, not an increase, in aviation emissions for there to be any possibility of meeting our climate goals! The proposed Master Plan Update also clears a path for greater harm to neighboring communities. Aviation is a major source of air and noise pollution, and the communities closest to the airport that take the brunt of this pollution are far more diverse and poorer than King County as a whole. The plan trivializes serious noise impacts and ignores adverse health effects from ultra-fine particulate pollution. This is classic environmental racism, and we can't let it happen. Please amend the Master Plan Update to align with King County's climate goals and commitments to equity and environmental justice (as laid out in written comments submitted by 350 Seattle), and incorporate the demands of impacted communities! We need a moratorium on all aviation growth.	Comments noted. KCIA is one of the few airport's in the country that has prepared a comprehensive GHG inventory (entitled, *King County International Airport Greenhouse Gas Emissions Inventory: 1990, 2007 &* 2020), which was published in 2011. Also, as a County entity, KCIA is aligned with the King County Strategic Climate Action Plan (KCSCAP). Specifically, KCIA supports the KCSCAP by managing GHG emissions (that they can control), conducting climate preparedness, and promoting climate/community resiliency. These include, but are not limited to, initiating an Airport Carbon Accreditation (ACA) program, managing fleet emissions, Green Building Scorecards for project planning, mitigating the impacts of climate change to Airport assets, participating in County task forces (green building, energy, and climate preparedness), and optimizing the involvement of interns and disadvantaged business to participate in capital projects. In addition, following KCIA's confirmation in the ACA program, the County will be required to prepare a current GHG Emissions Inventory that meets the ACA protocols.	4

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#1 Aisha Sial		Environmental Concerns		Dear Planners and Outreach, I am horrified to think anyone would make plans to grow air travel in King County. This is unjust to the point of criminal even suicidal to our region. Our family lived near Boeing Field, my grandchildren breathed the flumes left behind by the many small planes using leaded fuel! Now they live near Renton airport. Families of Black, Indigenous, and all people of Color have fewer educational employment, and housing options because of our deeply embedded ideas of White supremacy. Racist culture supports lies (both huge and small) and the illegal antisocial crimes of powerful wealthy people are destroying us all. Whites who remain apathetic and selfish will reach a bad end sooner or later. I warn you now make plans to shrink aviation and provide more equity. For my personal reasons and all the reasons listed below by 350 Seattle... DOWNSIZE AVIATION! The King County International Airport (KCIA) Master Plan Update lays the groundwork for an untenable increase in greenhouse gas (GHG) emissions and climate warming from new aviation activity. In King County, aviation is already a major contributor to climate warming. Before the Master Plan Update goes forward, KCIA should perform a full GHG emission inventory, including total emissions from all fuel pumped and factoring in radiative forcing. The Master Plan Update should also include concrete steps for meeting the emission reductions goals laid out in King County's Strategic Climate Action Plan: a 50% reduction from 2007 levels by 2030. We need a decrease, not an	Comments noted. King County does not have the authority limit or restrict the operation of aircraft to and from the facility. We concur that a projected increase in aircraft operations, as outlined in the Master Plan Update, would result in an increase in aircraft noise at KCIA, which was documented in the Environmental Overview chapter of the MP Update (see pgs. E.10-19). However, the potential environmental impacts associated with any of the proposed projects in the MP Update (e.g., noise and air quality impacts) would have to be evaluated and receive both NEPA and SEPA environmental clearances prior to development. It should also be noted that the updated existing and future noise contours, generated for this Master Plan Update, are significantly smaller than the previous contours generated for the KCIA Part 150 Noise Compatibility Study, and would likely result in a much smaller Noise Mitigation Boundary if the Study were updated today. This current reduction in the KCIA-related noise footprint is the result of both fewer aircraft operations being conducted at the Airport and changes in the fleet mix of those operations due to the retirement of many older/noisier aircraft, along with the continued advancement of quieter engine technology.	4

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				increase, in aviation emissions for there to be any possibility of meeting our climate goals! The proposed Master Plan Update also clears a path for greater harm to neighboring communities. Aviation is a major source of air and noise pollution, and the communities closest to the airport that take the brunt of this pollution are far more diverse and poorer than King County as a whole. The plan trivializes serious noise impacts and ignores adverse health effects from ultra-fine particulate pollution. This is classic environmental racism, and we can't let it happen. Please amend the Master Plan Update to align with King County's climate goals and commitments to equity and environmental justice (as laid out in written comments submitted by 350 Seattle), and incorporate the demands of impacted communities! We need a moratorium on all aviation growth.		
#1 Amy Marks		Environmental Concerns		Hello. I am writing today with a comment on the King County International Airport Master Plan. I will keep my comments simple. Aviation activity in our region has been increasing in recent years, and with it comes an increase in climate pollution, noise pollution and air pollution. Hopefully I don't need to explain the importance of lowering global climate pollution. Air and noise pollution from KCIA effect some of the county's least economically advantaged residents. I would like to suggest that the master plan focuses on decreasing these environmental pressures, rather than increasing them. This would be more in line with our county's values and goals.	Comments noted. See response to Aisha Sial comments noted above on pg. 10.	4
#1		Environmental		Dear Planners and Outreach,	Comments noted.	4

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Daniel Ferra		Concerns		CARBON HAS 30-50 YEAR LAG TIME BEFORE MOLECULE REACHES ITS FULL POTENTIEAL IN HOLDING HEAT MASS METHANE NATURAL GAS HAS 10 YEAR LAG TIME AND IS 130 TIMES HOTTER THAN A CARBON MOLECULE WE ARE LOCKED IN TO EXPONENTIAL HEAT EXPONENTIAL RAIN EXPONENTIAL SNOW COMING OFF OF GREENLANDS 20 FEET OF SEA LEVEL RISE METHANE NATURAL GAS INDUCED WINDS CAN BRING RECORD HEAT RAIN OR SNOW ANY WHERE US FEDERAL RESERVE BANK NUCLEAR FOSSIL FUEL MONOPOLIES BITCH SLAPPING HOME GLOBE IN WARRING SLAVE MINERAL OIL AND GAS EXTRACTION TERRITORIES ARRESTING SHOOTING BURNING DROWNING AN KILLING us IN THEIR EXECUTIVE EXTINCTION EXECUTION LYING AND DENYING GLOBAL WARMING ABRUPT CLIMATE CHANGING SEA LEVEL RISING OVER 220 FEET WITH IN 36 MONTHS 444 Nuclear Reactors 450 Nuclear Facilities Over 1,300 Nuclear Fuel Rod Pools Over 2,000 Nuclear Detonations Over 14,000 Nuclear Weapons Over 250,000 Toxic Tons Of Radiated Nuclear Waste	See response to Aisha Sial comments noted on pg. 10.	

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				Globally NAKASAKI HEROSHIMA FUKUSHIMA SINCE 2005 GLOBAL WARMING FEED BACK LOOPS SEEPING SPEWING AND VENTING METHANE NATURAL GAS PERMA-FROST METHANE HYDRATES MANTLE METHANE FROM ISOSTATIC REBOUNDING AND PINGOES NATALIA SHOVKHOV GUY MCPHERSON AND KEVIN HESTER FEEL THEY ARE GETTING READY TO EXPLODE THIS SECOND MINUTE HOUR DAY 20 FEET OF SEA LEVEL RISE IN GREENLAND 200 FEET OF SEA LEVEL RISE IN ANTARCTICA MELTING CALVING GETTING READY TO COLLAPSE WITH IN 36 MONTHS LAST TIME PARTS PER MILLION OF CARBON WAS 410PPM SEA LEVEL WAS 130 FEET HIGHER THAN RIGHT NOW CARBON IS AT 415PPM ANTARCTICA HAS MELTED MORE IN THE PAST 4 YEARS THAN WHAT THE ARCTIC MELTED IN THE PAST 34 YEARS STRATOSPHERE IS 65C HOTTER THAN 4 YEARS AGO AN GETTING HOTTER ONLY MEASURING CARBON ADD 2.0C METHANE NATURAL GAS ADD 2.0C NITROUS OXIDE ADD 2.0C WATER VAPOUR ADD 2.0C CARBON = 8.0C GLOBAL TEMPERATURES RISE since the 1700S 21 JUNE 2020 SIBERIAN ARCTIC 100.4F RECORD HEAT RECORD FIRES RECORD RAIN RECORD FLOODS YEAR AFTER YEAR EVERY YEAR		

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				ALLOW RESIDENCE TO SELL THEIR SOLAR BATTERIES AND ELECTRICAL VEHICLE POWER TO THE UTILITY aka FEED IN TARIFF https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fpetitions.moveon.org%2Fsign%2Flet-california-home-owners&data=04%7C01%7CKCIACommunityOutreach%40kingcounty.gov%7C590124d2247845066bd608d893bd7a3d%7Cbae5059a76f049d7999672dfe95d69c7%7C0%7C0%7C637421789297573380%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=0wMA4LjhgZgOLXgFVZE3%2Fnxx%2FwHSrpys1UTD8VbNbwI%3D&reserved=0 SOLAR + ELECTRIC VEHICLE + AC UNIT = SAVED LIFE WHEN GRID IS DOWN BAN FRACKING https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3Dv9GRkZMTqCs&data=04%7C01%7CKCIACommunityOutreach%40kingcounty.gov%7C590124d2247845066bd608d893bd7a3d%7Cbae5059a76f049d7999672dfe95d69c7%7C0%7C0%7C637421789297573380%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=PsWxN8uhK%2BOK9BrVsE5Y%2FBE2pGEmh95QXYfkQKioaSc%3D&reserved=0 When Will Greenland and Antarctica Collapse ? Great Lakes Lake Levels Rising Because of Record Rain an Greenland Melting All That Ice an Snow Is Heavy		
#1 Robert		Displacement/ Loss of		Dear King County International Airport/Boeing Field -	Comments noted.	1

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Braunstein		Existing GA aircraft storage facilities		It has come to my attention that the current proposal and master plan of Boeing field includes the "redevelopment of the Southwest area", which is another way of saying "the elimination of approximately 75 general aviation hangars and tie down spaces". I do not see any firm plans in the current proposal for the relocation of these spaces on the field. I have lived in West Seattle for the past 30 years and have had a small airplane (single engine land) located on Boeing Field since 1996. It is not just a hangar but a way of life for me. According to FAA Airport Compliance Manual 5190.6B, Chapter 9, Section 9.1.a and Section 9.7, this current proposal is in direct violation. Here are the excerpts: Federal Grant Obligations. Grant Assurance 22, Economic Nondiscrimination, requires the sponsor to make its aeronautical facilities available to the public and its tenants on terms that are reasonable and without unjust discrimination. This federal obligation involves several distinct requirements. First, the sponsor must make the airport and its facilities available for public use. Next, the sponsor must ensure that the terms imposed on aeronautical users of the airport, including rates and charges, are reasonable for the facilities and services provided. Finally the terms must be applied without unjust discrimination. The prohibition on unjust discrimination extends to types, kinds and classes of aeronautical activities, as well as individual members of a class of operator. This is true whether these terms are imposed by the sponsor or by a licensee or tenant offering services or commodities normally required at the airport. The tenant's commercial status does not relieve the sponsor of its obligation to ensure the terms for services offered to aeronautical users are fair	The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. The future development boundary for this site would exclude the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. The future development boundary of the proposed new Aviation Redevelopment Area will be revised as described above on the updated draft Airport Layout Plan. Please note the proposal to redevelop this area of the Airport was introduced in the previous Master Plan, with the planned removal of the three T-hangars and the acquisition of the adjacent Woods Meadow property being reflected on the current 2007 Airport Layout Plan. For this MP Update, the Airport Staff's initial recommendation to propose the new Southwest Air Cargo Area originally included a provision for the development of a new North General Aviation Aircraft Storage Area to accommodate the relocation of displaced based aircraft. Schematic layouts for these new GA facilities were presented in the draft Working Paper Three document and meeting notes on this topic are presented on the MP Update website, under the tabs: Master Plan Update – Meeting 3 Summary and Master Plan Update – Meeting 4 Summary. However, FAA's decision to no longer support the Threshold Crossing Height (TCH) waiver on Runway 14R landings for large aircraft, which was received late in the study process, resulted in the required 300-foot relocation to the north of the Runway 14R threshold. This threshold relocation then eliminated the potential development of the new North General Aviation Aircraft Storage Area. This information is presented in Draft Chapter D Alternatives Development and Evaluation (see pgs. D.95 & D.96).	

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				and reasonable and without unjust discrimination. (See An air carrier that assumes the same obligations imposed on other tenant air carriers shall enjoy the same classification and status. This applies to rates, fees, rentals, rules, regulations, and conditions covering all the airport's aeronautical activities. Availability of Leased Space. The sponsor's federal obligation under Grant Assurance 22, Economic Nondiscrimination, to operate the airport for the public's use and benefit is not satisfied simply by keeping the runways open to all classes of users. The assurance federally obligates the sponsor to make available suitable areas or space on reasonable terms to those willing and qualified to offer aeronautical services to the public (e.g. air carrier, air taxi, charter, flight training, or crop dusting services) or support services (e.g. fuel, storage, tie-down, or flight line maintenance services) to aircraft operators. Sponsors are also obligated to make space available to support aeronautical activity of noncommercial aeronautical users (i.e., hangars and tie-down space for individual aircraft owners). This means that unless it undertakes to provide these services itself, the sponsor has a duty to negotiate in good faith for the lease of premises available to conduct aeronautical activities. Since the scope of this federal obligation is frequently misunderstood, the following guidance is offered: a. Servicing of Aircraft. All grant agreements contain an assurance that the sponsor will neither exercise nor grant any right or privilege that would have the effect of preventing the operator of an aircraft from performing any services on its own aircraft	Regarding the comments in reference to compliance with Grant Assurance 22, BFI is a significantly space constrained facility that has historically experienced a greater demand for aircraft storage facilities than could be accommodated within their limited development footprint. Given these existing site development constraints and the ongoing changes in aviation demand, Airport Staff are sometimes required to make difficult choices regarding future planning recommendations through the Airport Master Plan process, and have those changes reflected on the updated Airport Layout Plan. As noted above, the existing southwest T-hangars were identified for removal in the previous planning study, as reflected on the existing ALP. In addition, the designation of this area as a future Aviation Redevelopment Area that could include air cargo facilities is not a violation of the grant assurances. BFI Staff had no input into FAA's decision to revoke the existing TCH waiver that eliminated the option for the proposed new GA aircraft storage area at the north end of the Airport. However, they have committed in recent public meetings on the MP Update to continue the evaluation of other locations on the west side of the Airport (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) to accommodate some of these relocated based aircraft, as existing leaseholds expire. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix*, including revised Figure ES1/pg. *xliii*.**	

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				with its own employees. This does not, however, federally obligate the sponsor to lease space to every aircraft operator using the airport. It simply means that any aircraft operator entitled to use the airfield is also entitled to tie down, adjust, repair, clean, and otherwise service its own aircraft, provided it does so with its own employees and conducts self-servicing in accordance with the sponsor's reasonable rules or standards established for such work. Accordingly, the assurance establishes a privilege of selfservice, but it does not, by itself, compel the sponsor to lease the facilities necessary to exercise that privilege. Furthermore, general aviation (GA) has a rich history at Boeing Field, providing jobs, flight training, aircraft charter, maintenance, repair, recreation and more. GA activity at Boeing Field generates significant economic impact to King County – both at the airport and in the surrounding community. Other airports in the area do not have the additional capacity to accommodate the displaced aircraft, forcing many owners to base their aircraft several hours away, or sell. I strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area unless a new hangar and tie down area, commensurate or larger in size, can be located on the field. GA deserves a continued presence on Boeing Field.		
#1 Brian Janssen		Displacement/ Loss of Existing GA aircraft storage facilities		t and user of the sw parking tiedown and hangar area. I am strongly opposed to the redevelopment of this space, unless it is redevelopment of the existing spaces and uses. General aviation is a critical part of the history and future of boeing field. Repurposing these spaces would leave no hangaring options for small plane owners. This would leave King County catering to the private hangaring needs of a half	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				dozen or so local billionaires. If this is a revenue generation issue then increase the current rents for sw parking and hangars, but if that is done the facilities would require significant renovation.		
#1 NJ Morgan		Environmental Impact concerns		Dear Planners and Outreach, Having lived in locations that were significantly, and negatively, affected by increases in aviation activity, I strongly urge you to decrease air traffic at the King County International Airport. In addition, it is essential that you amend the Master Plan Update to align with King County's climate goals.	Comments noted. King County does not have the authority limit or restrict the operation of aircraft to and from the facility. We concur that a projected increase in aircraft operations, as outlined in the Master Plan Update, would result in an increase in aircraft noise at KCIA, which was documented in the Environmental Overview chapter of the MP Update (see pgs. E.10-19). However, the potential environmental impacts associated with any of the proposed projects in the MP Update (e.g., noise and air quality impacts) would have to be evaluated and receive both NEPA and SEPA environmental clearances prior to development.	4
#1 Kevan Yalowitz		Displacement/ Loss of Existing GA aircraft storage facilities		Dear King County, I am a general aviation pilot based on Vashon Island. Boeing Field is a critical safety destination for me. Recently, my wife was pregnant, and using tie downs at Boeing Field allowed me to rush my wife to the hospital and see my child be born. Please continue to welcome general aviation at BFI and consider the implications beyond GA as simply joy flights and training.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Wesley Hebert		Displacement/ Loss of Existing GA aircraft storage facilities		Rumor has it you're considering removing some GA parking spots at the SW corner of the field? This is a horrible idea! There is not enough General Aviation parking near Seattle as it is. Hangar wait lists are years long and ridiculously priced, and this is only going to make it	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				worse. BFI has a history filled with GA, please don't push it away like so many great airports have. If anything, more GA parking should be built. In case it isn't clear, I'm vehemently opposed to tearing down ANY GA parking unless it's to build MORE GA parking.		
#1 Bob Carpenter		Displacement/ Loss of Existing GA aircraft storage facilities		Please do not eliminate the 75 tie down and hanger parking spaces for GA aircraft at Boeing field in the SW corner. As a pilot, I like to fly to the Museum of Flight and park in those spaces. There already are too few GA spaces at the field. Thank you!	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Jack		Displacement/ Loss of Existing GA aircraft storage facilities		I feel there is a theme around the Seattle area at the main airports. There are changes overall being made that discourage GA. From the numerous problems at Renton to tie downs at risk on Boeing field. It is slowly dying when i compare it to what it once was.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 David J Krall		Displacement/ Loss of Existing GA aircraft storage facilities		We need all available tie downs for GA use. Thank you and please keep me informed of progress on this issue.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 N13489		Displacement/ Loss of Existing GA aircraft storage facilities		Boeing field general aviation parking cut backs: STOP! It's hard to get parking already! Seems there's no plan to move the lost parking anywhere!	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Michael Angiulo		Displacement/ Loss of Existing GA aircraft storage facilities		Hello, I am writing in support of continued GA operations at Boeing Field. I am a commercial pilot who has been active in the local aviation community for the past 25 years. Over	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				that time, I have hangered airplanes at KBFI, purchased avionics and maintenance on the field, and have rented and chartered both fixed wing aircraft and helicopters. The redevelopment of the Southwest area will eliminate important GA capacity, and I strongly oppose the proposal unless new hangar and tie down areas can be located on the field which compensate for the loss. I have owned ten airplanes and finding suitable tie down and hangar space has always been difficult. Please do not make it more difficult to be able to have access to these general aviation services in the future!		
#1 Mark Masciarotte		Displacement/ Loss of Existing GA aircraft storage facilities		I am traveling and just learned that a proposal is being considered to eliminate the general aviation (GA) ramp at the southwest section of the airport as well as the apron and tiedown area at the northeast end. As a pilot and long-time aircraft operator I should like to go on record to say that I oppose eliminating any space for GA parking or storage. It should be remembered that GA has long played an important role at BFI. Indeed, almost the entire eastern side of the field has been supported by GA aircraft — from large, transport category private jets to small trainers and helicopters — and a number of small GA-related businesses. To my knowledge, the hangars on the west side south of the Boeing facility are leased entirely by owners of GA aircraft as are the tiedowns adjacent to the air museum and the tiedowns on the northeast side. I can see from the Mead and Hunt draft document and drawings that some new FBO space is planned. Nevertheless, unless a plan is adopted that would replace the existing hangars and tiedowns somewhere on the field without a net loss of existing capacity, the proposed redevelopment should not be pursued. As the prime GA reliever for SEA, BFI is the only airport within many miles	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				that can accommodate locally owned GA aircraft. The economic impact of BFI's GA-related operations is substantial, and the loss of based GA aircraft and related businesses will impact jobs, rents and revenue. The need for hangar and tiedown space is real and the availablity nationwide is dwindling. Please consider a plan that will not reduce the number of based GA aircraft at Boeing Field. Kind regards,		
#1 Ted Millar		Displacement/ Loss of Existing GA aircraft storage facilities		King County Commissioners, We strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area at Boeing Field unless a new hangar and tie down area, commensurate or larger in size can be located elsewhere on the field !! Our company and many of our businesses from Oregon use Boeing Field constantly in our Interstate Commerce activities which generates significant economic impact to King County – both at the airport and in the surrounding communities. Respectfully Submitted, Ted Millar	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Christopher Carey		Displacement/ Loss of Existing GA aircraft storage facilities		I'm an on field tenant. Please count me as against taking away more hanger space. KBFI is the safest approach in the Seattle area and GA needs this field. Also, once lost GA will not return. I hope this is not KC intent. Regards	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				Christopher Carey		
#1 Michael Tanksley		Displacement/ Loss of Existing GA aircraft storage facilities		Greetings. It has come to my attention that King County is considering significant reductions in parking facilities for general aviation aircraft (GA) at BFI. I am opposed to this proposal as presented. GA is a fundamental element of our aviation community yet it is under tremendous pressures from many angles. Not the least of these is availability of hanger and tie-down facilities in and around large urban centers such as King County. BFI offers a crucial public service in this regard, as it has for many decades. Looking back on my 35 year career as a commercial pilot, perhaps the pinnacle of which was over 15,000 hours in the B-747, it all started with my first lessons in a Piper Cherokee. Civilian aviation is a fundamental building block for aviation in our country and should be afforded the appropriate respect and accommodations. If this location is crucial for some sort of redevelopment, this should proceed only after replacement facilities are secured and developed at BFI for the displaced GA operators.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Alan Gureivch		Displacement/ Loss of Existing GA aircraft storage facilities		General aviation is a valid part of KBFI and has contributed financially to the airport's finances for decades. As the airport is a County asset, meant to benefit all King County residents and taxpayers, cutting General Aviation out of the picture, as will be done to large extent by the development of a cargo facility in the Southwest corner, goes counter to that charter responsibility.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				As airport management so disingenuously states, 'further development of areas to provide for general aviation is being explored'. Given the presentations made by them and their consultants, where they repeatedly say the airport footprint is severely constrained with very little ability to expand, I anticipate their final statement being "Further parking for general aviation uses can be found at other airports in the area" and washing their hands of what the impact of closing the SW area will be. I am already at one of those "other general aviation airports" and there is already zero room for more tie-down parking/hangaring. Improving BFI is absolutely needed and overdue. But it must be done as a County facility serving all users, not just "big airplanes" and commercial functions. General aviation users pay our taxes to support the county airport. We should reap some benefit from this as a matter of course.		
#1 Deirdre Curle		Environmental Impact concerns		Hello, I attended the community meeting in October. I wish to submit comments regarding the King County Master Plan. I live on Beacon Hill, about 1 mile from the airport. I am concerned about the effects of increased noise on local homes and businesses near the airport, as well as the effects of the runway expansion. Do you have plans to make an environmental impact statement that takes into account communities within a 2 mile radius of the airport? How will you measure and mitigate the environmental effects on the community of the extension of the runway on the north side? I appreciate the information you have provided through	Comments noted. The potential noise impacts of repositioning the RW 14 threshold 300 ft to the north on airport property will have to evaluated in separate environmental review documents (i.e., specified NEPA and SEPA studies) and receive environmental clearance prior to implementation or construction. In addition, the updated existing and future noise contours that were generated for this Master Plan Update are significantly smaller than the previous contours generated for the KCIA Part 150 Noise Compatibility Study, and would likely result in a much smaller Noise Mitigation Boundary if the Study were updated today. This current reduction in the KCIA-related noise footprint is the result of	4

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				community meetings and your website, and the efforts you made to make the information available in the multiple languages spoken by community residents. Thank you for your time.	both fewer aircraft operations being conducted at the Airport and changes in the fleet mix of those operations due to the retirement of many older/noisier aircraft, along with the continued advancement of quieter engine technology.	
#1 John Haug		Environmental Impact concerns		Hello, I attended the community meeting in October. I wish to submit comments regarding the King County Master Plan. I live on Beacon Hill, about 1 mile from the airport. I am concerned about the effects of increased noise on local homes and businesses near the airport, as well as the effects of the runway expansion. Do you have plans to make an environmental impact statement that takes into account communities within a 2 mile radius of the airport? How will you measure and mitigate the environmental effects on the community of the extension of the runway on the north side? I appreciate the information you have provided through community meetings and your website, and the efforts you made to make the information available in the multiple languages spoken by community residents. Thank you for your time.	Comments noted. See response to comments noted above.	4
#1 Unknown		Displacement/ Loss of Existing GA aircraft storage facilities		I use Boeing Field as a professional pilot and I want to fly my private plane to the field to visit the museum. The spaces being considered to be eliminated should be saved or relocated to provide all GA pilots access. The usefulness of BFI will be greatly diminished if this proposal is adopted.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 John Sandvig		Displacement/ Loss of Existing GA aircraft storage facilities		Thank you for the opportunity to comment on the draft KCIA Master Plan Update. The development goals and the underlying assumptions shown on pp D1-D4 make good sense. I support them. I	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				believe, however, there is a fatal flaw in the draft update having to do with general aviation (GA) aircraft stowage which is manifested in at least two ways. 1) The GA storage requirements stipulated on pp C61-C66, specifically in table C20 are inadequate to the need. The estimated need provided by Mead & Hunt analysis reduces the number of tiedowns required in 2020 by 60% from the actual use in 2015. No basis is provided for this dramatic reduction. The central metro area of Seattle is already squeezed for GA hangar and tiedown space. The wait list for hangar space is years long and will undoubtedly get worse as Renton airport management has plans to raze a number of T-hangars in the SW corner of that airport. Even if those T-hangars are replaced with large hangars, fewer GA aircraft will be able to be accommodated. As Boeing 737 production comes back on line they will not be eager to return space for T-hangars or tiedowns. Central metro Seattle needs <u>more</u> GA storage space, not less. BFI is the best place to provide it. 2) Development of the proposed SW air cargo facility appears to presume approximately 75 GA hangars and tiedown spots will be relocated elsewhere on the airport but without specifically stating where. This amounts to an unsecured promissory note. As such it is unacceptable. If specific and definite plans to relocate these facilities were defined and committed as part of the plan, that might be acceptable. It is obvious from the draft airport authorities are planning to provide excellent to outstanding support to corporate GA (i.e., bizjets) and to air cargo providers. Such an orientation is supportive of the prosperity and well being of King County but to do so at the expense of lighter GA is a huge mistake and should not be allowed. GA also provides huge economic benefit to the county and is an essential and adaptable component of our regional transportation system.	Also, additional information is required for the existing and projected apron storage data presented in Table C20. The table's 2015 based aircraft and itinerant aircraft tiedown counts/area requirements (e.g., 159 spaces and 11.1 acres) reflect the existing baseline counts for those facilities at that time, but not the existing demand for those facilities in 2015. For example, the estimated demand for based aircraft tiedown spaces in 2015 was identified at 96 spaces, and this information will be added to the table to better present the forecasted projections. Thus, the MP Update does project a modest increase in based aircraft tiedowns (i.e., from 96 to 106) through the 20-year planning period. As noted in the response to Robert Braunstein comments on pg. 16, both this projected additional demand for based aircraft tiedowns and the relocation of the existing southwest GA tiedowns and hangars was to have been accommodated by the development of the new North GA aircraft storage area.	

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				KCIA planners may believe light GA can be shunted to other outlying airports but that is not true. Do not sacrifice light GA hangar and tiedown space for the SW air cargo development area without a realistic and committed plan to continue to support light GA storage requirements.		
#1 Sam Cordell		Displacement/ Loss of Existing GA aircraft storage facilities		My name is Sam and I am a Seattle based private pilot. I have just learned of the proposed master plan changes to BFI. I am writing to express my opposition to what seems to be the removal of dozens of general aviation parking spots at the southwest ramp north of the Museum of Flight — point #2 in your Master Plan Update. There is no apparent accommodation for replacing them elsewhere on the airport grounds. Parking for small aircraft has long been difficult to find throughout the Seattle area. Dozens of airports have been closed over the decades, and few options remain within a reasonable distance of the city. Hangars and tie-downs and are proposed to be removed from both Boeing Field and Renton. The introduction of TSA restrictions to Paine Field and the airport management's seemingly near-sole focus on scheduled operations is turning PAE from a very GA-friendly airport to something entirely different. These three are the only airports in central Sound offering IFR landing options in low ceilings and are therefore a near necessity for many pilots. Aside from those aircraft owners who need parking – and who pay rent, for services, and taxes which partially fund the airport and its business – would be the loss of museum visitor fly-in parking and space for aviation events held at the museum. Past events include hosting EAA's B-17 Aluminum Overcast, Olde Thyme Aviation's biplane rides,	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. Also, the decline in GA operations at BFI was fairly steady between 2000 and 2015, with average annual reductions of 4.9% for itinerant GA and 7.1% for local GA ops (see pgs. B.8-B.9 of the forecast chapter). 2015 was the base year of the forecasts for the MPU and GA ops later bottomed-out in 2016. The GA operational forecast presented on pgs. B.35-B.36 of the forecast chapter reflect the projected growth in the Business/Corporate and Air Taxi sectors with a corresponding decrease in recreational/training activity. We agree that the projections for the GA recreational/training activity are pessimistic, but that outlook for those users was not unique to BFI, and the projected ops are still higher than the latest FAA TAF estimates for BFI that have local GA operations leveling off in the 55k range over the next 20 years.	1

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				and specific flight and youth aerospace education events held by local organizations such as Cascade Warbirds and Civil Air Patrol. In your own update/feedback doc above, GA is shown to represent over half of all aircraft operations at BFI. Your forecast showing a sudden decline in GA activity is in stark contrast to the continued growth of GA in our region (short-term economic factors notwithstanding). One can only speculate this sudden reduction would be due to pushing more GA out of Boeing Field. FAA's own "Air Traffic Activity System" (https://gcc01.safelinks.protection.outlook.com/?url=https%3A%2F%2Faspm.faa.gov%2Fopsnet%2Fsys%2FAirport.asp&data=04%7C01%7CKCIACommunityOutreach%40kingcounty.gov%7C6f43b79e1bec4ee4d82b08d89f2381a0%7Cbae5059a76f049d7999672dfe95d69c7%7C0%7C1%7C637434322150999286%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000&sdata=rb7F4OfRnV9irO4Y4tFZQHBGNbsJXovWsjUPRhoT%2Fjw%3D&reserved=0) shows increases in itinerant GA plus local civil operations from 124,050 in 2015 to 149,316 in 2019. While many of us recognize that commercial interests dominate the revenue generation and thus policy making at the county and the airport, we "little guys" should not be swept away with little thought to the negative impact on our avocations, small businesses, volunteer work, and commercial transactions. I request that you either reconsider the proposed redevelopment of the southwest ramp or only take on that work with equivalent GA parking elsewhere on the airport grounds.		
#1		Displacement/		Greetings,	Comments noted.	1

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Melanie Miller		Loss of Existing GA aircraft storage facilities		I am a general aviation pilot who enjoys flying into BFI. I have flown to the airport and parked for business and personal reason's for a duration of a few hours per trip. I typically park in the Northeast parking area. There are only three spots there and l have been lucky to park in the last open spot when visiting. The spot closest to the gate has been vary challenging to get into. I'm trying to figure out why the transient parking is being eliminated when in fact more transient spaces are in need at this airport. I hope the masterplan changes to accommodate general aviation transient parking.	See response to Robert Braunstein comments on pgs. 14-16 above.	
#1 Martin Makela		Displacement/ Loss of Existing GA aircraft storage facilities		I strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area unless a new hangar and tie down area, commensurate or larger in size, can be located on the field.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Larry Becker		Displacement/ Loss of Existing GA aircraft storage facilities		I'm a current WA state pilot. I strongly urge you not to change the GA tiedown area on the southwest corner of Boeing Field.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Don Goodman		Displacement/ Loss of Existing GA aircraft storage facilities		Hello – My name is Don Goodman, small GA owner/operator. I am concerned with the possible loss of small GA parking/hangars in the subject Master Plan. The area in question is the SW complex. While not currently a tenant at KBFI I have been in the past and I am well aware of the pressure on small GA facilities in the greater Puget Sound. - Small GA is critical to the aviation community…..literally the foundation of the aviation community - Significant economic benefit is derived from small GA operations/presence	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				- Loss of the SW facility, without any plan to relocate such capacity at BFI, would be a serious blow to small GA at BFI It is for the above reason that I strongly oppose the elimination of the SW small GA facilities without comparable (or larger) facilities being developed elsewhere on the field. The demand is clearly present. Thank you for the opportunity to comment.		
#1 Donald Madonna		Displacement/ Loss of Existing GA aircraft storage facilities		Hi - I am writing in support of continued GA operations at Boeing Field. I am an active pilot who has been active in the local aviation community for the past 15 years. Over that time, I have hangered airplanes, purchased avionics and maintenance on the field, and have rented aircraft on the field. The redevelopment of the Southwest area will eliminate important GA capacity, and I strongly oppose the proposal unless new hangar and tie down areas can be located on the field which compensate for the loss. I have owned 5 airplanes and finding suitable tie down and hangar space has always been difficult. Please do not make it more difficult to be able to have access to these general aviation services in the future! Thank you in advance for your consideration.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Jim Claypool		Displacement/ Loss of Existing GA aircraft storage facilities		Hi, As one of the residents of the SW Airpark, I just want to express how important it is that we have a solution that provides AT LEAST as many hangar and tie down spaces	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				as might be displaced prior to the demolition of the existing spaces. I had to wait 2 years to get a hangar and that time period is growing. There are no other alternatives. Renton has an 8 year waitlist the last time I checked. My aircraft is just sightly too big for tiedown and small hangars. None of the other Seattle area airports have hangar space that will accommodate a 43 ft wingspan. PAE is also about 2 years, but it's a much longer drive and weather is often well below BFI making the ability to get home that much more precarious. I know corporate aircraft that have moved to TIW because of the lack of availability at BFI along with the outrageous costs. They pay pilots to commute for them to bring the plane into BFI or PAE to pick them up but its housed and serviced and fueled at TIW, causing Seattle and King County to miss out on revenue as a result. And pilot/owners don't have the luxury of sending their corporate pilot to fetch the plane so locating it so far away makes it unrealistic. This could also be indirectly leading to a decrease in safety as pilots forced to travel farther just to get to their plane may fly less than they would if their aircraft were stored closer. We know that less flying time leads to rusty pilots and that is not good for our busy airspace. I know that GA isn't the most lucrative user of the airfield, especially if you can attract a new cargo hub, but nonetheless, it is a critical part of the aviation community and the history and purpose of BFI. I learned to fly at BFI over 30 years ago and since then I've seen the several flight schools and flying clubs all get squeezed out, save one. We can't let the billionaire's club force out any more GA space. All of the fancy private hangars on the east side have displaced so much that used to be thriving GA businesses. The cost of hangar space is already outpacing people's ability to afford it and not because of real value increases in the land, but because the billionaire's club has no care how		

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				much things cost and have unrealistically driven up the cost. But the purpose of government is to balance the needs of all of the constituent users which is why it's important that King County maintains its purpose in planning for BFI. This proposal to develop a cargo base is just another sign of this same problem. Now that the east side is so built up with luxury private hangars we have pushed more GA users to the West side, away from FBOs and fuel services. This increases costs as we have to pay delivery fees or taxi our aircraft further in order to get fuel and other services. That said, I would not be opposed to relocating, as long as a reasonably priced alternative was provided prior to the loss of the existing hangars and tie downs.		
#1 Bruce Porter		Displacement/ Loss of Existing GA aircraft storage facilities		King County Commissioners, We strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area at Boeing Field unless a new hangar and tie down area, commensurate or larger in size can be located elsewhere on the field !! Our company and many of our businesses from Oregon use Boeing Field constantly in our Interstate Commerce activities which generates significant economic impact to King County – both at the airport and in the surrounding communities. Respectfully Submitted,	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Bob Wyzenbeek		Displacement/ Loss of Existing GA aircraft storage facilities		I am against the reduction of GA tiedowns at boeing field!!!!!!!!!!!!!!!!!!!!	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
Multiple responders around 10		Displacement/ Loss of Existing GA aircraft storage		Hello, I wanted to submit my feedback on the proposed BFI airport changes.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16	1

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		facilities		General Aviation (GA) has a rich history at Boeing Field, providing jobs, flight training, aircraft charter, maintenance, repair, recreation and more GA activity at Boeing Field generates significant economic impact to King County – both at the airport and in the surrounding community The redevelopment of the Southwest area will eliminate an estimated 75+ general aviation hangar and tie-down spaces at the airport, with no firm plan for relocation on the field for these aircraft Other airports in the area do not have the additional capacity to accommodate these aircraft, forcing many owners to base their aircraft several hours away, or sell You/I/we strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area unless a new hangar and tie down area, commensurate or larger in size, can be located on the field GA deserves a continued presence on Boeing Field!	above.	
#1 S Hughes		Displacement/ Loss of Existing GA aircraft storage facilities		Dear KCIA Decision Makers: I hope that you reconsider your Boeing Field Master Plan to remove general aviation tie downs and hangars to make room for expanded air package facilities at Boeing field without providing adequate and similar general aviation alternatives at Boeing Field. King County general aviation pilots are a critical part of King County well being and there are insufficient and inadequate alternative facilities in King County. I should know. I kept my Cessna 182 in a hangar at KBFI for 8 years. But I was displaced by two such shortsighted Boeing Field actions in the 1990's. My first County hangar was demolished to make way for high-net-worth Gulfstream and Global Explorer owners at the northeast corner of the	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				field. Then I was displaced by the destruction of the hangars at the SW corner of the field to make room for non-general aviation hangar use. Although I was given an alternative location to move to, it was irrelevant because I had to wait years to obtain the replacement space and the cost was significantly more. In fact, 20 years later, I'm still on the list for a replacement hangar. I live in Seattle a stone's throw from the Space Needle. I work on Airport Way a mile north of Boeing Field. I learned how to fly at Boeing Field and I obtained my Instrument and Commercial ratings at a KBFI flight school. But my airplane is now at Paine Field 30 miles to the north. It has been for over 20 years. And I don't see any path to have my single engine Piper airplane closer to where I work and live. Like I did this weekend, I have to drive 45 minutes to my plane and go flying and then drive 45 minutes home. Paine Field has added hangars over the last 20 years to make up for the lack of public duty shown by Boeing Field for King County aviation enthusiasts. The people I know live in King County, but park their planes at Paine Field because King County executives don't plan to have a vibrant and healthy private pilot community. King County has two airports that can accept air freighter airplanes: Sea-Tac and Boeing Field. Add the air freighter capacity to Sea-Tac. Or let Snohomish County add air freight services to their plan as Paine Field loses Boeing's manufacturing over the next 20 years. Or even better, create alternative hangars and tie-downs NOW at Boeing Field. Otherwise, the KCIA master plan's failure to provide		

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				adequate alternatives for the existing general aviation footprint now, not "TPD", is only going to make more King County pilots move their planes to other counties like Snohomish County. Adding more air freight capacity is one thing. But removing general aviation parking without adding comparable and timely replacement solutions is irresponsible and short-sighted. I think you can make a better decision: keep King County pilots at Boeing Field, don't force them out like you have me and my airplane. Sincerely,		
#1 Denise Stecconi		Displacement/ Loss of Existing GA aircraft storage facilities		Please do no eliminate SW parking for GA. There are practically no places to park GA in the field already and this is the only airport that is close to seattle. I see why a cargo ramp is desirable but then is there another place we could use to replace this parking? GA is important for the community too, Many thanks, D	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Tom Roberts		Displacement/ Loss of Existing GA aircraft storage facilities		It is stated in your Master Plan that you intend to tear down the hangers of SouthWest Parking to put in a cargo facility. I am a tenant of a SW parking hanger. I strongly object to this plan. General aviation has long been a large part of the role Boeing Field has supported. GA parking has slowly disappeared across the greater Seattle area leaving long waiting lists for any hanger space availability. By razing the hangers at SW parking do you intend to simply throw these tenants out with no provision to house these airplanes in another part of BFI? I have no doubt this is financial driven but each and every one of us not only pays hanger rent we also pay taxes to keep and maintain Boeing Field. Treating this community like this is simply unacceptable.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				We simply would have no where else to house our airplanes. I would appreciate it if your master plan included some accommodation for hanger space to be created to house these aircrafts before the cargo facility is created. Again, I strongly object to this master plan.		
#1 Carlo		Displacement/ Loss of Existing GA aircraft storage facilities		I was informed by AOPA and WSPA that there is a plan to reduce GA parking in the museum parking. I currently have a plane there. I had to move my other plane to KPLU because I m still waiting for other spot to open up. Reducing any areas of parking at Boeing will not only make it worse for several pilots such as my self and others that we are having a hard time finding Justine downs for our planes. I do see the GA community growing. Planes have become much more affordable and accessible. If anything, thinking long term. We will need more parking for more planes. It would be nice to add covered areas with access to electricity. Thank you.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Pat McFadden		Displacement/ Loss of Existing GA aircraft storage facilities		To Whom it concerns, I strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area unless a new hangar and tie down area, commensurate or larger in size, can be located on the field . Please endeavor to find an alternative for the GA community instead of simply eliminating access	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Marty Duke		Displacement/ Loss of Existing GA aircraft storage facilities		Please do not eliminate the General Aviation parking on the southwest corner of Boeing Field, without providing an equal or larger capacity location at the airport. We need more not less spots. Also, this has already happened at Renton, and caused great problems with trying to find places to park GA aircraft in the Seattle area. Thanks,	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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#1 James Brocksmith		Displacement/ Loss of Existing GA aircraft storage facilities		Greetings, As a BFI hangar tenant, GA & Commercial flyer and active Flight Instructor, the footing of GA at BFI is critical for the overall training of pilots and business commerce in the Seattle area. Any expansion of cargo at the expense of GA is unnecessary as cargo has space at SEA to expand, and they could use larger aircraft to meet their demand, simply gauge up. UPS and Fedex could also share their ramp space with other cargo operators like many airports in the country. Any removal of GA should be mitigated by building new hangars at other area airports, such as Auburn, Renton, Snohomish or others. A few more points, 1) hangars are essential for high dollar assets in our climate, 2) hangar space is extremely tight in our market and 3) you are removing one customer to serve another, all while GA pays its fair share of aviation fuel taxes. Lastly, Billionaire row on the east side takes an enormous amount of space while only serving 3-5 airplanes. These operations could consolidate while opening precious space. Kind regards,	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Phillip Rissel		Displacement/ Loss of Existing GA aircraft storage facilities		I strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area at Boeing Field unless a new hangar and tie down area, commensurate or larger in size can be located elsewhere on the field !! Our company and many of our businesses from Oregon use Boeing Field constantly in our Interstate Commerce activities which generates significant economic impact to	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				King County – both at the airport and in the surrounding communities. Respectfully Submitted,		
#1 Austin Wood		Displacement/ Loss of Existing GA aircraft storage facilities		Greetings Boeing Field Authorities – I am writing in response to the published master plan – specifically the plan to destroy the South East museum parking to build a new cargo terminal. For as long as I have been aware, Boeing Field has become increasingly unfriendly to the Piston GA pilot. I think the reason for this is clear: Piston planes don't spend six figures on a fuel stop. I'm sure the numbers all make sense: get rid of the little planes. But the plan is unsustainable – I've spent my entire life and career in aviation – both big and small – and one things is clear: you can't have the big planes without the small ones. It's not a training problem; it's a people problem. The MoF has an honored place at Boeing Field and in the community. Its mission is to inspire the next generation to join in the great miracle of the modern aviation industry. The GA community at Boeing Field is the same – only there's no place to write it down. It's two sides of the same coin. You wouldn't put the Museum in Arlington or Puyallup. Access to aviation has to be where the people are. If you take away general aviation in Seattle, you take away an entry point to a staggeringly large, vital, and magical career field. I can trace my love affair with aviation (and my career) to a flight I took in a piston plane at a very young age. The small airplanes based at the field have no doubt springboarded thousands into their career field. Nobody	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				goes for a friendly hop on a sunny Saturday in a 767. Nobody keeps their small piston airplane to themselves – we GA pilots love nothing more than sharing the joy of flight. By slowly eroding the presence of small airplanes at Boeing Field, you erode the wonder, opportunities, and futures of local youths. The costs may be measurable, but the benefits are less so. All aviation must start small and work up. There would be no jumbos if there were no Cessnas for pilots to get their start. Boeing field has an opportunity to preserve this precious resource. What are the alternatives? Shall we tell the kids at Raisbeck, South Lake, Cleveland and Rainier Beach to ride the bus to Auburn to go for their EAA Young Eagles flight? We understand our place in the ecosystem – piston airplanes are at the bottom of the food chain. But it's clear that without piston airplanes, there is no entry to aviation as a career. Is that something King County wants to remove? My voice is one of many. Please listen to my brothers and sisters in this vibrant and active community. All the pilots who fly into Boeing Field - the elite Boeing test pilots in the T-38s, the sports team charters, the UPS widebodies, the crews of both of Howard Shultz's Gulfstreams - got their start in a 2 or 4 seat airplane. Do not deprive Seattle and King County of the magic of flight.		
#1 David Acklam		Displacement/ Loss of Existing GA aircraft storage facilities		The changes to the airport master-plan are extremely disturbing. Specifically, the removal of general-aviation parking/transient parking near the Museum of Flight, which may-well eliminate the usefulness of Boeing Field as a destination (rather than a home-base).	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				Specifically, without transient parking along to the Marginal Way side of the airport – near a large parking-lot & within walking distance of bus service (or in some cases, walking distance of your workplace), it becomes very hard for non-based aircraft to actually go anywhere after landing at BFI. Even if you pay to park your plane at one of the FBOs, you are now stuck on the 'wrong' side of the airport (Airport Way) - unable to go anywhere unless you use Uber or Lyft. Please consider leaving space for transient GA parking near the museum, or at least on the Marginal Way side of the field….		
#1 Jon Counsell		Displacement/ Loss of Existing GA aircraft storage facilities		I am terribly dissapointed, but not the least bit suprised at the resonding stupidity and short sideness of your proposal. While 99.9% of the world will never be the ultra rich, elite that operate business jets, or CEO's of major coorporations, your plan caters to that 0.01% at the cost to the oher 99.9% whom's taxes pay for your job and BFI. You can't support big dollar aviation by eliminating the small, affordable general aviation access to your airport. I have very little faith that anything presented to this board or group will be taken seriously, the fact that you have even recommended the solution you have tells me you are beyond stupid, incompetent or criminally bribed by BIG BUSINESS.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Reggie Smith		Displacement/ Loss of Existing GA aircraft storage		I am deeply concerned about the proposed redevelopment of the Boeing Field general aviation (GA) tie-down and hangar area in the southwest corner of the airport next to the Museum of Flight for an air cargo ramp. The concern lies	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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		facilities		in what appears to be a lack of planning for the relocation of the GA fleet, some 75+ parking spaces and hangars. Until a development plan to relocate the general aviation parking and hangar space on Boeing Field with equivalent or greater capacity is created and approved, I must strongly oppose the current redevelopment plan. Surrounding airports cannot handle the increased demand precipitated by the proposed closure of the GA facilities at Boeing Field. Virtually all airports within a reasonable driving distance of KBFI have no GA space available with long waiting lists for any that might open up. For example, a phone call to the City of Renton Airport Manager's office today revealed a long waiting list for GA space, the manager indicated a 3-4 year waiting time based on the length of their list as of today (12/14/2020). A call to the Auburn Airport Administration office shows a similar situation with a waiting list for GA space with 90 names on it, so long that they could not even give an estimate as to when a space might open up. Boeing Field has a rich history of GA presence and enjoys the positive economic impact GA activities has on the surrounding community. Please give strongest consideration to providing for the many owners, operators, and customers of general aviation at Boeing Field first before proceeding with any new redevelopment that negatively impacts GA aircraft based at the airport.		
#1 Bill Ayre		Displacement/ Loss of Existing GA		John- Here are my thoughts on the Master Plan. I appreciate the opportunity to provide comments.	HI Bill. Thx for the input. More discussion to follow to attempt to find a solution.	1

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		aircraft storage facilities		General aviation plays a critical role in America's infrastructure, and is part of an ecosystem that benefits all segments of aviation. A robust general aviation presence fuels aviation's future. And at KCIA, general aviation contributes significantly to the economic base of King County. Flight training and humanitarian missions are just two key GA activities at Boeing Field that require space and facilities in order to function. The development assumptions in the Master Plan establish the foundation for the plan itself. The second development assumption states that "...the Airport will continue to safely accommodate the existing variety of aviation users and activities...all sectors of the existing general aviation users...with facilities properly sized to accommodate the projected forecast demand." In 2015, 62% of the based aircraft at KCIA were piston-powered GA airplanes. The FAA demand forecast ("FAA TAF") shows a growth in total based aircraft, including a very slight loss in single-engine airplanes (from 188 to 165 from 2015 through 2035), a flat forecast for twin engine piston airplanes and growth for turboprop aircraft. The master plan contemplates eliminating 24 T-hangars and 53 tie-down spots in the southwest area of the airport in order to build a new cargo facility. That cargo facility has no current customers. In addition to these 77 airplanes, the plan also contemplates eliminating tie downs in the northeast parking area (for the runway 14R RPZ) which currently accommodates approximately 54 airplanes. There is no plan to provide parking anywhere on the airport for these 130-plus displaced airplanes. There is little to no space for these airplanes at any of the airports within a reasonable distance of Boeing Field. Also, there is a waiting	Currently KCIA/BFI does not meet the full needs of any segment of the aviation industry. GA, Corporate, FBO, Commercial Cargo and Boeing all want more room. Even among GA we are looking at how to best accommodate fixed and rotary wing training as well as humanitarian (medivac) customers along with recreational flyers. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. We are also currently investigating how some of the existing Airport property that is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.*** According to the stats KCIA had over 400K operations in the 07-08 time frame and is now down to about 185K Also, the decline in GA operations at BFI was fairly steady between 2000 and 2015, with average annual reductions of 4.9% for itinerant GA and 7.1% for local GA ops (see pgs. B.8-B.9 of the forecast chapter).	

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				list at KCIA of 70 airplanes for tie-downs, and 30 airplanes waiting for hangars. The Master Plan must include a plan to accommodate the displaced airplanes. The FAA demand forecast shows a clear need long into the future. Questions on what the plan is have been met with "no specific location has yet been identified" and the "process is ongoing." We need to know what that "process" is and the timing for resolution. In the meantime, we should not approve the Master Plan until it includes (with proposed funding) a plan to accommodate this important demand.	Appreciate your thoughts Bill and we are looking at innovative ways to try to do what is best for the most. I will say that it may not be reasonable to have a plan to mitigate something that may or may not happen. Knowing that we will have to mitigate if we do something may be the best we can do for now.	
#1 Devin Wong		Displacement/ Loss of Existing GA aircraft storage facilities		Hello, It has come to my attention that King County is considering redevelopment of the general aviation tie-down and hangar space on the south west side of the airport. My understanding of the plan under consideration is that it includes elimination of 75+ general aviation hangar and tie-down spaces at BFI. As someone who has been involved in general aviation for the past few years and is looking to acquire my own aircraft, this is concerning for a number of reasons: - Physical space: Other airports in King County and the greater Seattle-Tacoma-Everett metropolitan areas currently have a shortage of space and long wait times, particularly for hangars. Elimination of spaces at BFI will accelerate this problem. - Economic impact: Elimination of spaces at BFI combined with current low inventory (and a resultant increase in prices for remaining inventory) will force many aircraft owners to base their aircraft several hours away, or sell. Both would cause a net loss of maintenance, repair, and other commercial revenues within King County.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				- Cultural and community impact: BFI has long been a center for aviation in Washington, and importantly, one that is accessible to the public. Reducing the general aviation presence at BFI will erode this heritage and make aviation less accessible to King County residents. I oppose any plan to reduce the general aviation presence at BFI; I believe it is important to promote accessibility and economic diversity, while not squeezing out current citizens and participants in our communities. I would like to see BFI invest in more hangar spaces, promoting a resurgence in general aviation activities within King County. I recommend that King County seek more opinions and suggestions from the aviation community; I strongly suspect the proposed changes aren't well-known throughout the community or even pilots based at BFI. General awareness and a thorough discussion will lead to better outcomes that benefit everyone. Thank you for your time and consideration.		
#1 Nik Webb		Displacement/ Loss of Existing GA aircraft storage facilities		I am writing in response to the published master plan – specifically the plan to destroy the South East museum parking to build a new cargo terminal. I request that you reconsider that plan, which will effectively block out small general aviation aircraft from full use of the airport. I learned to fly at KBFI, and its central location was part of that choice of where to learn. It was also a great experience to learn somewhere pilots of all stripes fly from tiny piston planes all the way up to 747s and military aircraft. I fear that these changes in the master plan will make it much harder for aspiring young pilots in Seattle to access	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				aviation and ultimately choose aviation for their career path. Without piston aircraft based at KBFI, students of all ages will need to travel much further to access a first flight that ultimately decides the career path of many pilots. Yours very respectfully,		
#1 Bill Nicolai		Displacement/ Loss of Existing GA aircraft storage facilities		To Whom it may concern, As a frequent user of King county public airport I object to eliminating general aviation spaces to make room for more cargo usage at the airport. Over the last 30 years we have based our two single engine airplanes on Boeing Field, used the maintenance facilities, avionics services, there at Galvin/Signature, Wings Aloft, Clay Lacey/Modern Aviation, and American Avionics. General Aviation use by small planes is involved in the employment of hundreds of skilled workers at Boeing Field. A few cargo loaders moving containers around do not provide a fraction of the economic and sociaL benefits General Aviation provides to Seattle and the surrounding areas of King county. My Life partner and fellow Pilot Jane Nicolai and I were married beneath the wing of the Curtis Jenny at the Museum of Flight. We have both made frequent flights out or Boeing Field in support of local environmental education causes concerning salmon and waterfowl habitat on the Duwamish River and Green Rivers. So many other Washington citizens have made similar beneficial contributions to our local communities from their use of Boeing Field. Please reconsider this ill advised change.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Duane		Displacement/ Loss of		Keep Small planes welcome! we don't spend as much, but this is where aviation starts I was disappointed once when I	Comments noted.	1

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Little		Existing GA aircraft storage facilities		flew in just to pick up a friend and nowhere to park for even ten minutes	See response to Robert Braunstein comments on pgs. 14-16 above.	
#1 Lonnie Duran		Displacement/ Loss of Existing GA aircraft storage facilities		I dont like the idea of loosing so much GA ramp space. KBFI is a great place to train as a new pilot. This is because of the diversity in the Airspace at BFI due to SeaTac and Renton over lapping air spaces. We need to keep GA at BFI it is very important.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Seth Sprinkle		Displacement/ Loss of Existing GA aircraft storage facilities		To Whom It May Concern, The proposed updates to the BFI Master Plan demonstrate the clear intent of the airport leadership to make BFI inaccessible and/or undesirable as a destination for general aviation traffic. In particular, the redevelopment of the general aviation southeast parking area is objectionable to those of us who live in King County and use the airport on a regular basis for GA operations. I do not submit these comments oblivious to the changes that are happening in our region. Growth in all sectors in occuring at an astonishing rate. In the short time I have used BFI, I have seen the number of UPS jets and large charter aircraft at the airport increase steadily. I can appreciate that the airport is an infrastructure investment that must serve all of King County and something must be done to ensure it continues to serve that mission. However, nearly all of the changes proposed in this Master Plan will come at the expense of GA users, and that is starkly unfair to those of us who live and work in King County and are also GA users of the airport. I recently requested a tie down at BFI and was told the wait list is 5+ years. While there is clearly excessive demand for GA at the airport, this plan seems to ignore it and suppress it. Simply put, I live in Seattle and I want to fly in Seattle.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				Why not more effectively manage the existing tie down areas, raising fees to market-bearing rates that increase their attractiveness to the airport from a revenue perspective? If you plan to take away GA tie-down space, perhaps it is time to think about revoking leases from operators on the airport grounds to replace the lost GA space? All in all, the general disregard for and abandonment of general aviation in this plan is a disappointment to me and many others. I do not support these efforts and would urge the airport leadership to consider alternatives that are more hospitable to the preservation of general aviation at BFI.		
#1 Johnathan Alvord		Displacement/ Loss of Existing GA aircraft storage facilities		Greetings Boeing Field Authorities – I am writing in response to the published master plan – specifically the plan to destroy the South West museum parking to build a new cargo terminal. I am a new pilot, now flying for approximately 2 years. I started in Rural AZ and was fortunate enough to be able to afford to drive 2.5 hours from Page Arizona to St. George Utah for my flight instruction as there was no active instruction in Page. Since then I have moved to Eastern Washington where I continue to see airports favoring those that can afford to get into flying. Our local airport officials would rather demolish existing hangers than repair and provide affordable storage. I was lucky and was able to find a hanger to share but fear that time is short lived. Through my journey in aviation which started in the military as a airborne Medic, to skydiving, to my current Private Pilot Licence, and now working on my commercial license I have seen many small airports that have provide access to GA pilots across the country. They get smaller and smaller, but we provide a great deal to the public. As a member of Pilots and Paws, which provides transport for animals, to Angel Flight which provided medical transport to those in need. Every airport is needed. Regarding Boeing Field, I live in Eastern Washington and	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				have flown into Boeing Field multiple times to provide transport for family members needed to go to Seattle for health care. Taking that away from GA would be a shame. I also understand the MoF is also based there and it would be a big loss to GA pilots to lose ability to access that via air. I read about communities on a daily basis loosing airport access that should provide for all, not just the corporations and wealthy. Most recently I heard about Dillingham Airfield in Hawaii, now Boeing, at least one other airport in WA which was most recently bought to build a Marijuana farm. Please preserve Boeing Field for EVERYONE and do not make it harder for smaller planes and locals to get instruction, and all of us that wish to fly there in our own little planes.		
#1 Matt Hayes		Displacement/ Loss of Existing GA aircraft storage facilities		Good morning. I hope this finds you well. The latest version of the Master Plan has a cargo area just to the north of The Museum of Flight. Can you let me know how this proposal impacts the Blue Box and the Through the Fence agreement? Thank you.	It was good to speak with you this afternoon Matt. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. The future development boundary for this site would exclude the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. The future development boundary of the proposed new Aviation Redevelopment Area will be revised as described above on the updated draft Airport Layout Plan. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix*, including revised Figure ES1/pg. *xliii*.**	1

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					We trust this addresses the questions from your email, below. Attachment was page D84 from Chapter D of the airport Master Plan. Regards,	
#1 Matt Towers – President, Washington Air Search and Rescue along with a few others		Displacement/ Loss of Existing GA aircraft storage facilities		I am writing today on behalf of Washington Air Search and Rescue in regards to the proposed Master Plan revision for the King County International Airport. In particular, I would like to express my concern for the proposed elimination of general aviation parking on the southwest ramp, adjacent to the Museum of Flight. Washington Air Search and Rescue (WASAR) has long relied on KCIA as a base of operations for emergency operations conducted with the Washington State Department of Transportation and in partnership with Civil Air Patrol (CAP). Most recently, we coordinated and launched from KCIA emergency deliveries of hand sanitizer to regional first responders in Washington in the early days of the COVID-19 pandemic. The consistent decline in availability of general aviation parking at KCIA has already forced WASAR and CAP to relocate some of our search aircraft to more distant airports. Moreover these alternate locations themselves have very limited options, and wait times for new tenants are frequently measured in years. This has necessarily had a direct impact on emergency response time as air crews are now forced to travel significantly farther to reach their aircraft. Should the county continue with the plan of eliminating a significant portion of the remaining general aviation parking	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. In addition, Airport Staff is committed to coordinate with organizations like WASAR and CAP to maintain the provision of emergency aviation response assets at KCIA.	1

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				at KCIA, further pressure will be placed on the remaining options which could result in the inability of organizations like WASAR and CAP to station emergency response assets at KCIA at all. Aside from the economic benefits of, and the significant growth in general aviation activity at KCIA, the availability of the airport for emergency search and rescue operations is of significant importance to the overall safety of our transportation infrastructure. Please reconsider the plan to further erode the ability for this critical facility to meet that need.		
#1 Tyler Finn		Displacement/ Loss of Existing GA aircraft storage facilities		To Whom it May Concern: This message is in regards to the proposed redevelopment of the Southwest parking at Boeing Field. I have intimate knowledge with Boeing Field as I have been working on the field for Boeing Flight Test for the last 15 years. When I first moved to Seattle I trained and rented planes at Galvin. Once I had my CFI, I instructed at Wings Aloft and flew young kids from the museum summer program around the Puget Sound on introductory flights. I have watched the WWII aircraft stage their visits outside the museum, the flying eye care hospital aircraft, civil air patrol and the Blue Angels. I currently own an Cessna 182 and park it in Southwest parking. I have been parking there for over 2 years now. I live just north of downtown Seattle and the proximity of my airplane to work is invaluable. The proximity of my airplane to my house is also invaluable. I cannot afford a hangar at BFI but I can afford the tiedown. I fly my plane almost daily and have met most of the people who park their planes near me. We have built a small community in our area. One of the residents helps the Aviation High School kids with their solar car project out of his hangar. I know all of the airports in the Seattle vicinity are feeling pressure from growth. This pressure cannot be	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				at the expense of general aviation, the local community and the smaller planes. With the 777 in flight test I know we have lost the parking spots adjacent to taxiway B. If I lost my parking spot at BFI I would most likely have to move my plane to Auburn or Everett which doubles my commute to the airplane from my house and it wouldn't even be possible to fly after work as I can now. UPS and Ameriflight have significant space for operations as their spots are empty half of the day. It appears that there are other options to make space for additional cargo operations. Please do not sacrifice anymore GA parking for the wealthy, commercial operations or anything else. Please continue to support the small aircraft parking and operations at Boeing Field and do not take away anymore GA parking.		
#1 Brian Davern		Displacement/ Loss of Existing GA aircraft storage facilities		Please record my opposition to proposed changes to GA parking and hangars at BFI. Their proximity to the Museum of Flight is important to the use of the museum by traveling aviators and their passengers. Moreover, King County has far too little accommodating space for GA as it is. Commercial aviation interests continually crowd out General Aviation... the very source of future professional aviators. Every airfield needs a welcoming home for private aircraft. BFI has a good one as is. Don't let that change.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 David Shangraw		Displacement/ Loss of Existing GA aircraft storage facilities		As a long time aviator and frequent operator from KCIA, I need to voice my strong opposition to the proposed master plan. I have operated from this airport for the last 13 years in several capacities. I started flying from BFI with Civil Air Patrol in 2007. After flying at BFI for several years, I flew for AIRPAC airlines for several more. Recently I fly	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				for Boeing as a test pilot operating 737s. I have reviewed the master plan and find the absolute disregard for general aviation an absolute travesty. GA is what built this airport, how can you turn your back on what makes this airport great! If you remove the majority of the parking for light GA you are left with an airport that only serves Boeing, U PS, Starbucks, Costco, Microsoft and any other huge corporations that can afford to operate here. This airport has always been friendly to anyone that wishes to operate with reasonable prices and accommodations. This is slowly changing to an airport that only caters to corporate flight departments and other billionaires. A true shame. CAP and several of my close friends park in the southwest parking spaces. This master plan removes their parking and any other parking suitable to their needs. Please keep KCIA accessible to ALL! Residents of king county need access to this community jewel not just the corporations trying to drive GA out!!		
#1 Alain & Marva Semet		Displacement/ Loss of Existing GA aircraft storage facilities		To whom it may concern, We had been waiting a long time when we finally got to rent a hangar in the Southwest corner of KCIA 5 years ago. One of us works at the Museum of Flight and the other at Raisbeck Aviation High School. Our relationships with these institutions make the location of our hangar ideal as there is much interaction, visits and instruction. We give students hands on experience in aviation and other technical artifacts in the hangar. .	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				Because of the proximity and easy access to the field, many students are attracted to careers in aviation. Loosing this access will loose future aviation historians, pilots, medical personnel, mechanics etc. We have seen all these career choices from students. Please do not redevelop the Southwest corner.		
#1 Sean		Displacement/ Loss of Existing GA aircraft storage facilities		I wanted to express my concern over the re-development of SW parking into a cargo ramp. I understand that Boeing field serves an important role as a international cargo hub, however it has an equally important role for general aviation. The pilots to fly those future cargo jets are getting training and experience in the 75 odd airplanes parked in SW parking. I myself am one of those people. I recently completed my instrument and commercial license in our bonanza that we keep at Boeing. Please consider expanding general aviation and not removing it for all the economic, career and community that it creates. Without airport parking, general aviation is relegated to the drab European-style model where the only flights are strictly commercial.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Bill Craven		Displacement/ Loss of Existing GA aircraft storage facilities		To Whom It May Concern: I currently own or have interest in two aircraft parked at NE Parking at Boeing Field, one being a $50,000 training aircraft that I use with a friend for fun, and to maintain proficiency, and the second being a $750,000 airplane I use to transport my family around the area. I have been a resident of NE parking for over three years, and have enjoyed the people that are my tie-down neighbors. We are a robust community.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. In addition, the decommissioning of the existing NE tiedown apron area will be dictated by the expansion of the RW 14R approach RPZ (the parking of aircraft is not an approved land use within the RPZ boundary).	1

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				As your own quick research will reveal there is already a dearth of tie-down at Boeing Field for GA Aircraft, a several month, if not years long waitlist. Though we don't provide the revenue, or cache that freight or other uses do, we do provide a community for small GA airplanes and general public good will. Because of King County's current practices we have already lost on field maintenance support for light GA aircraft. It's evident that the past and current administration does not realize the benefit of Light GA Aircraft. As an example of the public goodwill I have taken a number of kids flying for an intro flight into aviation, a few of them have gone on to become pilots themselves. Holding events, like Young Eagles, or open houses at Boeing Field could and would go the extra mile to illustrate to the public that light GA does actually provide a public necessity. Please keep me informed of developing events and opportunities to speak on behalf of light GA at Boeing Field.		
#1 Rob Spitzer		Displacement/ Loss of Existing GA aircraft storage facilities		To whom it may concern: I am writing in support of General Aviation at King County International Airport against the proposal in the Master Plan to remove over 75 parking spaces for light general aviation aircraft at the airport. I am a City of Seattle resident and aircraft owner, airline pilot, and aviation attorney that currently keeps an airplane hangered at King County International Airport. General aviation is the lifeblood of Boeing field, and	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. Also, the decline in GA operations at BFI was fairly steady between 2000 and 2015, with average annual reductions of 4.9% for itinerant GA and 7.1% for local GA ops (see pgs. B.8-B.9 of the forecast chapter). 2015 was the base year of the forecasts for the MPU and GA ops later bottomed-out in 2016.	1

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				currently comprises the majority of the traffic operations at Boeing Field. Light aviation operations comprise a wide spectrum of aviation services, including training flights, air ambulance flights, sightseeing flights, and charitable flights. Over the past several years, thousands of pilots have learned to fly at Boeing field, many of these individuals have gone on to become airline pilots, corporate pilots, or better-informed engineers designing future jetliners. Thousands of rides for minority and disadvantaged youth have occurred because of light general aviation operators at Boeing field, and countless disaster relief and search and rescue flights have been launched from Boeing field. Critically, light general aviation flights create an opening for local members of the community to experience and participate in aviation, and use the airport. As it is currently slated, the Master Plan for KCIA will remove 75 tie-down spots or hangar spaces. The deleterious impact this will have on general aviation operations at KCIA is impossible to overstate. There is already a critical shortage of aircraft parking in the Seattle area. KCIA is the closest airport to downtown Seattle. Currently, it is extremely difficult to obtain a parking spot for an aircraft at any airport within an hour drive of downtown Seattle. By removing 75 parking spots and reducing the footprint of space available to general aviation operators, King County Airport management will exacerbate the already critical state of aircraft parking spot, and will likely price most light aircraft owners out of Seattle area. KCIA's own forecast shows a dramatic reduction in the number of light general aircraft operations at Boeing Field. This stands in contrast to the FAA's expected increase in nationwide light GA operations, indicating that the Master	The GA operational forecast presented on pgs. B.35-B.36 of the forecast chapter reflect the projected growth in the Business/Corporate and Air Taxi sectors with a corresponding decrease in recreational/training activity. We agree that the projections for the GA recreational/training activity are pessimistic, but that outlook for those users was not unique to BFI, and the projected ops are still higher than the latest FAA TAF estimates for BFI that have local GA operations leveling off in the 55k range over the next 20 years.	

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				Plan's authors are aware that the proposed changes at the airport will essentially shut light GA operations out from the airport. The larger number of turbine aircraft will also come with a much larger noise footprint than the light general aviation aircraft that currently use the airport. The effects of this will be felt across the community, not just amongst airport owners. As general aviation dies in the Seattle area, children will no longer get aircraft rides, locals will not be able take plane tours, and city dwellers will have no place to take flight lessons. As has been proven time and time again in other cities, an airport which is disconnected from the local community loses the local community's support. The overwhelming majority of community members in the City of Seattle will never be able to afford to charter a private jet, but nearly all community members can sign up for an air tour; take their child to a Young Eagles, Civil Air Patrol, or Red Tail Hawks event; or volunteer to help with general aviation-supported disaster relief. Shutting general aviation operations out from KCIA will separate the airport from the local community. We strongly urge the managers of KCIA to reconsider the impacts that the Master Plan will have on not only the airport but also the local community.		
#1 Dan Driscoll		Displacement/ Loss of Existing GA aircraft storage facilities		Greetings- I'm writing to you with comments on the KCIA Master Plan produced earlier this year. While this master plan brings many welcome improvements to Boeing Field, I want to call out the plans for the Southwest parking area and proposed redevelopment into an air cargo area. I oppose this part of the plan as it withdraws necessary space for general aviation parking.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				I'm a long-time BFI pilot, and leaseholder. Boeing Field's strong historical support for General Aviation activity has been key in shaping King County as a world-class center for aviation, which extends beyond manufacturing into safety, small-business development, pilot training, repair, and more. I tell all of my flight students that BFI is the best place to learn to fly, and to get the services they need to stay in the air. Removal of Southwest parking would increase the strain created by the removal of the central Eastern hangars a few years ago. While I welcome Modern Aviation and their growth, the airport must also serve the broader King County aviation community. The tie-down and hangar wait lists are far too long (both at BFI and nearby), indicating that the county as a whole does not have capacity for the many pilots, mechanics, and administrators that make our aviation community so active. Publishing a plan that retains the current, very high-quality Southwest area, or which adds new capacity equivalent to what is in the redevelopment plan, would alleviate my concerns. I always welcome the net addition of GA space but I recognize the hard work put in to balancing concerns in the KCIA master plan.		
#1 Chris Seto		Displacement/ Loss of Existing GA aircraft storage facilities		I was made aware of the elimination of some GA parking in the BFI master plan. As an aircraft owner and pilot in the Seattle area, it concerns and disappoints me to hear that this parking would be eliminated under this plan. GA parking is already at an extreme scarcity in and near Seattle. If anything we need /more/ parking, not less. I strongly oppose this proposed redevelopment plan.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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#1 Justin Huff		Displacement/ Loss of Existing GA aircraft storage facilities		Hello! I am greatly concerned that the master plan update includes a drastic reduction in the number of GA tiedowns available at BFI. While small GA doesn't bring in serious money to King County, it is heavily used by county residents and provides for flight training, transportation, etc. In the PNW climate tiedowns provide a cost and space efficient way to keep an aircraft. This is made even more critical by the lack of nearby airports with available space for small GA aircraft. I understand the need for the RPZ, but the master plan needs to include a relocation plan (and ideally modest growth) for the NE and SW tiedowns in addition to moderate growth of GA hangers.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Jeff Katten		Displacement/ Loss of Existing GA aircraft storage facilities		I understand today is the last day for comment regarding the proposed Master Plan. I would like to voice my concern regarding the phasing out of the NE Parking (tie-downs) and the mid-field hangers on the west side without relocation to other airport property. As a local flight instructor (based out of Renton), I have trained countless new General Aviation pilots who have sought to expand their commitment to aviation through membership in a club or aircraft ownership. Since Renton is space constrained and there is no room for additional GA facilities, I often refer people to flight clubs based out of BFI such as Alternate Air. Some have even purchased aircraft and leased tie downs. They choose BFI because of the proximity to their homes and offices and enjoy the pride of flying out of their community airport. The reduction of light GA piston tie downs poses a significant challenge for	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. Also, thanks for your recommendation regarding the potential redevelopment of the NW development area. Airport Staff has committed to continue the evaluation of other locations on the west side of the Airport (e.g., the existing Lot 13 area located directly south of the existing ATCT facility) to accommodate some of these relocated based aircraft, as existing leaseholds expire.	1

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				growing our community of GA pilots in the Seattle area. Without the option of parking a plane in Renton or BFI, I have had at least 3 clients suggest they should lease hangers/tie downs in Pierce County (PLU or TIW) and relocate their families as well to be closer to a community that supports light GA aircraft. King County not only loses out on the airport revenue (tie downs, fuel, etc) but also the tax revenue associated with these high net worth individuals and their associated assets. As someone who has an interest in growing my own aviation related business, I was looking to BFI to be a location that could help support the potential launch of a new flying club that would help support our existing and new GA pilots in Seattle. Without aircraft parking remaining the same or increasing, it looks like I may not be possible any more. I would like to propose an alternative of utilizing some of the space around the proposed Airport Maintenance Development Area for the relocation of GA facilities (tie downs and hangers) and consider acquisition of property elsewhere for the housing of airport maintenance operations.		
#1 Nancy Auth		Displacement/ Loss of Existing GA aircraft storage facilities		I am writing regarding the proposed changes to the KBFI Master plan, which appear to have significant changes to, and have a profound impact on, General Aviation at the field. I write wearing several hats, all of which offer a look at how important GA is to the local community's economy both now and in the future. As a pilot who bases a private aircraft at BFI for part of the season, I know that we pay significant money in fuel, hangar, and other services for our jet. We support the livelihoods of line service personnel, air	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				traffic controllers, maintenance crews, catering and food services, and administrative support for all of these. Those who don't wish to hangar their planes, for whatever reason, depend upon the tie down spaces on the field and support the many same services as do we. Wearing my second hat as a pilot who began my flying "career" at BFI with Galvin Aviation, I know that I supported not only the flight instructors with whom I worked, but their back office personnel at the flight school as well: my payments for aircraft rentals, fuel, flight and ground instruction certainly added to the economy of the community. The importance of a flight school's presence at BFI cannot be understated; the proximity of the field to so many Seattle trainees makes it accessible and manageable for those who often need to work at jobs in the city to afford their training for an aviation career. While the world of commercial aviation may be in turmoil now, the future requirements for professional pilots will only increase. Finally, I don my hat as a Trustee on the board of the Museum of Flight, where I have seen the incredible value to visitors, students and pilots of the Museum's accessibility. Pilots can fly their aircraft literally to the back door of the Museum, pay a visit to our amazing facility, and in the process add more dollars to the community in the form of admission fees, merchandise purchases, and by utilizing the same services on the field as above - thereby continuing to bolster the local economy. Non-pilot visitors are inspired by the sight of individuals otherwise no different from themselves, taxiing a plane up to the ramp outside the Museum. The value to young people, especially, cannot be underestimated; many of today's engineers, technicians and aeronautical personnel have received their inspiration from a close encounter with pilots and their planes.		

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				I urge you to consider the importance of these and other examples of how critical it is for KCIA to continue its support of General Aviation in and around BFI. It matters today, and it will continue to matter for years to come.		
#1 Elissa Lardon		Displacement/ Loss of Existing GA aircraft storage facilities		Boeing Field offers a fantastic GA experience that is unlike any other in the world. I have personally trained and flown out of Boeing Field for the last 3 years and would be extremely sad to see this amazing opportunity to lean and fly go away. General Aviation (GA) has a rich history at Boeing Field, providing jobs, flight training, aircraft charter, maintenance, repair, recreation and more. Removing space for over 75 aircraft would have a dramatic impact on the flying community. Redevelopment plans at BFI, PAE and RNT have causes a dramatic reduction in available space. Airports in the surrounding areas are unable to accommodate any more aircraft. Aircraft owners, flight schools and aircraft rental clubs are out of space and out of options. Please consider the long lasting impact that this will have on our GA world. We have something incredibly special in Seattle and at BFI. Don't take it away. I strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area unless a new hangar and tie down area, commensurate or larger in size, can be located on the field.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Brian Makar		Displacement/ Loss of Existing GA aircraft storage facilities		I am writing you to provide my feedback on the proposed Airport Master Plan. I feel I am an important stakeholder in the following regard: 1) I am a resident of King County.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				2) I am an employee of King County, although I am writing this in my capacity as a private citizen. 3) I am a pilot. 4) I received my flight training at King County International Airport (Boeing Field) and still actively use its services. In reviewing the plan, I am dismayed to learn that over 75 spaces dedicated to General Aviation would be permanently displaced. This would severely impact the operation of general aviation on the field. I feel that this presents an issue impacting our Equity and Social Justice values within the county. As a man of color, I have resided in South King County and experienced the economic hardship that the people in this region have statistically undergone. As a young man, I also had dreams of one day being able to fly. I realized that dream in 2014-15, as I worked on my initial pilot ratings right at Boeing Field! I cannot express the magic of flying over my community, and how such an opportunity propelled the dreams of a boy who grew up on the "wrong side of the tracks". Most pilots start their training with general aviation. This is true, whether you are a recreational pilot or it has become a part of your livelihood. As a whole, pilots of color, like me, are underrepresented in the United States. From personal experience, I can state that it comes from feeling that flying is "out of reach". As a pilot, I do what I can to share the joy of flight in my personal and volunteer endeavors, to make it more accessible. Part of what made flying accessible to me was to have general aviation available close to where I live in South King County. The area surrounding Boeing Field is the most diverse in the county. If a young person of color wishes to pursue their dream of flying, Boeing Field is likely the closest airport available to them. In order to be able to afford to learn flying, student pilots need a vibrant, competitive general aviation community.		

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				I kindly ask that the airport reconsider the real threat of reducing general aviation at Boeing Field. While general aviation may not bring as much direct economic value as other alternatives, it reflects our True North value where EVERY person can thrive. I believe that together, we can do the right thing. Thank you very much for your consideration.		
#1 Bryan Thompson Managing Member Queen Anne Air, LLC		Displacement/ Loss of Existing GA aircraft storage facilities		Queen Anne Air strongly opposes the replacement of the existing GA spaces on the field with an air cargo ramp or other non-GA facility. GA is vital to the health of the aviation industry. And GA spots are extremely tight in the general Seattle area. Keeping GA alive and well at Boeing Field is important for both current and future pilots. Queen Anne Air has a tie down in NE parking. Our average economic impact in King County over the previous three years is $123,000 per year. The details are broken down as follows. In addition, QAA is supporting the training of new pilots through exposure to general aviation. Average (2017-2019) $1,378 -- Aircraft Parking $6,653 -- AVGAS $102,213 -- Maintenance $12,500 -- Training **$122,745 -- Total** Queen Anne Air operates an amphibious airplane. In addition to other activities, we take water samples from a variety of local waterways and seek to understand the ongoing environmental changes.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. In addition, the decommissioning of the existing NE tiedown apron area will be dictated by the expansion of the RW 14R approach RPZ (the parking of aircraft is not an approved land use within the RPZ boundary).	1

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#1 Michael Grenier Managing Partner Blu Ox Ventures		Displacement/ Loss of Existing GA aircraft storage facilities		To whom in may concern, As a GA pilot and passenger, and someone who conducts regular business in the Seattle area, I am writing to let you know of my opposition to any reduction in GA parking or facilities at Boeing Field, specifically the proposed redevelopment of the southwest tiedown and hangar area. There is already an extremely limited number of GA options in the Seattle area, and certainly none that allow for practical access to the central business district. Sea-Tac is not an option and Renton is not a practical airport to reach downtown. Boeing Field is the only real option. I rely on access to GA facilities as part of the investments we make in the greater Seattle area, and I've also used the facility for personal and recreational use. GA activity at Boeing Field generates significant economic impact to King County – both at the airport and in the surrounding community The redevelopment of the Southwest area will eliminate an estimated 75+ general aviation hangar and tie-down spaces at the airport, with no firm plan for relocation on the field for these aircraft. Other airports in the area do not have the additional capacity to accommodate these aircraft, forcing owners like myself to base their aircraft several hours away, or abandon the use of GA aircraft entirely. Feel free to contact me with questions.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Mike Koss Museum of Flight board member		Displacement/ Loss of Existing GA aircraft storage facilities		Thank you for an opportunity to provide feedback on the latest proposed Master Plan update for Boeing Field. I have particular concerns about item #2 - the proposed Air Cargo facility. Particularly concerning are the proximity of that location to both the Aviation Highschool and the Museum of Flight. This could cause a	Comments noted. The MP Update will propose the maintenance of the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement.	1

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				major disruption to the activities of both entities, in the form of dramatically increased daytime noise levels as well as surface traffic in the form of large trucks on E. Marginal Way which could disrupt activities at both the school and the museum. As this is the first I've heard of this proposal, I don't have the details on the impact in terms of the amount of increased daytime flight operations and noise level increases, nor the impact statement from surface transport being added to E. Marginal Way. I would like to see those estimates as they become available. I would hope that the County would give due consideration to these impacts, and work with the Museum and School to enable them to continue to serve the community without undue environmental impacts.	**See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.*** In addition, the potential environmental impacts (e.g., noise and surface transportation impacts) associated with the redevelopment of this site for air cargo development or any other aviation facility would have to be evaluated and receive both NEPA and SEPA environmental clearances prior to development.	
#1 Jason Elrod		Displacement/ Loss of Existing GA aircraft storage facilities		To whom it may concern: King County International Airport has a federal mandate to support general aviation. The proposed elimination without relocation of the SW Hangars is in direct contradiction to this mandate. The mandate exists because general aviation is vital to the transportation, economic, and charitable infrastructure of our region and country. The SW hangars house general aviation aircraft and maintenance operations that support general aviation and all the economic and charitable good it provides. KCIA has a federal mandate to maintain infrastructure in support of general aviation. This general aviation support has been whittled away over the years. These hangars represent some of the last remaining infrastructure in which general aviation activities are supported at KCIA. The SW hangars are vital to the remaining general aviation	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				community. Their elimination would be a devastating blow to the general aviation at KCIA and throughout the region. KCIA has an obligation to support general aviation and keep the SW hangars in place.		
#1 Douglas Iverson		Displacement/ Loss of Existing GA aircraft storage facilities		To whom it may concern, My name is Douglas Iverson and I have been a tenant of KCIA for nearly 30 years in hanger E-6. I am responding to the Master Plan for KCIA concerning the demolition of all the SW hangers and placing a air cargo ramp in its place. This is a very bad idea for many reasons that should be carefully considered before going further. For me, as a general pilot, this would be devastating problem of where to keep my plane. There are no hanger spaces anywhere within 30-40 miles of Seattle and KCIA has no plans to relocate their tenants. KCIA will be demonstrating a strong anti-aviation bias, at time when general aviation is struggling, to more or less throw out 24+ airplanes with nowhere to go. A airport is is intended for aircraft. There already is a cargo ramp on the east side of the airport. KCIA has been taking general aviation locations away to provide for the extremely wealthy for the last several decades and now we are told that there just isn't any space left. These large private decadent aircraft estates take up so much land with there own private fueling stations and offices that it is crazy to think that this is fair and kicking out 24+ airplanes is a justified landlord decision. As for the community, why would anyone want to put cargo ramp across the street from a STEM high school and next to our treasured Museum of Flight that we are very proud of. The hangers blend into the SW corner very naturally where a cargo ramp will be a terrible eye sore and no doubt create noise issues.. It my hope that King County reconsiders this poor	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. In addition, the potential environmental impacts (e.g., noise and surface transportation impacts) associated with the redevelopment of this site for air cargo development or any other aviation facility would have to be evaluated and receive both NEPA and SEPA environmental clearances prior to development.	1

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				suggestion in the Master Plan,		
#1 James Young, Manager www.seaplanescenics.com		Displacement/ Loss of Existing GA aircraft storage facilities		I have a scenic tour business and flight school struggling on the field. There are nearly no services left at the airport. I do not believe the current Master plan and action is representative of the use of the airport. AOPA and other organizations including Seaplane Scenics land division are trying to express concern for equitable access to our public airport.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Amy Kaminishi		Environmental Impact Concerns		Hello. My name is Amy Kaminishi and I live in North Beacon Hill under the flight path. I attended the October 28th virtual open house. I appreciated the staff in taking Q&A from the public after the presentation. I would like to have seen actual photos of current site and future site of the projects discussed. It was difficult to view a map to figure out where these new proposed projects are located near the highway, Airport Way and surrounding neighborhoods. Here are my comments. Hire residents who live in surrounding neighborhoods. Place safeguards for safety as related to the construction of new fuel storage facility. The airport is located close to freeway, businesses and residences. Promote the use of younger airport models to reduce airplane noise. Create a better airplane noise measurement for takeoff, landing and in-flight. Reduce flights late night and early morning.	Comments noted. The MP Update recommends the relocation of the Airport's existing fuel facility to be further separated from the adjacent residential land uses. Also, the King County HR department maintains a rigorous program and protocols to promote nondiscrimination and equal employment opportunities for both its Staff and the contractors that are selected to provide services for King County. Airport Staff also interacts with area schools and administers an Airport internship program that draws upon applicants from the area neighborhoods and jurisdictions in the vicinity of the Airport. In addition, The potential noise impacts of repositioning the RW 14 threshold 300 ft to the north on airport property will have to evaluated in separate environmental review documents (i.e., specified NEPA and SEPA studies) and receive environmental clearance prior to implementation or construction. Also, King County does not have the authority limit or restrict the operation of aircraft to and from the facility.	4

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				Mitigate environmental impacts of airport expansion to neighborhoods, business, schools, etc... Create alternative solutions in softening the airplane noise such as sound barriers, etc… Thanks for reaching out to the neighborhoods and translating the materials. I hope you will consider the public comments that are submitted.		
#1 Mike Versstegen		Displacement/ Loss of Existing GA aircraft storage facilities		As a King County resident (Bellevue) and pilot, I've been searching for hangar space close to home (Boeing Field, Renton, etc) and waiting lists are years and years long. I understand from the Washington Seaplanes Pilots Association that Boeing Field Airport Management is considering removing existing General Aviation Hangars and Tie Downs while there is a huge pent up demand for an increase in hagar space. I strongly oppose the proposed plan to reallocate the SE hangar areas for Air Cargo unless the plan includes not only a replacement, but an increase in the number of General Aviation hangars elsewhere on KBFI. It's important that you consider the needs of King County citizens (and taxpayers) for resources on Boeing Field and not just corporate needs for these limited resources.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Alex Wells		Displacement/ Loss of Existing GA aircraft storage facilities		I learned to fly at Boeing Field. As a private pilot, I use it regularly. I would so hate to see it become unusable. It is a jewel to private pilots who pump money into the Seattle economy. Please reconsider your changes and keep this jewel of an airport open and usable for all - even the little guy.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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#1 Stan Kosko		Displacement/ Loss of Existing GA aircraft storage facilities		A fellow tenant alerted me to the proposed changes in the KCIA Master Plan, including the demolition of the SW GA hangars. I watched the Virtual Public Information Meeting and did not see any discussion of what is planned for accommodating the GA tenants in the SW hangars. I have a hangar as well as several tie downs in this area. 1. Can you share any information on what is planned for the displaced hangar and tie-down tenants? 2. Is the time-line 2023 as shown in the Information Meeting video? When will tenants be notified of these pending changes?	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. Also, the projected timeline for the decommissioning of the SW T-hangar area is identified for 2023, but would be contingent upon the acquisition of the adjacent Woods Meadows property and the future development demand for new aviation facilities (e.g., a west side air cargo facility) at BFI.	1
#1 Shawn Elston		Displacement/ Loss of Existing GA aircraft storage facilities		I am writing in support of general aviation (GA) at King County International Airport and **against** the proposal in the Master Plan to remove over 75 parking and hanger spaces for light general aviation aircraft at the southwest corner of the airport. General aviation has many proven benefits to communities, and removing this many spaces would be terrible for all involved. This should NOT be allowed to happen! Aviation is part of Seattle's history and community, with Boeing Field being at its center. These spaces are important, and getting rid of them will cause permanent damage. I respectfully request the managers of KBFI to reconsider the impacts that the Master Plan will have on not only the airport but also the local community and either: 1)Remove the alternative to convert the southwest GA tie-down and hanger spaces to cargo operations, or2)Replace those GA	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				spaces with an equal or greater amount of space in another location, and not eliminate the NW parking until alternative spaces are provided.		
Multiple people		Displacement/ Loss of Existing GA aircraft storage facilities		I am writing to convey my opposition for the master plan changes at King County International Airport – Boeing Field (KBFI) regarding the proposed removal of general aviation spaces on the southwest ramp, and to ask that you reconsider the decision. This is a bad plan for the aviation community and for everybody else. The proposed master plan has caught most of the aviation community by surprise. The impression is that this was intentional. For the past fifty-three years I have operated out of KBFI as a pilot, a tenant and in numerous other capacities. As a longtime board member of the Museum of Flight, and a volunteer and supporter of Raisbeck Aviation High School, I have seen firsthand the invaluable contributions made to KBFI and our community by the colocation of general aviation and these two world-class institutions. The proximity of aircraft parking to The Museum of Flight provides convenient access for educational and public event displays for visiting aircraft, with ease of access for all pilots and visitors with disabilities. There is nothing else like this in the Puget Sound area. General aviation aircraft currently represent half of all aircraft operations at KBFI. The Federal Aviation Administration's (FAA) own "Air Traffic Activity System" data shows an increase in itinerant general aviation plus local civil operations from 124,050 in 2015 to 149,316 in 2019. Yet despite continual growth in general aviation in	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above. Also, the decline in GA operations at BFI was fairly steady between 2000 and 2015, with average annual reductions of 4.9% for itinerant GA and 7.1% for local GA ops (see pgs. B.8-B.9 of the forecast chapter). 2015 was the base year of the forecasts for the MPU and GA ops later bottomed-out in 2016. The GA operational forecast presented on pgs. B.35-B.36 of the forecast chapter reflect the projected growth in the Business/Corporate and Air Taxi sectors with a corresponding decrease in recreational/training activity. We agree that the projections for the GA recreational/training activity are pessimistic, but that outlook for those users was not unique to BFI, and the projected ops are still higher than the latest FAA TAF estimates for BFI that have local GA operations leveling off in the 55k range over the next 20 years.	1

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				our region, King County's own forecast predicts a sudden decline in general aviation. Is it setting up a self-fulfilling prophecy? General aviation activity at KBFI generates significant economic benefits to King County both at the airport and in the surrounding community. It is both a substantial business generator and provides jobs in everything from flight training, aircraft charters, maintenance, repair, recreation and more. Squeezing out general aviation operations from the airport is simply not acceptable. This proximity to downtown Seattle is vital. KBFI and King county have received substantial federal grants to support the airport as a joint use facility. This balance must be maintained. There are other more compatible areas for cargo at both SeaTac Airport and Paine Field. Cargo flights at KBFI would increase the frequency of late-night operations, which will not be well received in the noise sensitive surrounding areas. This is simply a bad plan. It is detrimental to the existing users of the airport and the surrounding community and is not consistent with previous master plans of the airport. It should be redone. Respectfully submitted.		
#1 Jack Yager		Displacement/ Loss of Existing GA aircraft storage		Hello BFI/KCIA Management, I'm writing to protest the plan to remove 75 GA tie-down spaces in the area adjacent to the Museum of Flight.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16	1

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		facilities		General aviation is a driving force at BFI. The proposal to eliminate these tie-downs makes no sense. Please reconsider.	above.	
#1 Frank Sioda		Displacement/ Loss of Existing GA aircraft storage facilities		I strongly oppose the proposed redevelopment of the Southwest tiedown and hangar area unless a new hangar and tie down area, commensurate or larger in size, can be located on the field, GA deserves a continued presence on Boeing Field! Thanks for your consideration Frank BTW, I trained and obtained my license to fly at KBFI back in 2006, and look forward to continue to fly back to king county in the future.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Tod Dickey President VMI Holdings Inc., and Aircraft Owner		Displacement/ Loss of Existing GA aircraft storage facilities		To Whom it May Concern, In my opinion, eliminating General Aviation parking spots at Boeing Field is not a good idea. KBFI has been a major Reliever Airport to KSEA for many years, and KBFI has flourished because of this. I liken this to the efforts of Scottsdale AZ airport to displace private aviation planes to create more space for corporate aviation. The airport then lives or dies by the corporate aviation economy. Their experience is that, once you run Private aircraft off, you can't get them back when you want them. If it is necessary to use the current parking spaces for other uses, then they should be replaced at another location on the airport. Please consider the larger picture when making your decision, not just the most convenient decision for the current situation.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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#1 Bryan Tomperi		Displacement/ Loss of Existing GA aircraft storage facilities		Subject: Boeing Field Master Plan Dear Mr. Parrott, After reviewing the proposed Airport Layout Plan, I am highly concerned about the removal of a number of GA hangars that are not being replaced on the field. Buildings numbered 4,5,6,7,9, 88,87,89 are all hangars being removed. Where will all these General Aviation aircraft go? There is a shortage of hangars in the Pacific Northwest. A narrow triangular area labeled as GA redevelopment is shown but due to the geometry cannot come close to what is being taken away from the general flying public. I support making reasonable modifications to provide commercial growth, but it should not be at the expense of taking away the flying opportunities for the public. I request that you ask the planners to take another look at preserving the GA community at Boeing Field. Respectively yours,	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Jim Immler		Displacement/ Loss of Existing GA aircraft storage facilities		To Whom It SHOULD concern, As a Canadian Pilot that frequently utilizes the facilities of Boeing Field I must say that I am very concerned about the Master Plan to remove GA aircraft parking spaces from the field. Boeing Field has always played a critical role for me on business trips as well as an annual Museum of Flight day that I experience with members of my aviation group. As a Canadian I have always been impressed by the usefulness of services at American airports and it is greatly disappointing to see that this tremendous economic value becoming lost. Perhaps with most of the blame falling on bean counters	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				that clearly underestimate the critical stepping stone that GA activity creates in their local community. Please reconsider this potentially devastating elimination of General Aviation services at Boeing Field.		
#1 Jim Evans		Displacement/ Loss of Existing GA aircraft storage facilities		Hello. I am writing to express concern for the proposal to remove GA tie-down spots in the SW parking area. I currently rent a tie-down spot there, and would be displaced. There is no other facility or parking spots available in the entire Seattle metro area that provide equivalent GA access to Seattle. I understand that cargo and corporate growth needs to be accommodated, but I think that it can be done without displacing personal GA use! The plane I keep there is fundamental and key to my business, Bear Air Sport Aviation. Lack of a affordable outdoor tie-down space in Seattle would spell the end of this business. Please work towards a plan that accomodates all users!	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Rachelle Ornan		Displacement/ Loss of Existing GA aircraft storage facilities		Hello, I am writing to give feedback on the proposal to change the SW tie-downs into a cargo terminal! I absolutely oppose this decision, unless there is adequate additional 75+ parking spots created for people like my boyfriend who has his airplane located there. I'm a 13 Boeing veteran, Associate Tech Fellow, and I'm learning how to fly in this airplane. It's short sighted to just wipe these GA aircraft and pilots off the map of Boeing Field. It's the antithesis of what working at Boeing means to me. With proper planning and resourcefulness, I believe	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				everyone should be able to benefit from BFI- ultra-rich and normal people who are just trying to enjoy the hobby and experience of flying. What message does this send to the Raisbeck Aviation high school students across the street? They'll have nowhere to learn themselves and furthermore you'll be putting in their heads that money is king. As if they need more reminders in this town. SUCH the wrong message.		
#1 Paul Larson		Displacement/ Loss of Existing GA aircraft storage facilities		I have been made aware of plans to remove GA accessibility at KBFI. I would like to formally express my opposition to such a plan as a current GA aircraft owner/partner who parks at Boeing Field. Please reconsider your proposition to limit GA which deserves a continued presence at Boeing Field without feeling squeezed out.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Travis Brandt		Displacement/ Loss of Existing GA aircraft storage facilities		King County Commissioners, I own a small local start-up manufacturing company, dealing in aluminum boats, and have been operating small marine manufacturing companies in the Seattle area since 2004. As a necessary part of our business, our customers, investors and principles, operate part 91 singles and twins in support of our business. Boeing field is known for 'big expensive corporate jets' and, sadly, mall businesses like us are overlooked because we don't have big jets, we fly under the radar, so to speak. That said, millions of local economic dollars change hands in my companies, and many like minded peers, consultants, customer, and investors also rely on various part 91 operations. We've parked, washed, landed, taken off, picked up passengers, et al, and generally	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				this SW parking area enables efficient use of our time and limited resources. **Access to this area**, or one on the West side, **is critical**. The East side of the runway is too busy, jam packed, with no reasonable room to park cars, and go at our own **safe pace** away from the hustle. Our immediate impact to King county has merely been approximately ten million over a few years, however, we are just one business, collectively businesses like ours are easily a billion. This particular area on Boeing Field is unique, and it needs to be retained, eliminating it will pinch operations into potentially unsafe compromises. In comparison, there are no sufficient secure and dependable alternatives at Renton (no approaches and far too cramped) or Auburn (no approaches and completely insecure). Please consider carefully the impact your proposed actions with have to MANY small business, which I guarantee you, are currently being overlooked. I urge you to reconsider, or solve the problem with adequate development of similar areas/access/hangars elsewhere on the field. Respectfully Submitted, Kind Regards,		
#1 Clark Crawford		Displacement/ Loss of Existing GA aircraft storage facilities		Why waste aviation aspects of a historical nature that still provide a niche of usefulness to those that brought the existing field into the world of aviation. To discard all elements of that connection in favor of the almighty dollar is short sighted. Be sensitive to aviation heritage. Keep the General Aviation spaces available and functional in that useful corner of Boeing Field. I first used the facilities of Boeing field in the 1950's and on into the 70's both as private aviation and commercial endeavor. I am in favor of both, even today. Thank you for your consideration. May	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				your heartstrings be plucked and nourished with Aviation tradition and history. Clark Crawford		
#1 Eric Misbe		Displacement/ Loss of Existing GA aircraft storage facilities		As an aircraft owner and user of the SE tie down area I urge you to reconsider the plan to turn the SW tie down area into a cargo ramp area without having a solution / new area for the GA aircraft that would be impacted. General Aviation seems to always be the easy answer to toss aside, yet GA account for a heft use at KBFI and other area airports as well as generates large revenues for area airports and businesses. As airports get more busy space certainly does become a premium however consideration and accommodation for GA must always remain part of the plan. Thank you for your time.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1
#1 Ben Buehler		Displacement/ Loss of Existing GA aircraft storage facilities		Hello To Whom It May Concern, I just got word that the new Master Plan has a proposal to eliminate the Southwest Hangar and tie down space and not relocate the hangars or tiedown space, This would be a devastating thing to happen for general aviation at KBFI and the surrounding airports, there simply is not enough hangar or tie down space available at KBFI or Surrounding airports they all have long waiting lists for tiedown and certainly hangars. Many of us have been Tenants for 30 plus years and have been contributing to the airport fund which over that period of time is a substantial amount ,and I don't think it is reasonable to evict us we have been your customers. I like many others learned to fly out of KBFI and enjoy the airport and have always been grateful to have a hangar at KBFI . I believe a solution can be found by the management and the consulting firm, either having a different location for air cargo or the SW complex, possibly the Jorgenson	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				complex (not sure what the plans for that property is). I believe since 1976 KBFI has lost over 80 General Aviation Hangar. Thank You for your consideration in this matter. Sincerely		
Unknown		Displacement/ Loss of Existing GA aircraft storage facilities		To whom it may concern: Save the Hangars and Tiedowns! It is not enough that the MOF (Museum of Flight) could remain as the only vestige of GA (General Aviation) and its history at Boeing Field (KBFI)...IF the Master Plan were to eliminate 75 tiedowns and hangars on Apron 2. A number of military, commercial and GA historical records have been set with launches at KBFI. Over the past 40 plus years, I have assisted with emergency aircraft repairs and preparations for record attempts using borrowed hangar space at KBFI. I have commuted to my Boeing job(s) on occasion, tying down on Apron 2 spots coordinated with Operations. Nearby airports or airstrips have been closed since 1975, including: Bellevue Cedar GRove Evergreen (Federal Way) Issaquah Martha Lake Sky Harbor with no replacements in sight (Evergreen Sky Ranch, Black Diamond, was the LAST new airport allowed in King	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				County, in 1964.) Displacing those GA aircraft on Boeing field to a "nearby" (e.g. Olympia, etc.) airport will greatly diminish their utility. (NOTES SUBMITTED INCOMPLETE TO MEET 12-15-20 OPEN COMMENT PERIOD.		
#1 Ghyrn, Colin, and Elizabeth Loveness		Displacement/ Loss of Existing GA aircraft storage facilities		To King County, My name is Ghyrn Loveness, I am a licensed private pilot that has been using BFI since 1987. My brother, Colin, mother, Elizabeth, and I have a shared ownership in a DeHavilland Beaver housed in hangar E1 in the SW hangars at BFI. These are the only hangars within the local area that can fit this size of aircraft in proximity to the central Puget Sound and greater Seattle area. I have enjoyed this airport for many years and It has been always a very handy airport for my family, friends and my business because of its proximity to Vashon Island and West Seattle where my family and myself have lived at since the early 1980s. The master plan is an ambitious plan that does not benefit GA but hinders their progress for present and future generations of aviators. GA is the blood that feeds aviation in America and hurting GA will hurt the progress of all aviation. Your Master Plan will not have value if this blood is cut. It will also leave a large number of current tenants homeless without option for nearby relocation. It will burden neighboring airports and drive away activity, including maintenance, flight training, and sight-seeing activities that support GA operations and inspire and train future generations for STEM careers.	Comments noted. See response to Robert Braunstein comments on pgs. 14-16 above.	1

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				The Master Plan is one sided and at a great sacrifice to GA. It helps the few at the expensive of the many. GA is made of Americans that appreciate this country and also share the love of aviation and always willing to help the industry and community. King County should look for a wholistic approach to this Master Plan where King County can find a balance between all because it will benefit all not just a selected group of individuals or entities. The following are some points to consider: • General Aviation (GA) has a rich history at Boeing Field, providing jobs, flight training, aircraft charter, maintenance, repair, recreation and more • GA activity at Boeing Field generates significant economic impact to King County – both at the airport and in the surrounding community • The redevelopment of the Southwest area will eliminate an estimated 75+ general aviation hangar and tie-down spaces at the airport, with no plan for relocation on the field for these aircraft • Other airports in the area do not have the additional capacity to accommodate these aircraft, forcing many owners to base their aircraft several hours away, or sell • i strongly oppose the proposed redevelopment of the Southwest tie-down and hangar area unless a new hangar and tie down area, commensurate or larger in size, can be located on the field		

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				GA deserves a continued presence on Boeing Field! Sincerely,		

Draft Report PUBLIC MEETING #1

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PM 1 Comment I.D. & #	Page	Section or Issue	Comment as Noted	Response to Comment	Action
Josh Pruzek	NA	SW air cargo development and future loss of GA aircraft parking area	Does the AMP provide an estimate of the # of based aircraft displaced by the air cargo development in the SW corner of BFI and how many additional GA aircraft can it accept	There are 32 T-hangar spaces and 30 apron tiedowns provided in the existing southwest GA development area that could potentially be displaced by the future redevelopment of this existing GA aircraft storage area (this site was initially identified for new Southwest Air Cargo Area in this MP Update). However, this site will be identified on the Airport Layout Plan (ALP) as a Future Aviation Redevelopment Area. In addition, King County has not yet acquired the adjacent Woods Meadows property that would likely be required for the development and won't until it becomes available for purchase. Also, King County continues to explore several options on or near the Airport for future aviation development. One of these potential sites that could be used for displaced GA aircraft parking is located on the west side of the Airport, directly south of the existing ATCT facility (i.e., the existing Lot 13 area), and will be identified for this use on the ALP. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.***	1
South Park resident	NA	Mitigation measures and neighborhood engagement	What mitigation opportunities are you thinking about so engagement with your neighbors is ongoing? Like a fund for visible projects that the neighborhood would benefit from.	FAA regulations indicate that virtually all funds generated at an airport must be used for operation and maintenance of the airport. Exceptions include some monies spent on outreach/communication opportunities with surrounding stakeholders/neighborhoods/communities. Therefore, BFI is limited by FAA constraints with what off-airport projects they can fund or help fund. BFI will continue to engage the surrounding neighborhoods and communities and will strive to stay in regular communication with them. Also, King County is currently coordinating with the City of Seattle regarding the relocation of a segment of Airport	4

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				fencing to improve the existing pedestrian connection between Georgetown and South Park neighborhoods of Seattle. This project could also include a combination of artwork and a landscape buffer along a segment of the Airport's perimeter fencing.	

Draft Report PUBLIC MEETING #2

Comments and Responses: DRAFT REPORT PUBLIC MEETING #2 (10/28/20)

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Robert Ferry/#1	NA	Airport conversion to public park	Big picture: There should be a 30-year strategic plan to convert Boeing Field to a public park. The site is becoming too urban for an airport land use, which is polluting, noisy, and provides little benefit to the general community. Transition flights to surrounding airfields. See Santa Monica and Berlin for precedents.	At this time King County intends to continue operating BFI and provide the positive economic impact produced.	2
Robert Ferry/#2	NA	Airport curfew	There are still large aircraft making landings into the wee hours of the morning. Is it within the scope of the master plan to place curfew on flights after midnight for example?	It was not within the scope of the MP Update to evaluate curfews. The ability of local airport sponsors to unilaterally implement curfews and/or restrictions that affect access to a publicly funded/public-use airport by any type of aircraft has been removed by Congress and authority given to FAA. For an airport sponsor to attempt implementation of such restrictions, a significant study, called a Part 161 – Notice and Approval of Airport Noise and Access Restrictions, must be conducted and approved by the FAA. It involves conducting a noise study similar to a part 150 noise study combined with a detailed analysis of the anticipated or actual costs incurred to the restricted users compared to the benefits gained by the community. There has been only one determination by the FAA that an airport sponsor has fully complied with Part 161, which was at Naples Municipal Airport in Naples, FL. It is an agreement between airlines and the FAA attempting to avoid a patchwork of different use restrictions at airports across the county in return the airlines agreed to phase-out old Stage 2 noisy aircraft.	4
Velma Veloria/ #1	NA	Jobs and training availability	What type of jobs and or training will be available to the communities where the airport is located?	There are a wide variety of jobs provided by BFI tenants - from entry level, customer service reps, fuel line personnel, drivers, engineers and pilots at Boeing and UPS. Not all 18,000 jobs mentioned in the video presentation are on the airport, but include transportation providers getting to and from BFI, support for entertainment/food and beverage establishments in Georgetown. Because BFI is responsible for such a small number of jobs at the airport, we are working upstream of the job pipeline to create substantial,	4

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				meaningful opportunities to engage youth. BFI partners with local high schools to host a day of activities called Discover U and partners with the Museum of Flight on Women Fly events. These events educate students on the wide variety of careers at an airport and sparks an interest in the broader aviation field. BFI also has a robust internship program that sponsors interns at all levels from high school, community college, university and graduate school. This program helps to reduce the barriers to entry for careers in aviation and the County.	
Brenda Nelson/#1	---	Airport vitality	This is a vital airport for air medical transports to the only level 1 trauma hospital in 3 states.	Comment noted. Was not aware of this fact.	4
Linda Cox/ #1	---	Date of baseline information	What date was the baseline year of the current environmental study?	2015 was the baseline year of the environmental analysis for this MP Update. Some update of the environmental categories occurred in 2019 to get updated information. The baseline aircraft activity was 2015.	4
Niesha Fort-Brooks	---	Archaeological and cultural resources	What is the archaeological and cultural resources? Is this on your website?	The existing archaeological and cultural resources located on BFI and in the surrounding area were identified in the MP Update/Inventory of Existing Conditions chapter and is available on the website.	4
Judy Peterson		RPZ impact on Boeing	Is this new RPZ still impacting the Boeing A6 stall? Hard to view in the slides.	With the 300' runway extension, a corner of the RPZ still overlaps Stall A6. However, there were two design standards that impacted Stall A6: the RPZ and the aircraft parking limit line at 500' from the runway centerline, which is still in place relative to Stall 6. But there is benefit gained from the RPZ repositioning.	4
Robert Ferry/#3		Park expansion study	There is a triangle of land adjacent to Ruby Chow Park (to the southwest and approximately the same size as Ruby Chow, near Jet City fitness) that seems to be entirely unused by KCIA. Has there been a study to expand park area into that triangle in the future (pulling the fence line in)? It seems to be no close to the actual runway.	Not sure what area your referring to exactly and want to be talking about same place. If the area in question is the paved area southwest of the park, BFI hopes to repave and put recreational uses there. Other sections to the north inside the fence line that appear to be unused are within the existing or future RPZ. BFI will want to keep that land open and not	4

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				develop in uses that attract gatherings of people.	
Linda Cox/#2		Pilot communication	What are the plans to inform pilots of approved flight paths for departure and arrivals over West Seattle including violation of the approved flight paths?	BFI has an operations duty manager who works on BFI's noise program that talks with both community members and pilots concerning noise complaints. It is a challenge since BFI has no authority over the surrounding airspace. BFI works with pilots, the community, and the FAA to determine if pilots are following approved procedures. The procedures will vary based on weather conditions (IFR vs VFR), the exact location, and the airspace category. If a location is known, please contact BFI's operations duty manager who can speak more definitively to a specific location.	4
Evan Nelson		Small aircraft storage	If Southwest and/or Northeast tie downs are eliminated, does the airport intend on maintaining small aircraft capacity elsewhere, and if yes, where?	The northeast area is encroached by the RPZ and to meet FAA standards BFI must eventually move the aircraft located there. Some leaseholds have reverted to the airport and the properties will be evaluated to best accommodate all user groups. One of these sites that will be identified on the ALP for small GA aircraft parking is located on the west side of the Airport, directly south of the existing ATCT facility (also referred to as Lot 13). However, BFI will not be able to provide all of the large and small aircraft parking that is desired. BFI has a wait list for hangars and will likely continue to have a wait list for tiedowns. BFI will try to optimize development for all user groups, which is very diverse and includes aircraft from Cessna 152s to B-777Xs. No definitive answer is available at this time. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.*****	1
Robert Ferry/#4		General	Thanks for your responses. I'll follow up with an email regarding that land area in question.	Comment noted. Please do follow up as email address has been posted.	4

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Linda Cox/#3		General	Thank you. This has been very helpful. I'll be in touch to follow up.	Comment noted. Please do follow up.	4
Girmay Zahilay		Public input	Is there where the public can give input?	Yes. KCIACommunityOutreach@kingcounty.gov	4
Anonymous from Q&A/#1		Public input	Do public comments make a difference? Can you state any examples that have? Also, what will be the noise impact to the neighborhood by moving the runway towards the neighborhood?	Yes. Comments from the public allow BFI personnel to be made aware of how different aspects of the airport affect people. They provide input on what the public thinks about BFI. Different people will have different opinions, so no one opinion will outweigh another and sway a decision one way or the other. Comments provide the decision makers with community and neighborhood concerns so they can make informed, balanced decisions. Comments and opinions can make a difference even if one does not see the exact results for what was advocated. Specific examples from when director John Parrott was the Airport Director at Anchorage include where comments resulted in additional general aviation aircraft parking areas being developed. It was not necessarily where the pilot groups wanted, but continued access to the airport was provided. Have seen where communications improved with surrounding communities to the point that even though not all groups agreed with everything, at least they acknowledged publicly that the airport was listening and discussing. This led to the community better understanding why decisions were being made the way they were and airport staff better understood what was important to the community and how to mitigate negative impacts. When the runway threshold is relocated to the north, the aircraft taking off to the south will be 300' closer to the surrounding area, so there will be some noise impact. There will be no change for aircraft landing from the north	4

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				following the instrument approach procedure glide path. An environmental study specific to that project will be conducted that analyzes, among many other things the noise impacts. If any noise sensitive receptors are within the Day-Night Average Sound Level (DNL) 65 noise contour and experience an increase of 1.5 DNL with the project compared to the modeled noise environment without the project, then the FAA would consider this a significant noise impact.	
Anonymous from Q&A/#2		FAA approval	Have these plans be "pre-approved" by the FAA?	The FAA has been involved and reviewed all chapters throughout the MP Update. However, the FAA only officially approves two elements of an Airport Master Plan – the aviation activity forecasts and the Airport Layout Plan (ALP). If a project is not identified on the ALP, then it is not approved by the FAA and cannot be constructed. Each proposed project must compete for federal funding and will have to be environmentally analyzed; they are not pre-approved by the FAA. In addition, the FAA conditionally approves the ALP, meaning that, among other things, no projects are environmentally cleared through the ALP approval. Each project will require its own environmental analysis and clearance prior to implementation.	4
Linda Cox/#3		Public comment	How do you make a public comment?	Comments made during this meeting are preserved and included in the record of the MP Update. Emails sent to KCIACommunityOutreach@kingcounty.gov are considered public comments and will be included. There is no official form to fill out. Any comment or question made in the public forums will be addressed.	4
Razaq Raji/#1		Fuel farm	Will the proposed fuel farm on the west side of East Marginal Way be above or below grade?	No decision has been made yet. The property west of East Marginal Way has not yet been acquired. If acquisition occurs, then BFI will partner with a developer to permit, build, and operate the fuel farm. It will largely be up to developer, through the permitting process to relay to BFI	4

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				how best to meet the environmental requirements for a fuel farm at any airport location. BFI would rely upon the business and regulatory experts to make necessary decisions.	
Linda Cox/#4		FAA representative	Who is our FAA representative and how do we contact that person?	There is no single FAA representative; there are anywhere from 5 to 7 based on the type of issue you are interested in. No single point of contact. Let BFI know what the issue is and they can direct you to the right person.	4
Anonymous from Q&A/#3		Public input	Where can the public give input if they can't make these calls? Is there an email address?	Yes, KCIACommunityOutreach@kingcounty.gov	4
Anonymous from Q&A/#4		Existing development south of BFI	I joined the meeting late. What construction is happening at the south end of the airport?	Construction across the street in the old Associated Grocers site is Prologis, a logistics company. The northeast part of the property concerned BFI the most. BFI worked with the Facilities Management division of King County and Metro to change the use from an office building (vertical development) to a bus driver training facility (horizontal development). Hopefully at end of a 12-year lease BFI can buy the property and ensure no future incompatible development will occur.	4
Robert Ferry/#5		General	I've sent an email with additional information about the land areas in question. Thanks again for hold this meeting.	Comment noted. Look forward to receiving the email and discussing the property in question.	4

Draft Report PUBLIC MEETING #3

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John Haynes/#1	NA	Future availability of the recorded meeting.	Will the recording be shared later?	Yes, the recorded meeting will be available on the project website: kingcounty.gov/KCIAMasterPlan	4
Deirdre Curle/#1	NA	Sound mitigation options to residents resulting from potential 1.5 DNL increase.	If there is a 1.5 DNL increase in noise, what will King County Airport do to provide mitigation to residents affected by the noise?	That would likely depend upon whether the residential property is located within the previous Part 150 noise mitigation boundary for the 65 Day-Night Average Sound Level (DNL) contour and was sound attenuated as part of the resulting sound insulation program. If the answer is yes, the residence may already meet the specified interior noise reduction level requirements and no new noise mitigation would be required. If the residential property is located outside the previous Part 150 noise mitigation boundary for the 65 DNL contour, but inside the new 65 DNL, and would experience a 1.5 DNL increase resulting from the new project, then the property would likely be eligible for noise mitigation improvements.	4
Ahmad White/#1	NA	Risk of additional noise impacts to Georgetown residents resulting from the RW 14R threshold shift.	Considering that the airport has already had to provide noise mitigation features for the residential Georgetown, what is the risk to noise levels based on moving the runway north and/or additional projected takeoffs and landings of larger aircraft?	Prior to the implementation of the RW 14R threshold relocation project, a detailed noise analysis will be conducted as an element of the environmental screening/documentation for the project. The potential impact of repositioning the RW 14R takeoff noise 300 feet north of the existing threshold will be identified in the noise analysis. Due to the significant reduction in size/coverage between the previous 65 DNL contour generated for the Part 150 noise study compared to the new MP Update 65 DNL contours, it is likely that many of the residential properties in Georgetown that are located within the new 65 DNL contour have already been sound attenuated or were new construction that may already meet the specified interior noise reduction level requirements.	4
Sherell Ehlers/#1	---	Noise and land use evaluation	In assessing noise and land uses, is the study using actual land use or zoned land use? The study should be using actual land use and not zoned. The zoned land use does not accurately reflect the actual use and therefore noise	The existing land use mapping for the Master Plan Update (MPU) is generalized and was compiled from the planning documents prepared by the surrounding jurisdictions in the vicinity of the Airport (i.e., King County, City of Seattle,	4

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			mitigation/analysis would be lacking.	City of Tukwila, City of Burien, and C:ity of SeaTac), as well as Google Earth mapping. The environmental screening documentation that will be prepared for the individual projects of the MPU will include a comprehensive analysis of the actual existing land use that could potentially be impacted by the project prior to the implementation of the project.	
John Haynes/#2	NA	Project cost estimates.	Is there a detailed budget to be shared?	Yes, a listing of the recommended projects from the MP Update and their associated planning-level cost estimate is presented in Chapter G of the Draft Report, entitled *Financial Implementation Plan.*	4
Sherell Ehlers/#2	---	Extent of Georgetown that is visible on Airport base map.	It appears that north Georgetown neighborhood and the Georgetown playfield north of Michigan is missing. Only south Georgetown seems to be shown on the map.	You are correct that the Generalized Existing Land Use map (see Figure A15 of the Inventory of Existing Conditions chapter) needs to be updated to include the Georgetown Playfield and adjacent residential land uses. **See revised Chapter A illustration: Figure A15/pg. A.42.**	1
Anonymous/ #1	---	Threshold crossing height (TCH).	Why not just raise the glideslope to meet the threshold crossing height requirement rather than moving the with all its accompanying noise issues?	Increasing the angle of the glide slope antenna to raise the TCH was one of the first potential solutions that was investigated by the FAA. However, this option was found to negatively impact the south flow arrival stream into SeaTac due to the existing airspace constraints caused by the close proximity of the two airports.	4
Holly Krejci/#1	---	Potential noise impacts on new residential development.	A number of properties within the 2008 contour have been demolished and new multi-family townhome developments have been built in those locations. How would these changes be addressed in new noise assessment?	Typically, existing property owners or developers who redevelop noise sensitive properties within a previously defined noise mitigation boundary that was a product of an FAA Part 150 Noise Study are recommended and sometimes required to incorporate noise mitigating construction improvements into the new project to achieve the desired interior noise reduction guidelines. Thus, depending on the findings of the new noise analysis, the developers of these new townhomes would likely not be eligible for any federal funding assistance of new sound attenuation projects.	4
Anonymous/	---	GA relocation	Where do the GA airplanes from SW parking move to?	Airport Staff is currently investigating how some of the	1

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#2		from existing Southwest GA development area.	And more generally, what is the growth plan for GA?	existing Airport property that is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. There are 32 T-hangar spaces and 30 apron tiedowns provided in the existing southwest GA development area that could potentially be displaced by the future redevelopment of this area (Airport Staff initially identified this site for a new Southwest Air Cargo facility). However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. King County has not yet acquired the adjacent Woods Meadows property that would likely be required for the redevelopment of the area and won't until it becomes available for purchase. Also, King County continues to explore several options on or near the Airport for future aviation development (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) will be identified on the ALP for new or displace GA aircraft parking. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.*** Regarding a growth plan for GA at BFI, the decline in GA operations at BFI was steady between 2000 and 2015, with average annual reductions of 4.9% for itinerant GA and 7.1% for local GA operations. 2015 was the base year of the	

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				forecasts for the MPU and GA operations later recorded recent year lows in 2016. The GA operations forecast for the MPU reflect a projected growth in the Business/Corporate and Air Taxi sectors with a corresponding decrease in recreational/training activity. However, even though fewer small GA aircraft operations have been recorded at BFI in recent years, the Airport still maintains a high based aircraft occupancy rate for both T-hangars and apron tiedowns.	
Tony Eayrs/#1	---	Air Cargo demand.	Does the Master Plan Update incorporate a 20-year regional air cargo demand forecast?	Yes, Chapter B of the MP Update includes forecasts for both air cargo weight and air cargo aircraft operations (see pgs. B.32 thru B.35 of the Draft Report.	4
Warren Hendrickson/#1	---	NE GA tiedown ramp.	The impact of the relocated 14R RPZ on the fuel farm was noted. What will be the impact, if any, on the NE general aviation tiedown ramp already within the RPZ and relocated RPZ?	Ultimately, the existing Northeast Tiedown Apron will have to be decommissioned to accommodate the larger Runway Protection Zone (RPZ). The proposed schedule for decommissioning of this aircraft parking area has not been identified, but all of the parked aircraft within the boundary of the RPZ will eventually need to be relocated.	4
Sherell Ehlers/#3	---	Landscape buffer north of the Airport.	What is the plan for increasing the landscape buffer between the Georgetown neighborhood (specifically along Ellis Ave. S.) and the airport property? There is currently little to no buffer and the lighting from the airport property shines into neighborhood windows across the street.	King County is currently coordinating with the City of Seattle regarding the relocation of a segment of Airport fencing to improve the existing pedestrian connection between Georgetown and South Park neighborhoods of Seattle. This project could also include a combination of artwork and a landscape buffer along a segment of the Airport's perimeter fencing.	4
Ahmad White/#2	NA	Future air cargo facility expansion.	You mentioned that one of the goals of the plan was to add capacity for an additional shipping operation. How does your master plan account for additional ground to air transportation needs to accommodate another UPS shipping operation?	Prior to the development of a new or expanded air cargo operation at BFI, a comprehensive vehicular transportation study will have to be conducted as an element of a detailed environmental review/analysis of the project. A determination of the potential level-of-service impacts and any capacity constraints to the surrounding ground transportation system would be documented in the required environmental study prior to the construction of the project.	4

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Jonathan MacKenzi/ #1	---	Runway 14L/32R strengthening.	Is there plans for runway 14L/32R to be strengthened during the resurface project to allow heavier business aircraft to it when 14R/32L is closed?	The existing RW 14L/32R pavement strength is very similar to the pavement strength of the primary runway. However, at just over 3700', runway length and existing design standards would be the limiting factors for operations of heavier/larger business aircraft operating on RW 14L/32R during the resurfacing project for the main runway.	4
Sherell Ehlers/#4	---	Future neighborhood sound mitigation.	If the airport is making changes that will increase noise in the neighborhood, will the airport be retrofitting the new construction in the neighborhood since those projects do not have access to the sound mitigation program?	Typically, existing property owners or developers who retrofit property within a previously defined noise mitigation boundary that was a product of an FAA Part 150 Noise Study are recommended to incorporate noise mitigating construction improvements into the project to achieve the desired interior noise reduction guidelines. If the impacted property is located outside the previously defined noise mitigation boundary, then the property may be eligible for funding of sound attenuation projects.	4
Sherell Ehlers/#5	---	Future neighborhood sound mitigation.	No new infrastructure is required to be built to the higher noise standards. The City does not require that.	That may be the case in some or all of jurisdictional boundaries surrounding the Airport, and is why it's the responsibility of the property owner to include the appropriate noise reduction construction improvements to meet the recommended guidelines within the defined noise mitigation boundary.	4
Greg Ramirez/#1	---	Georgetown outdoor noise mitigation.	The Georgetown community has been actively advocating for more outdoor open space (off leash dog park, a connection to south park via bike lanes and pedestrian walkways). How could the King County Airport mitigate the noise pollution in those scenarios? We can't expect the community members to only stay inside to be protected by the sound attenuation.	King County is currently coordinating with the City of Seattle regarding the relocation of a segment of Airport fencing to improve the existing pedestrian connection between the Georgetown and South Park neighborhoods of Seattle. Regarding the outdoor noise levels in the vicinity of the Airport, resulting from the operation of aircraft (e.g., aircraft taxi, takeoff, and landing operations) the Airport Sponsor is really limited in what can be constructed to effectively minimize outdoor noise levels. The Boeing Company has constructed an elevated wall system adjacent to several of their aircraft parking positions on the west side of the Airport that likely serve multiple purposes related to jet blast and noise mitigation, as well as provides a visual barrier. It is possible that some variant of this wall system could be	4

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				constructed at the north end of the Airport, in conjunction with the current artwork and a landscape buffer project that is being planned in this area.	
John Haynes/#3	NA	Existing fuel farm remediation.	Does KCIA expect that remediation tasks will be required for the relocation of the fuel farm?	Yes, it is likely that some degree of remediation will be required given the age of the underground tank facilities. However, this will need to be confirmed following the decommissioning/removal of the existing facility.	4
Holly Krejci/#2	---	Georgetown Apartments.	A community member was concerned about potential impact of RPZ on the Georgetown apartments at the northeast corner of the field - as these are affordable housing units. Can you speak to how these might be impacted.	The answer to this question was excerpted from the following FAA website: https://www.faa.gov/airports/environmental/relocation_assistance/land_acquisition_under_aip/ "Land acquisition necessary for Airport Improvement Program (AIP)-assisted airport development or noise compatibility purposes must be accomplished in accordance with Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs (49 CFR Part 24). This is the implementing regulation for the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act). The Uniform Act is the Federal law that provides minimum real property acquisition policies and requires the uniform and equitable treatment of persons displaced as a result of a Federally assisted project". In accordance with the Uniform Act, families and individuals displaced from their dwellings may be eligible to receive two kinds of relocation payments: one to cover moving and related expenses and one to assist in obtaining a replacement dwelling.	4

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Laura Wright/#1	---	Final details on Airport MP Update recommendations.	When will we have concrete details on this plan including buildings you are buying, fuel farm relocation determination, and how high planes will be flying over the neighborhood in the new taking off zone? Numbers and facts would be most helpful.	The specific projects recommended in MP Update and tentative phasing plans are presented in Chapter G of the document. The timing of the property acquisition projects is typically driven by the seller of the property. The details on the new fuel farm project will not be known until the final site location is selected and the final design is completed by the chosen operator. Regarding the RW 14R shift project, the majority of the aircraft landing to RW 14R will be at the same altitude over Georgetown as they are today since the Instrument Landing System (ILS) and GPS approaches will not be changing. However, the RW 14R takeoffs will begin at the new threshold location, 300 feet further north. A comparison of Figures E2 and E3 in the Environmental Overview chapter does provide some reference to how the runway threshold project could reposition the DNL noise contours.	4
Adam Malone/#1	---	Planning for future light GA parking.	Since the 737MAX is close to re-entering service in 2021, will this extra space be accounted for when planning light GA parking relocation in this Master Plan Update? If not, why not?	Airport Staff is currently investigating how some of the existing Airport property that is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii.***	1

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Sherell Ehlers/#6	---	Future impacts to Steam Plant.	Could you explain in plain language what impacts there may be to the Steam Plant?	The existing RW 14R RPZ currently overlays a portion of the off-airport property associated with Steam Plant. The proposed RW 14R threshold relocation project would slightly reduce the amount of the Steam Plant property that is impacted by the RPZ. King County is in ongoing negotiations with the Steam Plant representatives for a new access road from Ellis Ave., including the operation of the facility as a museum. However, the final approvement of the agreement must include a balance of the FAA's safety guidelines for land uses located within the RPZ -both people and property on the ground and the operation of aircraft.	4
Greg Ramirez/#2	---	Community coordination on future fuel farm design/relocation.	Can King County agree to engage with the community about the fuel farm co-design and relocation? We continue to hear a lot of concern about this aspect of the master plan.	The environmental documentation process for the new fuel farm design will include several opportunities for public comment and meeting participation prior to receipt of the environmental clearances and permitting that would be required before construction of the project.	4
Anonymous/ #3	---	Existing fuel farm location.	Where is the existing fuel farm?	The existing fuel farm is located at the north end of the Airport, southwest of the intersection of S. Hardy St. and 15th Ave. S.	4
Holly Krejci/#3	---	Fuel Farm relocation process.	Following up on Greg's question, how might community be a part of the relocation process in advance of SEPA, NEPA?	Airport Staff, through its interaction with the Airport Roundtable, postings on the Airport's website, and community involvement presentations with various neighborhood associations surrounding the Airport, is able to disseminate information regarding upcoming projects at BFI. The site selection and ultimate design process for the Airport's new fuel storage facility is the type of project that would be coordinated with the various on- and off-Airport stakeholders.	4
Laura Wright/#2	---	Community impact of the MP Update.	What are you doing to make KCIA reflect the communities it is impacting the most? Are there any efforts to have some cultural or gender diversity in your group or to hire people from the Duwamish Valley for jobs that hold decision making power? There seems to be some serious equity problems with this presentation.	The King County HR department maintains a rigorous program and protocols to promote nondiscrimination and equal employment opportunities for both its Staff and the contractors that are selected to provide services for King County. These requirements include: • Nondiscrimination in Employment and Provision of Services	4

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				• Equal Employment Opportunity Efforts • Equal Benefits to Employees with Domestic Partners • Nondiscrimination in Subcontracting Practices • Compliance with all applicable federal, state and local laws, ordinances, executive orders and regulations that prohibit discrimination • Compliance with Section 504 of the Rehabilitation Act of 1973, as amended (Section 504) and the American with Disabilities Act of 1990 as amended (ADA) The Airport is also working upstream of the job pipeline to create substantial, meaningful opportunities to engage local youth. BFI partners with local high schools to host a day of activities called Discover U and partners with the Museum of Flight on Women Fly events. These events educate students on the wide variety of careers at an airport and sparks an interest in the broader aviation field. BFI also has a robust internship program that sponsors interns at all levels from high school, community college, university and graduate school. This program helps to reduce the barriers to entry for careers in aviation and the County.	
John Haynes/#4	NA	General.	Great job John and Team!	Comment noted.	4

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Warren Hendrickson/ #2	---	Typo on pg. F.4 of Chapter F.	Just a note as the draft documents are reviewed and finalized: Chapter F, on page F.4, discusses Runway 14R. However, in the "Dimensions" section of that page, this runway is labeled 14L. Just a minor typo to be aware of…	Comment noted. Correction will be reflected in Final Report. **See revised Chapter F text on pg. F.4.**	1

Refugee Women's Alliance

Comments and Responses: Refugee Women's Alliance - received 12/07/20

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#1 Henok/ student	1	Potential job creation.	NA	"I agree with all statements on the master plan . Especially I am excited after the end of the project it will create a job opportunities for the community. Hoping also it will create good opportunity for business for immigrant and refugees to open their business in the airport and outside the Airport".	Comments noted.	4
#2 Rodas/ Uber driver	1	Potential job creation and vehicular access improvements	---	"The expansion of this project will bring more job opportunities for the residants living around the airport as well as the cities in seattle and it's surrounding cities .It also strengthen the economy of the state. On the other hand there are things need to get in to consideration beside the expansion of the airport. Mainy the roads around the airport has limited access and should be upgadeded parallaley to this project "	Comments noted. Yes, several of the proposed airport development projects will require an analysis of the existing vehicular transportation system surrounding the Airport prior to the implementation of the project.	4
#3 Feyisa Wario/ Airport Employee Union Member	1	Potential job creation and environmental impacts.	---	"The project is huge and the most part looks great, specially the job that will be created during the construction and even after its completion will be awesome. When it comes to the environment, how friendly it will be?"	Comments noted. Yes, each of the projects identified in the MP Update must undergo a comprehensive environmental review process and obtain environmental approvals prior to construction.	4
#4 Tigist Biru/Former Airport Employee	1	Economic impacts/benefits to the surrounding community.	---	"I agree 100 % with the plan,but I am afraid how emigrants and refugees benifeted from the business will be created after the end of the project. Finnaly, I would like to sugest this project shouldn't affect the residents lifestyle and economy around the airport."	Comments noted.	4
#5 Yonas Mamo/ Airport Employee	1	Future noise impact considerations.	---	"I am happy to get a chance to review the master plan. It is good proposal and my only feed back is the plan has to consider noice distubance protection and keeping communities day to day activities."	Comments noted. Yes, each of the projects identified in the MP Update must undergo a comprehensive environmental review process (including a noise analysis) and obtain environmental	4

Comments and Responses: Refugee Women's Alliance - received 12/07/20

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					approvals prior to construction.	
#6 Abayneh Lema	1	Potential job creation.	---	"Thank you for giving me a chance to send my feedback. I am totally agree with the masterplan .please start it and let job opportunites expand for those affected by Covid-19."	Comments noted.	4
#7 Fathi Karshi/ Director of DEI	1	Future environmental impact considerations.	---	"This is mostly residential areas that is also historically populated by lower households. Though there seems to be benefit for those in Upper Beacon Hill residents (never mind the noise pollution generated by the expansion), one wonders what equity measures have been put in place to 1 : See to it that residents in this area A are not inequitably - displaced as did the population on Marine Drive, just behind SeaTac airport during the third way expansion? And secondly, How and what measures are in place not to destroy historical landmarks like the old firehouse building located around the proposed section A?"	Comments noted. Yes, each of the projects identified in the MP Update must undergo a comprehensive environmental review process (including a noise, social justice, and historical properties impact analysis) and obtain environmental approvals prior to construction.	4
#8 Mahdi Ali / IT Specialist	1	Potential community benefits of implementing the MP Update.	---	" The proposal, for me, generates more questions than answers. I hope this will benefit the community in a clearly visible way. For example, how would this project help refugee and immigrant communities? Would they benefit in terms of work/jobs while being considerate of language and technical difficulties?"	Comments noted. According to the King County International Airport Economic Impact Study, BFI's economic impact is more than $3.0 billion in terms of local business sales that support 18,600 jobs and generates $1.3 billion in labor income to King County. The Airport's 150 tenant businesses, which include the Boeing Company's various civilian and military aircraft Flight Test and Delivery Center operations, directly support 5,209 jobs in the local economy.	4
#9 Mona	2	COVID19 impacts on the	---	" I have seen the graphs and the numbers of the increasing needs and the predictions of increasing in flights, Now, is	The forecasts of aviation activity that were developed for the MP Update were prepared prior to the pandemic and were	4

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Adam / Nurse		MP Update aviation activity forecasts.		that after COVID19 ? if not, Would predictions stand when COVID19 is put in plan?"	not reflected in the projections. However, previous economic downturns (e.g., the financial crisis of 2008) and the associated slow economic recovery were integrated into the forecasts generated for the MP Update.	
#10 Yahya Al Garib / Iraqi Community Center	2	Potential job creation and career growth.	---	"When it comes to the plan it makes it seem like there might be more job openings, however, will the refugee and immigrants really benefit from those job openings? In other words, will those jobs be only for the experienced, and those with senior positions? What kind of jobs will there be available for our community members? Will they just be minimum paid jobs, or will there be opportunities with this airport in terms of career and not just jobs for our refugee and immigrant community?"	Comments noted. See response to comment #8 above. Given the variety of disciplines and technical skillsets required for many aviation-related occupations, the pay scale for these positions tend to be above average, but also offer a variety of entry points with opportunities to grow and advance within the companies.	4
#11 Alan Abdulkade/ Resident	2	Potential environmental impacts.	---	"The master plan is only planning about the airport however, I don't see any plan about the effect that the airport will have on the street, and the area around the airport and if there is an effect, is the planning process taking measures in regards to those effects?"	Comments noted. Yes, see response to comment #3 above.	4
#12 Mahdi Ali / IT Specialist	2	Potential community benefits of implementing the MP Update.	---	" It looks like a good project, hopefully it'll bring jobs and opportunities for our communities specially as we face economical hardship due to covid19"	Comments noted. See response to comment #8 above.	4
#13 Hamse	2	Potential community	---	"This is an amazing project, local airport is beneficial to the betterment of the whole local community in terms of jobs	Comments noted.	4

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Nepe Mohamed / Owner Nepe Truck Co.		benefits of implementing the MP Update.		and better opportunities, so it's definite first salute of approval from me. The future of our young community is in good hands with such projects"	See response to comment #8 above.	
#14 Mohamud Mohamed / International Aid worker	2	Potential community benefits of implementing the MP Update.	---	"It looks good but I wish it was for commercial flights as well, pre-covid19 I was travelling a lot for work and the SeaTac airport line is horrible."	Comments noted.	4
#15 Joseph Ngun Lian Cung / Secretary Seattle Chin Youth Organization	2	Potential safety concerns due to flight training and location of fuel storage facility. Also would like more job opportunities for neighboring immigrant poppulations.	---	"Seeking public opinion is an excellent way to start a big project like the Master Plan. Safety and the environment vital matter for the locals and communities. I think improvement and development is a good thing; however, dismissing safety isn't. Putting a new fuel farm storage is a great idea, but it should carefully be located far away from people and homes. According to the airport activity by type graph, the airport is mostly used for recreational/ training. The airport is not for training because many families live near the field, so the training number should be reduced in the future. The airport employed more than 18,600, however, in my opinion; they did not represent much of our local and communities. King County is a diverse community, and employees of King County International Airport-Boeing needs to be more diverse like King County."	Comments noted. The MP Update recommends the relocation of the Airport's existing fuel facility to be further separated from the adjacent residential land uses. Also, the FAA mandates strict safety protocols for flight instruction and the Airport Sponsor cannot limit or restrict the level of flight training activity that originates from BFI. Also, the King County HR department maintains a rigorous program and protocols to promote nondiscrimination and equal employment opportunities for both its Staff and the contractors that are selected to provide services for King County. Airport Staff also interacts with area schools and administers an Airport internship program that draws upon applicants from the area neighborhoods and jurisdictions in the vicinity of the Airport.	4
#16 No Uk Cung / Vice President	3	Potential community benefits of implementing	---	"Honestly, this is one of the best things we have in the Seattle area because some companies are moving to other places but KCIA is stable and stayed. And it has plans to extend places and businesses - Thank God! Younger people	Comments noted.	4

Comments and Responses: Refugee Women's Alliance - received 12/07/20

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Seattle Chin Baptist Church		the MP Update.		or next generations will have more opportunities and grow their lifestyle in the future. I totally agree with the KCIA Master Plan."		
#17 Sumyat Thu / Board Member North West Commuities of Burma	3	Options to seek additional community input on the MP Update.	---	"My first impression is that people from Burmese community who would be living near that airport would have more thoughts and feedback on the plan. So, it might be helpful to post it via the NWCB facebook and collect responses."	Comments noted.	4
#18 Zen K Ning / President of Innkuan of WA	3	Concern over BFI use by mostly economic elites.	---	"To be honest KC airport is not for our communities. it's mostly used by the millionaires and billionaires for their jet to land and take off. I'd prefer they spend taxpayers' money on SeaTac International Airport for the latest security system and faster screening with less traffic."	Comments noted. BFI is operated as an enterprise fund, so no local tax dollars are used to fund the airport. All the costs of operating the airport are paid for through user fees, user leases and federal grants from the FAA. BFI also serves a vital role in the movement and transfer of air cargo within the Seattle Metropolitan area and the final delivery of Boeing commercial service aircraft throughout the world.	4
#19 Merigieta Zeru / Church Leader Medhane Alem Eritrean Orthodox	3	Potential community benefits of implementing the MP Update.	---	"The more service provided, the more job opportunity and more activities that help for the progress of the people. I think this will increase the number of visitors to the city, so it means the visitors will use different services that can help as a source of income."	Comments noted.	4

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Tewahedo Church						
#20 Abraham / Former Director Eritrean Community	3	Potential community benefits of implementing the MP Update.	---	In general, it is good for us. It Is good to see the area is growing and developing."	Comments noted.	4
#21 Estifanos / Computer Science Student	3	Future noise and air quality impact considerations.	---	"Noise pollution in that area will increase; and it will impact the people who lives in that area. Air quality will be affected, and this will affect health and wellbeing of the community who lives in its surrounding. Generally, it could be better if there is a probability of moving to a suburb area like 20 to 30 miles away from the community area. KCIA can try to identify the population that can be affected by this project and arrange an assistance in psychological and behavioral treatment."	Comments noted. Yes, each of the projects identified in the MP Update must undergo a comprehensive environmental review process (including a noise and air quality analysis) and obtain environmental approvals prior to construction.	4
#22 Eyasu / Teacher Renton School District	3	Potential community benefits and environmental concerns of implementing the MP Update.	---	"It will create job opportunity, will increase the economy of the area, business transaction, transportation opportunity, hotels, restaurants, other companies, parking, it will affect the external businesses in that area both negatively and positively. Environmental degradation, natural ecosystem disturbance and loss of natural ecosystem balance. There will be noise and smell pollution that can affect the birds, insects and other living things. The impact to the water area nearby should be study. There could be oil leaks that might affect the neatness of the water bodies."	Comments noted. Yes, the economic impact of the Airport to the regional economy is significant (see response to comment # 8 above. Also, each of the projects identified in the MP Update must undergo a comprehensive environmental review process/impact analysis and obtain environmental approvals prior to construction.	4
#23 Fanus; A nurse at	4	Concern over property value impacts due to	---	"If KCIA are planning to buy extra space from the area, it will affect others who want to buy land, homes or business place from the same area. There might be buying power	Comments noted.	4

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CHI hospital		future property acquisition by the Airport.		imbalance.		
#24 Isaac	4	Future noise impact considerations to new property owners.	---	"Noise pollution is the biggest problem to the people who live in that area. Specially those who bought houses around that place. When they buy the house that environment might be quite area, but through time it is getting more unplanned noisy for the residents."	Comments noted. We concur that a projected increase in aircraft operations, as outlined in the Master Plan Update, would result in an increase in aircraft noise at KCIA, which was documented in the Environmental Overview chapter of the MP Update (see pgs. E.10-19). However, please note that King Co. completed a comprehensive noise study for KCIA in 2005 (i.e., an FAR Part 150 Noise Compatibility Program) that resulted in FAA approval and funding of several noise mitigation projects at KCIA. One of these key projects from the Program provided a voluntary multi-year sound attenuation program for single-family homes located in parts of the Georgetown, Beacon Hill and Tukwila/Allentown neighborhoods. This project, which was 95% federally funded by the FAA, provided $40 million for the sound insulation of just under 600 homes in these neighborhoods.	4
#25 Angesom	4	Potential community benefits of implementing the MP Update.	---	"To increase service is good on my side, Improvement is always essential. I am happy to hear the plan."	Comments noted.	4

Seattle City Light (SCL)

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#1	2	Availability of report graphics in Chapters D & F to assist with the review process.	---	All figures in Chapters D and F are missing, including, Fig. F-2 Airport Layout Plan Drawing. Meaningful public comment is not possible, especially in a highly technical area such as airport planning, without graphics. Part of the controlling documents for the Airport are the figures, not text documents, so the public cannot understand what the Airport is proposing, committing to, or being held to without complete diagrams. This Airport Master Plan process has been going on for at least 4 ½ years; it is unreasonable to skimp on the information to the public at the end of the process just to save a few weeks. The full document including all the figures should be provided and a completely new public comment period established.	We agree with your comment. A PDF version of these chapters was prepared with the intension of posting on the website. It appears that a pdf version of the word document for these two chapters (without the graphics) was inadvertently posted by mistake. Thank you for bringing this to our attention. These chapters, with the associated graphics, have been posted to the website and Airport Staff will provide two additional weeks for your review, if needed. We apologize for the oversite. Also, please note that the Airport Layout Plan Drawing, which is the same drawing as Fig. F2 in Chapter F, was also posted on the website under the Airport Layout Plan working draft document tab and has been available for review throughout the formal public comment period. **All of the Chapter D & F illustrations are included in the Revised Draft Report.**	1
#2	2	Building hatch color edits to existing off-airport are needed to the base drawing for several Inventory chapter graphics.	---	Figs. A 3,4,5, and 7 show the GTSP as an on-airport building, and p. A-58 describes the GTSP as being within BFI, while p. E-13 says the GTSP is "not located on Airport property." Please state clearly that the GTSP is immediately adjacent to, and is not, and has never been, on KCIA property.	Agree. The building hatch color for the Stream Plant and adjacent buildings will be changed on the base drawing to match the legend for off-airport buildings. **Each of the Chapter A illustrations have been updated as noted above (see Figures A2-A5, A7-A9, & A11-A19/pgs. A.7, A.9, A.14, A.16, A.22, A.25, A.27, A.33, A.36, A.38-39, A.42-43, A.57, A.60, & A.63)**	1
#3	2	Update all references to GTSP from Registered Historic Site to National	pg. A.58 & others	P. A-58 and numerous other locations in the various documents describe the GTSP as a Registered Historic Site. The GTSP should be described more accurately as a National Historic Landmark – a designation which indicates a much higher value as an historic resource, than one that is just registered.	Agree. All GTSP references will be updated National Historic Landmark. **See revised Chapter A text and Table A15 on pg. A.58.**	1

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		Historic Landmark.				
#4	3	Noise and land use evaluation	pg. xxxviii of the Executive Summary document	On p. xxxviii of the summary, the following item is listed: "Future RPZ Use Agreement: Runway 14R approach RPZ – 1.3 acres" What does this mean? Does this mean that KCIA is seeking a use agreement for 1.3 acres in the (alleged) RPZ? Where? With whom? Under what terms?	KCIA is seeking to negotiate an off-airport RPZ land use compatibility agreement with Seattle City Light that is consistent with FAA guidelines for RPZ land use compatibility.	4
#5	3	Off-airport RPZ control options.	pg. C.37	P. C-37 includes: "Further consideration will be given to the options the Airport has in regard to achieving full control of all RPZ's." What are those options? Do they include condemnation? If so, please make clear whether, in the County's view, this would also include the ability for King County to condemn city property.	Text will be edited to add reference to the various options that Airport Sponsors have to provide or promote land use compatibility with RPZs. These can include property acquisition, RPZ easement acquisition, and negotiated RPZ land use agreements. KCIA has no intension to pursue any land acquisition projects identified in the Master Plan Update using condemnation. **See updated Chapter C text on pg. C.37.**	1
#6	3	Runway 14R/32L Alternative One: Uncontrolled RPZ acquisition options	pg. D.19	P. D-19 includes: "GTSP property @1.9 acres…approximately 1.9 acres to the north…is recommended for future RPZ easement or property acquisition to provide King County with land use controls." Please indicate which specific properties are recommended for which means of providing KCIA "with land use controls."	The location of the 1.9 acres of uncontrolled RPZ is identified on Figure D2/pg. D.16. This alternative presents two potential options for acquiring future control of this off-airport RPZ property. These include fee simple property acquisition or RPZ easement acquisition. Neither option is recommended in this section of the chapter.	4
#7	3	Location of recommended RPZ property acquisition at north end of Runway 14R/32L	pg. D.69	On p. D-69, the CDP summary says "RW 14R RPZ – 1.0 acres (To be acquired)". Which 1.0 acres? Acquired by what means?	The location of the uncontrolled RW 14R RPZ properties recommended for fee simple acquisition are identified on Figure D32/pg. D.72 and Figure F2/pg. F.3. There is no Seattle City Light property identified for acquisition in the Master Plan Update.	4
#8	3	Airfield access	pg. E.8	On p. E-8, it states: "the 300 foot- Runway 14R extension … would change access."	Relocation of the Runway 14R threshold will require	1

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		change		For what facility or entity would access be changed? How?	extension of the parallel taxiways (i.e., TW A and TW B) to serve the new runway threshold location. Text will be edited to clarify the proposed taxiway access change. **See updated Chapter E text on pg. E.8.**	
#9	3	Text typo	pg. xxxv of the Executive Summary document	On p. xxxv of the summary, there is the following item: "Runway Protection Zones (RPZs). The size of both approach and departure RPZ's for Runway 14L are to be maintained at 1,000 feet x 1,510 feet x 1,700 feet and…" We believe this should read "14R", not "14L".	Agree. Text will be revised as suggested. **See updated Executive Summary text on pg. xxxv.**	1
#10	3	Clarification of Table D11 text is needed.	pg. D.57	On p. D-57, for Alternative One, the chart states "no change" in RPZ. However, RPZ Easement/Property Acquisition line in the chart shows "significant change". This is just one example of the confusion in the documents about whether the RPZ in Alternatives One, Two and Four is the existing condition, or in fact a change in the baseline which is the approved 2004 AMP. In any event, there is an inconsistency within this chart.	The existing "(No Change)" entry for the RPZ component is correct. In addition, we propose that our assessment of the noted "significant" impacts of the RPZ Easement/Property Acquisition component for each alternative is correct given the potential acquisition cost of the property.	4
#11	3	Text typo	pg. D.59	On the chart on p. D-59, Environmental issues should read "possible incompatible land use/NHRP property"	Disagree. Steam Plant property is located within both the existing and proposed Runway 14R RPZ.	2
#12	3	Text typo	pg. F.4	On p. F-4, we believe that the Runway Protection Zones section is meant to apply to 14R, not 14L	Agree. Text will be revised as suggested. **See updated Chapter F text on pg. F.4.**	1
#13	4	Background info on steam plant ownership/operation	---	Page 109 of the 2004 AMP EIS includes this reference: "The steam plant was inactivated in 1977. It is currently owned by Seattle City Light and managed by the Georgetown Powerplant Museum as a museum and educational facility, with a broad variety of uses. It is used regularly for tours and training classes in boiler operations and related topics." This is accurate and we appreciate KCIA's recognition that museum activities are a long-standing feature of City	Comment noted.	4

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				Light's use of the GTSP.		
#14	4	Info on Airport Height Overly District	pg. A.40	P. A-40 describes that the City of Seattle's Airport Height Overly District "shall not restrict heights in Transition Areas to less than 37 feet (37')". This is accurate. However, the document should further educate the reader that this is the only applicable height regulation in that area for non-airport property.	Comment noted. Additional explanatory text on the application of the height restrictions specified by the Airport Height Overlay District is already provided on pg. A.40. In addition, the GTSP structure is identified as an existing Part 77 obstruction to the Runway 14R approach surface (with existing obstruction light), which is documented on Figure F3 of the *Airport Plans* chapter and Sheet #4 of the draft Airport Layout Plan Drawing Set.	4
#15	4 & 5	Question regarding change of the existing Runway 14R RPZ dimensions since the 2004 MP Update.	---	The 2004 adopted Airport Master Plan is helpfully provided in the project website. Table C-2 of that document specifies that the dimensions of the13R RPZ are 500 ft X1700 ft X1,010 ft (13R was, of course, the old designation of the runway now called 14R). Diagrams in the 2004 AMP also show that this RPZ does not include any part of City Light's property around the GTSP. A multitude of documents included in the present Master Plan Update website show that something has changed. The "existing" 14R approach RPZ is described as 1,000 ft X1,510 ft X 1,700 ft. Dozens of text and diagrammatic references show that this RPZ now overlaps a good portion of City Light's GTSP property. But the documents are not completely consistent in this view. For instance, on p. D-27, the "existing" ¾ mile, 1,000/1,510/1,700 RPZ is mentioned as possibly requiring an EA and Section 106 consultation. On p. D-28, Alternative One's disadvantages for the "existing" ¾ mile visibility and RPZ are indicated as requiring additional planning as well as the preparation of an Environmental Assessment and a Section 106 consultation. If the "existing" RPZ had been appropriately approved and established, why would these additional	You are correct in noting that something has changed regarding the dimensions of the Runway 14R RPZ dimensions since the publication of the 2004 Airport Master Plan. The required dimensions of the RPZ are dictated by the existing visibility minimums that are provided by the individual runway ends (e.g., a visual approach vs. various instrument approaches). Instrument approaches that offer lower visibility minimums specify increasingly larger RPZ sizes. The 2004 Airport Master Plan documented the existing and future approach visibility minimums for Runway 14R at 1-mile, which specified an approach RPZ dimension of 500' x 1,010' x 1,700'. During the early stage preparation of this MP Update, it was determined that some of the Runway 14R instrument approach procedures had been upgraded to provide ¾-mile visibility minimums, which require the slightly larger RPZ dimensions (i.e., 1,000' x 1,510' x 1,700'). This improved instrument approach capability was made possible due to criteria changes within FAA's Terminal Instrument Procedures order but was implemented without knowledge to both BFI Staff and FAA Airport District Office Staff.	4

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				planning/regulatory/consultation steps be necessary? One is drawn to infer that the "existing" RPZ is not, in fact, properly established or approved and is in fact not the existing baseline at all. The statement on p. D-5 provides some helpful information: "It has been confirmed through this planning process that the previous review of these non-standard conditions, which were documented in previous planning documents (i.e., the 2004 NEPA ENVIRONMENTAL ASSESSMENT/SEPA ENVIRONMENTAL IMPACT STATEMENT FOR PROPOSED MASTER PLAN IMPROVEMENTSAT BFI and the 2006 MODIFICATION OF STANDARDS ALTERNATIVE ANALYSIS document for BFI) and recorded as Modification of Standards (MOS) on the approved 2007 Airport Layout Plan Drawing Set were never "officially" approved by FAA." Supposedly the creation of an expanded RPZ is documented in these documents. The 2004 NEPA EA/ SEPA EIS is provided on the project website but no mention is made there (nor in the adopted 2004 AMP) of an expanded RPZ. One is left to conclude that the 2006 MOS Alternative Analysis and the approved 2007 Airport Layout Plan Drawing set document this RPZ expansion, but that is not clear because they are not provided on the project website. Please provide these documents on your website (and allow for an extended public comment period once the complete documents are provided.) Please state clearly if KCIA is relying on these documents to establish that the RPZ shown as "existing" in this Update was properly approved by FAA. If that is KCIA's contention, please explain why your document on p. D-5 states that the 2006 MOS and 2007 ALP drawing set were "never 'officially' approved by FAA." Please provide the NEPA, SEPA, and Section 106	Typically, the implementation of a new instrument approach requires environmental clearance documentation. This process was not completed for the implementation of the Runway 14R improved instrument approach and resulting RPZ enlargement at BFI. For the purposes of this MP Update, it was determined appropriate to recognize the larger RPZ, dimensioned at 1,000' x 1,510' x 1,700', as the current "existing" RPZ (consistent with the existing instrument approach visibility minimums). However, the continued need for the previously required environmental clearance documentation (e.g., Environmental Assessment and Section 106 consultation) has been documented and will be completed as a separate stand-alone planning project. It should also be noted the statement on pg. D.5 in the comment is in reference to a section of the MP Update (see pgs. D.4-D.11) that summarizes the existing non-standard runway and taxiway design conditions that currently exist at the Airport. It was thought that modification of standards had been approved by the FAA for several of these that were previously identified on the Airport Layout Plan, but that was confirmed to not be the case. Therefore, each of these previous non-standard conditions, along with others that include the Runway 14R land use compatibility issue, have been documented in this MP Update for FAA review.	

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				documentation that shows that proper environmental compliance was done by KCIA and FAA for any asserted expansion of the RPZ subsequent to 2004.		
#16	5	Question regarding existing Runway 14R RPZ designation & environmental clearance requirements	---	A reference on p. D-25 states: "The encroachment of the Runway 14R approach RPZ onto adjacent property associated with the Georgetown Steam Plant (a structure listed on the National Register of Historic Properties) is a result of the existing ¾ mile visibility minimums…Due to the fact the existing 2007 Airport Layout Plan (ALP) identifies only 1 mile visibility minimums for the existing and future Runway 14R IAPs, additional environmental coordination and documentation would be required to consider the various environmental impact categories…to support the larger Runway 14R approach requirements." This also states that the 2007 ALP is the "existing" plan, which is problematic. It also leaves a little more confusion of whether the 2007 ALP has a 1-mile visibility requirement (small RPZ) or a ¾ mile visibility requirement (bigger RPZ.) It does indicate that there are presently unperformed environmental coordination and documentation requirements that are necessary to establish the larger RPZ. This reinforces our inferences drawn from pp. D-27 & 28. There is a reference on p. E-9 to the "the FAA approved Airport Layout Plan (King County 2012)." What is this document? Is it the 2007 ALP? If so, why is it described as "approved" when on p. D-5 it is described never having been "officially" approved by FAA. What is the King County 2012 reference? Given all the above, including KCIA's statement on p. D-5, please explain how KCIA can assert that the 1,000/1,510/1,700 RPZ can be viewed as the "existing" RPZ.	We agree with your comment: "the existing 2007 Airport Layout Plan (ALP) identifies only 1 mile visibility minimums for the existing and future Runway 14R IAPs, additional environmental coordination and documentation would be required to consider the various environmental impact categories…to support the larger Runway 14R RPZ requirements." See additional information in the Response to Comment #15. The reference on pg. E.9 to the "the FAA approved Airport Layout Plan (King County 2012) is a typo and will be edited to (King County 2007).	4
#17	6	Existing	---	It is clear that the existing RPZ and the true baseline, is in	Comments noted. The rationale for designation of the larger	4

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		Runway 14R RPZ designation		fact the 500 ft X1700 ft X1,010 ft RPZ adopted as part of the 2004 AMP. The Master Plan Update documents should be revised to reflect that and all necessary SEPA, NEPA and Section 106 compliance must be done before considering any expansion of this RPZ. The impacts of any RPZ expansion should be measured against the adopted 2004 AMP RPZ. On a related note, references on pp. E-8 &9 state that "one NHRP-registered historic site, the Georgetown Steam Plant is potentially impacted by the 300 foot- Runway 14R extension, which would reposition the Runway 14R RPZ to encompass less of the Steam Plant property than under existing conditions." Given the conclusion above, the 300 foot 14R extension (if done in conjunction with a ¾ mile visibility requirement) would also impact the GTSP property more than the true 2004 baseline.	Runway 14R RPZ, dimensioned at 1,000' x 1,510' x 1,700', as the current "existing" RPZ was presented in the Response to Comment #15. In addition, environmental clearance documentation (e.g., Environmental Assessment and Section 106 consultation) have been identified as being needed for both the previous RPZ enlargement and the future repositioning of the existing RPZ associated with the proposed Runway 14R threshold relocation project.	
#18	6 & 7	Confusion regarding reference to future studies, agency coordination, and regulatory compliance remediation.	---	There are many references in the documents to additional studies and similar activities that are needed: "To facilitate the MOS preparation effort, a supplemental planning study will be undertaken to further define the long-term improvement/resolution options (beyond the 20-year planning period of the Master Plan Update) for the Airport's existing nonstandard design conditions." p. D-6 □ "Potential Compliance/Mitigation Options o …undertake the required environmental documentation to address the location of the Georgetown Steam Plant within the Runway 14R approach RPZ." p. D-7 "…application of FAA's Interim Guidance on Land Uses within a Runway Protection Zone could require additional environmental review and documentation to assess the land use compatibility of the Steam Plant" p. D-9 "may require additional environmental documentation and approvals to support and retain the ¾ mile visibility minimums." p. D-18 "Subsequent to the preparation of this draft chapter, the decision was made to retain the existing	We agree with your comment that the MP Update makes reference to several additional studies that must be undertaken to address the variety of existing non-standard conditions that were discovered during the planning process. To help summarize this list we will make reference to the project list (see Tables G2, G3, and G4) identified in Chapter G/Financial Implementation Plan. 1) The first project of interest is the required environmental clearance documentation (e.g., Environmental Assessment and Section 106 consultation) that is required for the larger (1,000' x 1,510' x 1,700' Runway 14R RPZ. Since this type of environmental study is typically prepared internally by the FAA, it was not included in the Airport's Capital Improvement Plan (CIP) project list, but is documented throughout the MP Update.	4

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				IAP visibility minimums and address the existing RPZ land use compatibility issues in a supplemental study to the Master Plan Update." p. D-9 footnote "Hot Spot #1. A new EA may be required to change the PPRP designation." p. D-12 "Subsequent to the preparation of this draft chapter during the MP update, the FAA elected to address the land use compatibility guidance from the Interim Guidance on Land Uses within a Runway Protection Zone in a separate follow up study to the MP Update." p. D-18 footnote 5. There are two problems with these statements. The first is that they are mostly unclear about the nature of the action that is being recommended. Are these supposed to be Section 106 consultations? NEPA EA's? SEPA analysis? When they refer to "studies" what is being proposed to be studied? Also, in what way can these actions resolve the incompatibility of a use on non-airport property which KCIA is seeking to include in an expansion of the RPZ? IS KCIA considering attempting to restrict City Light's property rights? The second problem is the implication that all these activities should be done after this AMP is adopted by the County and the ALP is approved by the FAA. If this is correct, then it leaves questions about mitigation and resolution of these potential impacts until after the main decisions are made. This is not the correct approach to SEPA and NEPA. Full environmental compliance (including SEPA and NEPA) should be done before the AMP and ALP are recommended for adoption or approval. If the AMP and ALP are considered programmatic decisions rather than project decisions, then SEPA and NEPA compliance (and Section 106 compliance and noise compliance) should be done on the programmatic decisions. And as we commented above, mitigation and resolution of impacts from past KCIA	2) Year 2020/Project A.2: Prepare request and submittal for update of existing ATC Operational Waiver to address non-standard centerline separation distance between existing parallel runway configuration. 3) Year 2021/Project A.1: Prepare consolidated EA or EIS for various Phase I projects: acquire property (multiple parcels), relocate/construct new fuel storage facility, and implement pavement maintenance/ reconstruction 4) Year 2021/Project A.2: Prepare request and submittal for modification of standards to address multiple existing non-standard conditions: 1) Runway 14R/32L OFA, 2) Runway 14R/32L to Taxiway A centerline separation, and 3) Runway 14R/32L to Taxiway B centerline separation 5) Year 2023/Project A.9: Prepare consolidated EA or EIS for various Phase II projects: 300-foot runway/TW A/TW B extension north; RW 14R approach RPZ property acquisition (multiple parcels); ALS and various other lighting relocation/upgrades; removal of future RW 14R VGAS obstruction, construct new airport maintenance facilities, and implement pavement maintenance/reconstruction (This project would also likely include the land use compatibility guidance from the Interim Guidance on Land Uses within a Runway Protection Zone 6) Year 2024/Project A.4: Prepare OAP and remove	

Comments and Responses: Seattle City Light (SCL) - received 12/01/20

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				actions should be completed before a decision is made to create any new impacts from further Airport expansion.	future obstruction to Runway 14R VGAS surface (i.e., one tree) 7) Phase II//Project B.5: Prepare ATCT Siting Study for relocation of existing ATCT 8) Phase II//Project B.8: Prepare consolidated EA for various Phase II and Phase III projects: construct new southwest cargo development area, property acquisition for Runway 14R Departure RPZ, and implement pavement maintenance/reconstruction 9) Phase III//Project C.9: Prepare consolidated EA for various Phase III projects: install Runway 32L ALSF-1, removal of future RW 32L obstructions (OFZ), and implement pavement maintenance/reconstruction Regarding the comment that "Full environmental compliance (including SEPA and NEPA) should be done before the AMP and ALP are recommended for adoption or approval." We concur that the environmental processing of the improved visibility minimums for the Runway 14R instrument approach procedures does still need to be prepared by the FAA. Also, keep in mind that FAA's approval of the ALP is conditional, meaning that, among other things, no projects are environmentally cleared through the ALP approval process. Each project will require its own environmental analysis and clearance prior to implementation.	
#19	7	On-going coordination between King County and	---	Also, on p. E-8 indicates that "It is recommended that BFI and King County continue to coordinate with Steam Plant representatives about the compatibility of the Steam Plant within the RPZ." What does this mean? City Light has been	King County and Steam Plant representatives will continue to negotiate on the final details of the proposed new access road and the terms of a future RPZ use agreement.	4

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		Steam Plant representatives about the compatibility of the Steam Plant within the RPZ		negotiating with KCIA about the Airport's impacts on GTSP for 19 years now with no final resolution in sight. Please explain the basis for the assumption that continued coordination will resolve issues arising from further RPZ expansion.		
#20	---	Comments on adherence to stated assumptions and goals in the MP Update.	---	There are several references to Assumptions and Goals in the documents: "Assumption Four. The fourth assumption is to encourage the protection of existing public and private investment in land and facilities and advocate the resolution of any potential land use conflicts, both on and off airport property." [p. xxxiv] "Goal 6: Communications and Community Partnerships Neighborhood & community. Act as a partner to neighboring residents, businesses and organizations." [p. A-3, pp. D-3 &4.] We comment that KCIA's actions have not been consistent with this Assumption and this Goal.	Comment noted. Given the existing site constraints of both the Airport and the surrounding environs, all of the Airport Stakeholders (e.g., King Co., neighboring residents, businesses and organizations) must continually work to mitigate potential land use conflicts and maintain ongoing communication efforts.	4
#21	7 & 8	Additional info requested on the relationship of IFR minimums and IFR accessibility to the Airport.	---	On p. D-28 it states that Alternative One provides the opportunity to increase IFR access capability to Airport by 8.8 hours annually if the existing Runway 14R ILS can receive environmental clearance for the ¾ mile visibility minimum approach procedures. Please state the baseline against which this 8.8 hour increase due to an expanded RPZ is measured. In other words, a 1-mile visibility gives X hours/year of runway use. A ¾ mile visibility requirement would give X + 8.8 hours of use. What is "X"? The Airport's general value to the local economy is clear, but please describe the incremental benefit to the economy of this additional 8.8 annual hours of operation in terms of jobs, $ of economic activity, $ of taxes	An instrument approach to a runway is defined by two weather variables: cloud ceiling and visibility. At the onset of the MP Update, the existing ¾-mile visibility approach to Runway 14R was provided by an RNAV GPS approach that offered a 703-foot ceiling minimum. Based upon 10 years of weather data, this combination of IFR minimums were available on average at BFI 3.6% of the time annually, which equates to 13.1 days of the year. At that same time, the existing Runway 14R ILS approach provided ceiling and visibility minimums of 273 feet and 1 mile, which were available 6.2% of the time annually or 22.6 days of the year. In 2017, the Runway 14R ILS approach minimums were	4

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				generated, etc. We are assuming that KCIA must view these incremental benefits as substantial since they are driving a preference to expand the RPZ despite the well-documented land use incompatibility problems that flow from that preference.	updated to a 290 feet ceiling and ¾-mile visibility and the ceiling was again increased in 2019 to 308 feet, due to revisions in the FAA's Terminal Instrument Procedures order and the updated obstacle data set. These updated minimums resulted in a decrease in the annual availability of the Runway 14 ILS approach from the original 6.2% (i.e., 22.6 days) to 6.0% (i.e., 21.8 days), a reduction of 19.2 hours annually. If the Runway 14 ILS approach visibility minimums were now raised to 1 mile, the annual availability of the procedure could be reduced to 5.8%, resulting in a potential reduction of 17.5 hours annually. The text on pg. D.28, referencing 8.8 hours, will be updated to 17.5 hours to reflect the revisions to the ILS minimums that occurred in both 2017 and 2019. The operational availability of an airport is extremely important to commercial operators that provide scheduled services. This is particularly true of the existing UPS cargo operation at BFI. The future environmental clearance documentation that will be required to review the instrument approach upgrade (e.g., Environmental Assessment and Section 106 consultation) will likely include a detailed assessment of the cost/benefit of the improved minimums to the existing air cargo operation, including documentation of the additional information that has been requested in your comment.	
#22	8	General comments on future noise analysis and on-going settlement negotiations.	---	The power point slide on Part 150 noise compares 2008 noise model results and 2018 noise model results. The proper baseline for noise impact analysis of the alternatives are that of the most recent data, not those of 12 years ago. There are several references to the noise impact on the GTSP from PPRP conversion/runway extension (p. D-48, D-60, and E-8.) We remind KCIA that City Light has offered KCIA an avigation easement that would cover noise from normal operations of aircraft, subject to resolution of	Comment noted regarding reference to the previous Part 150 noise contour. The power point slide reference to the 2008 noise contours was included for reference only to demonstrate the current reduction in the noise contours compared to the previous noise study. It is recognized that any future noise evaluation, as a component of an environmental clearance document, would include the generation of current year baseline contours, comparison to	4

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				all other terms of a final access settlement. But since KCIA has not agreed to such a final settlement, then all legal requirements for noise analysis and mitigation need to be met prior to any decision to extend the runway and convert the PPRP.	future noise contours, and identify potential noise impacts "with" and "without" the proposed development project.	
#23	email	Chapter D mapping edit	---	On Fig. D4 (p. D.20) , Fig. D5 (p. D.21) and Fig. D13 (p. D.34), there is a blue building shown immediately to the NW of the Georgetown Steam Plant, partly in the RPZ for that particular alternative. However it is not shown in the many other figures. Is it meant to signify a new building, or is it inadvertently included in these three figures?	That blue building represents the previous future location for the SRE building. Due to the proposed runway threshold shift and RPZ enlargement, it was removed from all of the other illustrations in the chapter and should have been removed from these Alternative One illustrations. This building will be deleted from the drawings for the Final Report. **See updated Chapter D illustrations: Figure D4/pg. D.20, Figure D5/pg. D.21, & Figure D13/pg. D.34.**	1
#24	email	Additional info requested on the relationship of IFR minimums and IFR accessibility to the Airport.	---	I would like to ask for one more clarification within the comment period window, even though it does not relate to any of the figures in Chapters D & F. Can you try to explain it to me one more time about the Airport's operational availability. You state that "If the Runway 14 ILS approach visibility minimums were now raised to 1 mile, the annual availability of the procedure could be reduced to 5.8%...". It seems obvious that the overall availability of the runway for operations would be much greater than that – 100's of days. It seems as though its availability would be the sum of its availability under ILS plus its availability from much better weather conditions for much of the average year. I must be missing something. Could the Runway 14 total availability (Instrument and non-instrument[??]) with ¾ mile visibility =A, be compared to the Runway 14 total availability (Instrument and non-instrument[??]) with 1 mile visibility =B? I get it that A will be greater than B (evidently by 17.5 hours in an average year). But what is A on an absolute	Visual Flight Rules (VFR) conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level and the visibility is at least three statute miles. These conditions occur at BFI approximately 91.7 percent of the time annually, which equates to approximately 335 days/year. The weather parameters and percentages described in the response to comment #21 above are only related to Instrument Flight Rule (IFR) conditions (i.e., the various weather conditions below the VFR parameters). The total operational availability of a runway on annual basis, based upon weather, is represented by the combination of VFR conditions plus the percentage of IFR weather access that is provided by the instrument approach procedure.	

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				scale?		

The Boeing Company

Comments and Responses: The Boeing Company - received 11/30/20

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#1	1	Potential impact of future Runway 14R RPZ on stall A6.	---	The North RPZ no longer affects the Boeing large aircraft stall, A6, as it did in prior reiterations. Boeing would like to verify this does not change as this project progresses and into construction.	Comments noted. Yes, the future RW 14R RPZ will be repositioned off of the existing A6 stall, but the stall could still be potentially impacted by the aircraft parking limit line, which measures 500 feet from the RW 14R/332L centerline.	4
#2	1	Future taxiway access by wide body aircraft to future RW 14R departure threshold.	---	Since the removal of the B1 access ramp is in the plan, verification by an outside firm will be needed to determine if the proposed north access ramp will allow our wide body aircraft (767, 777-x) to make the required turns to access runway R14. Boeing would like the opportunity to review the dimensioned Construction Documents and the associated construction schedule for this project to determine the impacts, if any, to our production capacities. If reconfiguration of our existing stalls, B15 and B16, is imminent, then Boeing and KCIA will need to discuss how this will affect our business.	Comments noted. Yes, confirmation of taxiway access by Boeing's wide body aircraft to the future RW 14R departure threshold will be verified during the design/engineering phase of the project.	4
#3	1	Direct taxiway access to the Runway 32L threshold from the MDC apron.	---	The B10 rolling gate entrance at the MDC is no longer an issue in this Master Plan.	FAA's review of the Airport Layout Plan Drawing Set for the MP Update did not include any comments on the existing direct taxiway access from the MDC apron to the runway using the TW B10 connector. However, the existing taxiway access restrictions, to and from the MDC apron, will need to be included in a finalized "Through-the-Fence" access agreement with BFI Staff.	4
#4	1	Future purchase and development of the Jorgensen Forge property.	---	The future intentions of King County purchasing the Jorgensen Forge property and constructing a fuel farm and new FAA control tower, may affect the Boeing Thompson site, which is directly south of the Jorgensen site, along with the Plant 2 site located to the north. Boeing's concerns are around the demo and construction of these proposed projects regarding possible vibrations and demolition dust for both the Thompson P8 assembly site and the Plant 2 laboratories located to the north. We have additional	Comments noted.	4

Comments and Responses: The Boeing Company - received 11/30/20

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				concerns around possible electronic interference from Boeing, and to Boeing, if a new FAA control tower is constructed nearby. Boeing would like to be kept informed on the status of the intent of this property if purchased by King County.		
#5	1	Future construction of new airplane stalls on Lot 12.	---	The construction of additional airplane stalls on Lot 12 is currently in Boeing's Capital Plan. If the control tower relocates, we assume the ARFF station will relocate with it. If this holds true, Boeing may alter our existing plans for the Lot 12 build. Boeing would like a better idea of which out years this relocation could occur so educated decisions can be made on our future projects.	Comments noted. The potential relocation of the ATCT has been identified as Phase II project (i.e., the 6 to 10-year timeframe) in the MP Update. Also, there are no current plans to relocate the existing ARFF facility, as they have a very strict response time requirements per the FAA and need to be as close to the center of the main runway as possible.	4
#6	1 & 2	West side airport service road reconstruction.	---	The West Service Road may be reconstructed and could lessen Boeing's ability to use certain airplane stalls (Lot 12). The project may also include the relocation of the Boeing Pump Station for the mitigation of the Object Free Area of Taxiway B. Boeing would like to be included in discussions and design reviews, if this project moves forward.	Comments noted. The Airport has a project on the books in 2023 timeframe to look at the impacts of the FAA's new Airport Design Advisory Circular (Draft AC 150/5300-13B, Airport Design) that is currently being reviewed. Based upon the initial review of the draft, it appears that some of the current taxiway OFA impacts my no longer be an issue if the revised criteria is published as presented.	4
#7	2	BFI operational impacts during reconstruction of Runway 14R/32L.	---	The main runway repaving project could interfere with Boeing's ability to conduct flight tests and to deliver aircraft during the construction period. Boeing would like to be closely involved in the project approach, phasing and construction scheduling to ensure Boeing's business is not adversely affected.	Comments noted.	4
#8	2	Stormwater management of airport property during	---	Due to the large list of KCIA Master Plan projects, Boeing is anxious with how KCIA plans on protecting our existing stormwater systems during all construction phases. Boeing would like to be kept current on any groundwater/stormwater plans being considered.	Comments noted.	4

Comments and Responses: The Boeing Company - received 11/30/20

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		construction of MP projects.				

Washington Seaplane Pilots Association

Comments and Responses: Washington Seaplane Pilots Association - received 12/16/20

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#1	1	Concern regarding planned loss of small GA aircraft storage facilities (i.e., both tiedowns and T-hangars).	---	As it is currently slated, the Master Plan for KBFI will remove over 75 tie-down spots and hangar spaces in the southwest corner next to the Museum of Flight, in addition to the removal of tie-down spaces at the northeast corner. The deleterious impact this will have on general aviation operations at KBFI is impossible to overstate. There is already a critical shortage of aircraft parking in the Seattle area. KBFI is the closest airport to downtown Seattle. Currently, it is extremely difficult to obtain a parking spot for an aircraft at any airport within an hour drive of downtown Seattle. By removing over 75 parking spaces and reducing the footprint of space available to general aviation operators, King County Airport management will exacerbate the already critical state of aircraft parking and will likely price most light aircraft owners out of the Seattle area.	Comments noted. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. The future development boundary for this site will maintain the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix*, including revised Figure ES1/pg. *xliii*.** Please note the decision to redevelop this area of the Airport was introduced in the previous Master Plan, with the planned removal of the three T-hangars and the acquisition of the adjacent Woods Meadow property being reflected on the current 2007 Airport Layout Plan. Airport Staff's initial recommendation to propose the new Southwest Air Cargo Area in this MP Update originally included a provision for the development of a new North General Aviation Aircraft Storage Area to accommodate the relocation of displaced based aircraft. Schematic layouts for these new GA facilities were presented in the draft Working Paper Three document and meeting notes on this topic are presented on the MP Update website, under the tabs: Master Plan Update – Meeting 3 Summary and Master Plan Update – Meeting 4 Summary. FAA's ultimate decision to no longer support the Threshold Crossing Height (TCH) waiver on Runway 14R	1

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					landings for large aircraft required the 300-foot relocation to the north of the Runway 14R threshold, and thus eliminated the potential development of a new GA aircraft storage area at the north end of the Airport.	
#2	1	Potential relationship between the aviation activity forecasts and the MP Update recommendations to relocate GA aircraft storage facilities.	---	KBFI's own forecast shows a dramatic reduction in the number of light general aircraft operations at Boeing Field. This stands in contrast to the FAA's expected increase in nationwide light GA operations, indicating that the Master Plan's authors are aware that the proposed changes at the airport will essentially shut light GA operations out from the airport. The larger number of turbine aircraft will also come with a much larger noise footprint than the light general aviation aircraft that currently use the airport.	Comments noted. Regarding a growth plan for GA at BFI, the decline in GA operations at BFI was steady between 2000 and 2015, with average annual reductions of 4.9% for itinerant GA and 7.1% for local GA ops. 2015 was the base year of the forecasts for the MPU and GA ops later recorded recent year lows in 2016. The GA operations forecast for the MPU reflect a projected growth in the Business/Corporate and Air Taxi sectors with a corresponding decrease in recreational/training activity. However, even though fewer small GA aircraft operations have been recorded at BFI in recent years, the Airport still maintains a high based aircraft occupancy rate for both T-hangars and apron tiedowns. In addition, the BFI aviation activity forecasts for the MP Update were prepared early in planning process, prior to the formulation and selection of the development area alternatives, and prior to FAA's determination on the required runway threshold shift, which impacted both the proposed new north GA development area and the existing northeast tiedown apron.	4
#3	2	Proposed redevelopment of the existing Southwest General Aviation Area with future Air Cargo	---	The effects of this will be felt across the community, not just amongst airport owners or the companies who service those aircraft. As general aviation dies in the Seattle area, children will no longer get aircraft rides, locals will not be able take plane tours, and city dwellers will have no place to take flight lessons. As has been proven time and time again in other cities, an	Comments noted. As noted in the response to comment #1, the existing/future development boundary for the southwest GA area will maintain the existing twelve apron tiedowns located north of the Museum of Flight (MOF), which are positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement. So, an existing small general	1

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		facilities.		airport which is disconnected from the local community loses the local community's support. The overwhelming majority of community members in the City of Seattle will never be able to afford to charter a private jet, but nearly all community members can sign up for an air tour; take their child to a Young Eagles, Civil Air Patrol, or Red Tail Hawks event; or volunteer to help with general aviation-supported disaster relief. Shutting general aviation operations out form KBFI will separate the airport from the local community.	aviation development area will be maintained directly adjacent to the MOF facility (the existing dedicated tiedowns for itinerant aircraft will be maintained), which would allow the MOF to maintain its current aviation-related educational programs (e.g., first flights) with King County youth. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix*, including revised Figure ES1/pg. *xliii*.**	
#4	2	Proposed redevelopment of the existing Southwest General Aviation Area would impact existing dedicated GA tiedowns for museum visitors and special events.	---	In addition, there is space provided for access to guests of the Museum of Flight in the southwest corner of the airport. This provides space for three or four itinerate aircraft which are typically used for visitors to the Museum to access GA aircraft for rides or visits. This too is an important connection with the community to encourage support of the airport. We also request that KBFI modify the master plan to preserve these spaces for the Museum of Flight.	Comments noted. See response to Comment #3 above.	4
#5	2	Data request on existing/future light GA aircraft parking positions.	---	Furthermore, we would appreciate in your response to this letter a summary of the current number of GA Light Aircraft parking spaces today and what the expected number will be when the Master Plan is fully implemented.	The MP Update documented baseline count of 159 tiedowns spaces for based aircraft and 101 spaces for itinerant aircraft. The percentage of light aircraft parking spaces was tabulated, but it's projected that the majority of the spaces for based aircraft are sized for light aircraft parking. Since Airport Staff will be looking for other locations on the Airport to relocate existing tiedown positions, a future count can not be estimated at this time.	4

Comments and Responses: Washington Seaplane Pilots Association - received 12/16/20

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Washington Pilots Association

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#1	1	Recommended Runway 14R threshold relocation.	---	**#1) Runway End Relocation 300' North**. Without modifications to FAA standards this decision will eliminate a primary "tie-down" / GA storage area. This aircraft parking location must remain . . .!	Comments noted. Following FAA's decision to no longer support an existing Threshold Crossing Height (TCH) waiver of on Runway 14R landings for large aircraft, the FAA evaluated numerous alternatives for achieving the flight procedure standards, but determined that the proposed 300-foot relocation of the threshold to the north was the only viable option. Please note that the MP Update originally planned for the development of a new North General Aviation Aircraft Storage Area to accommodate the relocation of displaced based aircraft from the existing southwest general aviation development area. Schematic layouts for these new GA facilities were presented in the draft Working Paper Three document and meeting notes on this topic are presented on the MP Update website, under the tabs: Master Plan Update – Meeting 3 Summary and Master Plan Update – Meeting 4 Summary. Ultimately, the FAA's recommendation for the RW 14R threshold relocation eliminated the potential development of a new GA aircraft storage area at the north end of the Airport.	4
#2	1	Opposition to the proposed redevelopment of the existing southwest GA development area to accommodate future air cargo facilities.	---	**#2) Redevelopment of the General Aviation tiedown and Hangar Area for Air Cargo . . .** . To increase the air cargo footprint at the expense of GA is unacceptable. I urge you to first contact the homeowners from the Magnolia Residential District and measure their resistance. Should those cargo haulers begin ". . . to drop their gear at 2 am over my house . . . ", the protests will be loud and clear. Again, there is NO case to be brought, be it financial or capacity, that supports the removal of GA.	Comments noted. The MP Update does identify a potential demand scenario for the future redevelopment of the existing southwest GA T-hangar and apron area to accommodate a new air cargo facility. However, the site will be identified on the Airport Layout Plan as a Future Aviation Redevelopment Area. The future development boundary for this site will maintain the existing twelve apron tiedowns located north of the Museum of Flight (MOF) and positioned within the existing access corridor defined by the current MOF Through-the-Fence agreement.	1

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4. No action necessary (i.e., an opinion given, or only clarification requested, etc.)

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					See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii*. Please note the decision to redevelop this area of the Airport was introduced in the previous Master Plan, with the planned removal of the three T-hangars and the acquisition of the adjacent Woods Meadow property being reflected on the current 2007 Airport Layout Plan. Also, see response to Comment #1 above. In addition, this Plan has been circulated as part of the Master Plan Update public outreach project with neighboring communities, but will have to also undergo both the SEPA and NEPA review process before a future project at this site can be constructed.	
#3	1	Demand for Large Aircraft Parking Ramp near the terminal.	---	**#3) Large Aircraft Parking Ramp near the terminal.** While some sports teams "occasionally" desire convenient parking there are alternatives for team members at other airports. At the same time Boeing Field has long ignored accommodations for all transient aircraft.	Comments noted. The new Large Aircraft Parking Ramp at the Passenger Terminal is a project that has been on the radar of Airport Staff for a number of years to accommodate increasing demand for large aircraft charter activity in the vicinity of the terminal. Various development alternatives were examined in the MP Update to accommodate both airside and landside demand for these facilities. Currently the Airport is unable to accommodate all of the larger charter aircraft looking to utilize BFI due to limited parking availability.	4
#4	1	BFI's challenges to	---	The Washington Pilots Association has been a part of numerous aviation studies focused on the Puget Sound	Comments noted.	4

Comments and Responses: Washington Pilots Association - received 12/16/20

Code for Response Action:
1. Concur that changes are or may be needed.
2. Disagree with intent or context of comment, no changes recommended.
3. FAA decisions required or additional information necessary from King County, FAA, etc.
4. No action necessary (i.e., an opinion given, or only clarification requested, etc.)

Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
		accommodate existing demand from all aviation user groups given the existing site development constraints of the facility.		Region; be it LATS, PSRC, Port of Seattle, Air Cargo Studies, The Commercial Aviation Coordinating Commission, and numerous other Aviation Division studies. They all point to the same problems . . . capacity for Commercial Enplanements, Cargo, and General Aviation. Unfortunately, GA is the first to be sacrificed . . . We strongly encourage King County to look at the bigger picture and work with all the area's airports to solve for our regional aviation problems. Boeing Field is so much more than an isolated airport in the middle of Seattle. And General Aviation is so much more compatible with downtown.	Airport Staff acknowledges the challenges of planning for the future development of an airport that is severely site constrained, but has high demand for facilities to serve all sectors of aviation. The airport is supportive of working with the FAA and WSDOT to look at the system as a whole.	

WSDOT Aviation

Comments and Responses: WSDOT Aviation - received 12/16/20

Code for Response Action:
1. Concur that changes are or may be needed.
2. Disagree with intent or context of comment, no changes recommended.
3. FAA decisions required or additional information necessary from King County, FAA, etc.
4. No action necessary (i.e., an opinion given, or only clarification requested, etc.)

Comment I.D. & #	Page	Section or Issue	Para/Line/ Sentence	Comment as Noted	Response to Comment	Action
#1	1	Concern regarding the MP Update recommendation to relocate GA aircraft storage facilities.	---	The 2017 Washington Aviation System Plan (WASP) classifies KCIA as a "Major Airport" with the primary activities of this classification being commercial service and aerospace manufacturing. WSDOT Aviation, a member of the Washington Commercial Aviation Coordinating Commission (CACC), acknowledges that Washington State has capacity issues with commercial passenger service, air cargo, and general aviation aircraft storage. Commercial passenger service and air cargo demand is projected to double in the next twenty years. Thus, the CACC is working to add capacity throughout the state aviation system to accommodate future demand including general aviation storage. For your consideration, WSDOT Aviation recommends that the Master Plan include a commitment from King County to conduct or participate in developing a plan to accommodate tenants at the airport should future projects displace them. In accordance with both state and federal grant assurances, airport sponsors are required to undertake reasonable consultation with affected parties when making decisions to commence any airport development project.	Comments noted. Airport Staff acknowledges the challenges of planning for the future development of an airport that is severely site constrained, but has high demand for facilities to serve all sectors of aviation. However, we are currently investigating how some of the existing Airport property that is being used by Boeing for temporary overflow B-737 MAX parking could potentially be used for displaced GA aircraft parking. This evaluation also applies to a few small airport leaseholds (e.g., the existing Lot 13 area located on the west side of the Airport, directly south of the existing ATCT facility) that may soon be available for new leases to support additional GA aircraft apron parking facilities. **See revised Chapter F text on pgs. F.24 & F.27, including revised illustrations: Figure F2/pg. F.3 and Figure F16/pg. F.26. Also see revised Executive Summary text on pgs. *xxxiii* and *xxxix,* including revised Figure ES1/pg. *xliii*.** Airport Staff are happy to work with WSDOT to see what can be done at BFI to help solve the regions aviation capacity problem as a whole and not just at BFI.	1

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